



## CHAPTER 8

## APPROVED COURSES

The following list includes undergraduate courses that have been approved as of February 1, 1997. Courses added after that date do not appear in this list. Courses eliminated after that date may still appear. Not every course is offered regularly. Students should consult the Schedule of Classes to ascertain which courses are actually offered during a given semester.

## COURSE NUMBERING SYSTEM

Number	Eligibility
000-099	Non-credit course
100-199	Primarily freshman course
200-299	Primarily sophomore course
300-399	Junior, senior course not acceptable for credit toward graduate degrees
386-387	Campus-wide internship courses; refer to information describing Experiential Learning
400-499	Junior, senior course acceptable for credit toward some graduate degrees
500-599	Professional School course (Dentistry, Architecture, Law, Medicine) or post-baccalaureate course
600-899	Course restricted to graduate students
799	Master Thesis credit
899	Doctoral Dissertation credit

## AASP—Afro-American Studies

**AASP 100 Introduction to Afro-American Studies (3)** Significant aspects of the history of Afro-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.

**AASP 101 Public Policy and the Black Community (3)** Formerly AASP 300. 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.

**AASP 200 African Civilization (3)** 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.

**AASP 202 Black Culture in the United States (3)** The course examines important aspects of American Negro life and thought which are reflected in Afro-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 nineteenth-century to the present.

**AASP 298 Special Topics in Afro-American Studies (3)** Repeatable to 6 credits if content differs. An introductory multi-disciplinary and inter-disciplinary educational experience to explore issues relevant to black life, cultural experiences, and political, economic and artistic development.

**AASP 299 Selected Topics in Afro-American Studies (1-3)** Repeatable to 6 credits if content differs. An introductory multi-disciplinary academic exploration of the cultural, political, and economic issues relevant to Africans and African-Americans.

**AASP 301 Applied Policy Analysis and the Black Community (3)** Prerequisite: (AASP 101 and ECON 201) or (AASP 101 and ECON 203). Recommended: one semester of statistics. 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.

**AASP 303 Computer Applications in Afro-American Studies (3)** Prerequisite: STAT 100 or SOCY 201 or MATH 111 or equivalent. Introduction to statistics and database processing software used in model estimation and simulation in policy analysis. Special emphasis on applications for applied research on policy problems confronting minority communities.

**AASP 305 Theoretical, Methodological and Policy Research Issues in Afro-American Studies (3)** Prerequisites: AASP 301 and (STAT 100 or BMGT 230 or PSYC 200 or SOCY 201 or ECON 321 or equivalent course with permission of department). Formerly AASP 401. Theories and concepts in the social and behavioral sciences relating to problems in minority communities. Issues include validity and soundness of theoretical arguments, epistemological questions of various methodologies and the relationship between policy making and policy research.

**AASP 310 African Slave Trade (3)** Prerequisite: AASP 100 or AASP 202 or permission of department. Formerly AASP 311. 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.

**AASP 312 Social and Cultural Effects of Colonization and Racism (3)** Prerequisite: AASP 100 or AASP 202. A comparative approach to the study of the social and cultural effects of colonization and racism on black people in Africa, Latin America and in the United States—community and family life, religion, economic institutions, education and artistic expression.

**AASP 314 The Civil Rights Movement (3)** Prerequisite: AASP 100 or HIST 157. Survey of the twentieth century civil rights movement from the desegregation of UM Law School through the National Black Political Congress in Gary in 1972. Major themes include leadership, legal and constitutional challenges, non-violence, Black Power, Pan-Africanism.

**AASP 397 Senior Thesis (3)** Prerequisites: AASP 305; and permission of department. Directed research in Afro-American Studies resulting in the completion and defense of a senior thesis.

**AASP 398 Selected Topics in the African Diaspora (3)** Repeatable to 6 credits if content differs. Analysis of the historical experiences and cultures of Africans in the diaspora.

**AASP 400 Directed Readings in Afro-American Studies (3)** Prerequisite: AASP 100 or AASP 202. The readings will be directed by the faculty of Afro-American Studies. Topics to be covered will be chosen to meet the needs and interests of individual students.

**AASP 402 Classic Readings in Afro-American Studies (3)** Prerequisite: AASP 100 or AASP 202. Classic readings of the social, economic and political status of blacks and other minorities in the United States and the Americas.

**AASP 410 Contemporary African Ideologies (3)** Prerequisite: AASP 200 or permission of department. 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.

**AASP 411 Black Resistance Movements (3)** Prerequisite: AASP 100. 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.

**AASP 441 Science, Technology, and the Black Community (3)** Prerequisite: AASP 100 or AASP 202 or HIST 255 or permission of department. 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 Afro-American contributions to science. Surveys the impact of

technological changes on minority communities.

**AASP 443 Blacks and the Law (3)** Prerequisite: AASP 100 or AASP 202 or HIST 255 or permission of department. 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.

**AASP 468 Special Topics in Africa and the Americas (3)** Repeatable to 6 credits if content differs. Cultural, historical and artistic dimensions of the African experience in Africa and the Americas.

**AASP 478 Humanities Topics in Afro-American Studies (3)** Repeatable to 6 credits if content differs. Advanced studies in the humanities, often requiring prerequisites, focusing on the literary, artistic and philosophical contributions of Africans and African-Americans.

**AASP 497 Policy Seminar in Afro-American Studies (3)** Prerequisite: AASP 301 or permission of department. Application of public policy analysis to important social problems and policy issues affecting black Americans. Policy research and analysis procedures through an in-depth study of a critical, national black policy issue.

**AASP 498 Special Topics in Black Culture (3)** Prerequisite: AASP 100 or AASP 202. Repeatable to 6 credits if content differs. Advanced study of the cultural and historical antecedents of contemporary African and Afro-American society. Emphasis on the social, political, economic and behavioral factors affecting blacks and their communities. Topics vary.

**AASP 499 Advanced Topics in Public Policy and the Black Community (3)** Prerequisite: AASP 301 or permission of department. Repeatable to 6 credits if content differs. 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.

## AGRI—Agriculture

**AGRI 302 Introduction to Agricultural Education (2)** Formerly AEED 302. An overview of the job of the teacher of agriculture; examination of agricultural education programs for youth and adults.

**AGRI 305 Teaching Young and Adult Farmer Groups (1)** Formerly AEED 305. Characteristics of young and adult farmer instruction in agriculture. Determining needs for and organizing a course; selecting materials for instruction; and class management. Emphasis is on the conference method of teaching.

**AGRI 311 Teaching Secondary Vocational Agriculture (3)** A comprehensive course in the work of high school departments of vocational agriculture. It emphasizes particularly placement, supervised farming programs, the organization and administration of future farmer activities, and objectives and methods in all-day instruction.

**AGRI 313 Student Teaching (5)** Prerequisite: satisfactory academic average and permission of department. Formerly AEED 313. Full-time student teaching in an off-campus student teaching center under an approved supervising teacher of agriculture, participating experience in all aspects of the work of a teacher of agriculture.

**AGRI 315 Student Teaching (1-4)** Prerequisite: satisfactory academic average and permission of department. Formerly AEED 315. Full-time observation and participation in work of teacher of agriculture in off-campus student teaching center. Provides

students opportunity to gain experience in the summer program of work, to participate in opening of school activities, and to gain other experience needed by teachers.

**AGRI 322 An Introduction to Adult and Continuing Education (3)** Formerly AEED 322. This course introduces students to the field of nonformal adult and continuing education. It examines the social functions, studies the critical issues, explores career opportunities and surveys some of the nonformal adult education delivery systems.

**AGRI 323 Developing Youth Programs (3)** Formerly AEED 323. Concepts involved in planning and executing nonformal educational programs developed to meet the needs of youth. Emphasize the identification of opportunities; needs, and problems of youth in all socio-economic levels; analysis of methods of working with youth groups and developing volunteer staff.

**AGRI 325 Directed Experience in Extension Education (1-5)** Prerequisite: satisfactory academic average and permission of department. Formerly AEED 325. Full-time observation and participation in selected aspects of extension education in an approved training county.

**AGRI 389 Selected Topics (1-3)** Prerequisite: permission of department. Repeatable to 6 credits. Students are placed in work experiences related to their stated career goals for a minimum of eight hours a week for a semester. Each student must do an in-depth study in some portion of the work experience and produce a special project and report related to this study. A student work log is also required. An evaluation from the external supervisor of the project will be required.

**AGRI 400 International Agricultural Extension and Development (3)** Formerly AEED 400. Examination of the social and ethical issues that shape extension's role in the agriculture sector of countries worldwide and that determine its contribution to international development. Review of a wide range of literature from scholars, governments, and international organizations.

**AGRI 450 Human Resources Development in Agriculture (3)** Three hours of lecture and one hour of discussion/recitation per week. Junior standing. Human resources development in the agriculture sector highlights policy, institutional, and programmatic determinations to advance work force capability in countries worldwide. Focus on developing countries, their problems, needs, and the challenge ahead.

**AGRI 464 Rural Life in Modern Society (3)** Formerly AEED 464. The historical and current nature of rural and agricultural areas and communities in the complex structure and culture of U.S. society. Basic structural, cultural, and functional concepts for analyses and contrasts of societies and the organizations and social systems within them.

**AGRI 466 Rural Poverty in an Affluent Society (3)** Formerly AEED 466. Factors giving rise to conditions of rural poverty. Problems faced by the rural poor. Programs designed to alleviate rural poverty.

**AGRI 488 Critique in Rural Education (1)** Formerly AEED 488. Current problems and trends in rural education.

**AGRI 489 Field Experience (1-4)** Prerequisite: permission of department. Repeatable to 4 credits. Formerly AEED 489. 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.

**AGRI 499 Special Problems (1-3)**

## AGRO—Agronomy

**AGRO 101 Introductory Crop Science (4)** Credit will be granted for only one of the following: AGRO 101 or AGRO 100 and AGRO 102. Major crop plants including: anatomy, physiology, morphology, history, use, adaptation, culture, improvement and economic importance.

**AGRO 105 Soil and Environmental Quality (3)** Soil as an irreplaceable natural resource, the importance of soils in the ecosystem, soils as sources of pollution, and soils as the media for the storage, assimilation or inactivation of pollutants. Acid rain, indoor radon, soil erosion and sedimentation, nutrient pollution of waters, homewoners problems with soils, and the effect of soils on the food chain.

**AGRO 202 Fundamentals of Soil Science (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: one semester of chemistry, or permission of department. Not open to students who have completed AGRO 302. Formerly AGRO 302. 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.

**AGRO 303 International Crop Production (3)** Prerequisite: BIOL 105 or equivalent. An introduction to the biological dimension of world hunger. The problems and potentials for increasing world food supply based on current agronomic knowledge. Emphasis on international aspects of food crop production and the interrelationships between agriculture and human populations in the developing world.

**AGRO 305 Introduction to Turf Management (3)** Formerly AGRO 405. Principles of turf culture. Identification and uses of turfgrass species; turfgrass fertilization, cultivation, mowing and establishment; and the identification of turf pests.

**AGRO 308 Field Soil Morphology (1-2)** One hour of lecture and two hours of laboratory per week. Prerequisite: permission of department. Repeatable to 4 credits. Intensive field study of soils with particular emphasis on soil morphology, soil classification, and agricultural and urban soil interpretations. Focus in fall semesters is on soils of the Northeast U.S.; focus in spring semesters is on soils outside the Northeast region. The lab period is devoted to fields trips and student efforts culminate in a mandatory extended field trip.

**AGRO 398 Senior Seminar (1)** Reports by seniors on current scientific and practical publications pertaining to agronomy.

**AGRO 401 Pest Management Strategies for Turfgrass (3)** Prerequisite: AGRO 305. 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.

**AGRO 402 Sports Turf Management (3)** Two hours of lecture and three hours of laboratory per week. Prerequisite: AGRO 305 and AGRO 401. Sports turf management, including design, construction, soil modification, soil cultural techniques, pesticide use, fertilization, and specialized equipment.

**AGRO 403 Crop Breeding (3)** Pre- or corequisite: BIOL 222 or equivalent or permission of department. A review of genetic principles and descriptions of contemporary and traditional methods of breeding self-pollinated, cross-pollinated, and vegetatively propagated crop plants.

**AGRO 406 Forage Crops (3)** Prerequisite: BIOL 105. Recommended: BIOL 106. World grasslands and their influence on early civilizations; current impact on human food supply; role of forages in soil conservation and a sustainable agriculture. Production and management requirements of major grass and legume species for silage and pasture for livestock feed. Cultivar development; certified seed production and distribution.

**AGRO 407 Cereal and Oil Crops (3)** Pre- or corequisites: BIOL 105 and AGRO 101. A study of principles of production for corn, small grains, rice, millets, sorghums, and soybeans and other oil seed crops. A study of seed production, processing, distribution and federal and state seed control programs of corn, small grains and soybeans.

**AGRO 410 Commercial Turf Maintenance and Production (3)** Two hours of lecture and three hours of laboratory per week. Prerequisite: AGRO 305 or permission of department. 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.

**AGRO 411 Principles of Soil Fertility (3)** Prerequisite: AGRO 202 or equivalent. 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

**AGRO 413 Soil and Water Conservation and Management (3)** Prerequisite: AGRO 202. Importance and causes of soil erosion, methods of soil erosion control. Effects of conservation practices on soil physical properties and the plant root environment. Irrigation and drainage as related to water use and conservation.

**AGRO 414 Soil Morphology, Genesis and Classification (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: AGRO 202. 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.

**AGRO 415 Soil Survey and Land Use (3)** Two hours of lecture and three hours of laboratory per week. Prerequisite: AGRO 202. Evaluation of soils in the uses of land and the environmental implications of soil utilization. Interpretation of soil information and soil surveys as applied to both agricultural and non-agricultural problems. Incorporation of soil data into legislation, environmental standards and land use plans.

**AGRO 417 Soil Physics (3)** Two hours of lecture and three hours of laboratory per week. Prerequisites: AGRO 202 and a course in

physics; or permission of department. A study of physical properties of soils with special emphasis on relationship to soil productivity.

**AGRO 421 Soil Chemistry (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: AGRO 202. 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.

**AGRO 422 Soil Microbiology (3)** Prerequisite: AGRO 202, CHEM 104 or permission of department. Relationship of soil microorganisms to the soils' physical and chemical properties. Nitrogen fixation, mycorrhizae-plant interactions and microbially mediated cycling.

**AGRO 423 Soil-Water Pollution (3)** Prerequisites: AGRO 202 and CHEM 104 or permission of department. Reaction and fate of pesticides, agricultural fertilizers, industrial and animal wastes in soil and water with emphasis on their relation to the environment.

**AGRO 425 Terrestrial Bioremediation (3)** Prerequisite: one course in biology and CHEM 103 or permission of department. Biologically based methods for the remediation of contaminated soil. Bioremediation using bacteria, fungi and higher plants, of both organic and inorganic contaminants in soil will be addressed.

**AGRO 440 Crop, Soils, and Civilization (3)** 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.

**AGRO 441 Sustainable Agriculture (3)** 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.

**AGRO 444 Remote Sensing of Agriculture and Natural Resources (3)** Interaction of electromagnetic radiation with matter. Application of remote sensing technology to agriculture and natural resource inventory, monitoring and management and related environmental concerns.

**AGRO 451 Crop Culture and Development (3)** Pre- or corequisite: PBIO 420. Application of basic plant physiology to crop production. Photosynthesis, respiration, mineral nutrition, water and temperature stress, and post-harvest physiology.

**AGRO 453 Weed Science (3)** Two hours of lecture and three hours of laboratory per week. Weed identification, ecology, and control (cultural, mechanical, biological, and chemical methods).

**AGRO 454 Air and Soil Pollution Effects on Crops (3)** Effects of air pollutants such as ozone, sulfur dioxide, acid rain, etc., and soil pollutants such as toxic metals, pesticides, on the growth, productivity and quality of crops.

**AGRO 461 Hydric and Hydromorphic Soils (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: AGRO 414 or equivalent. The soils of wetlands, including hydrology, chemistry, genesis, and taxonomy. Understanding and application of Federal and regional guidelines to hydromorphic soils with emphasis on interpretations based on field observations. Saturday field trips.

**AGRO 483 Plant Breeding Laboratory (2)** Prerequisites: AGRO 403 and permission of department. Current plant breeding research being conducted at The University of Maryland and USDA at Beltsville. Discussion with plant breeders about pollination techniques, breeding methods, and program achievements and goals. Field trips to selected USDA laboratories.

**AGRO 499 Special Problems in Agronomy (1-3)** Prerequisites: AGRO 202, AGRO 406, AGRO 407 or permission of department. A detailed study, including a written report of an important problem in agronomy.

## AMST—American Studies

**AMST 201 Introduction to American Studies (3)** Introduction to American cultural studies—past and present—by examining the concept of "self" in American autobiographical writing and the concept of "society" in accounts of various communities.

**AMST 203 Popular Culture in America (3)** An introduction to American popular culture, its historical development, and its role as a reflection of and influence on our culture and society.

**AMST 204 Film and American Culture Studies (3)** Exploration of the American film from an 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.

**AMST 205 Material Aspects of American Life (3)** Historical survey of American material culture. Ways of describing and interpreting accumulated material evidence, e.g. buildings, town

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plans, introduced by stressing relationship between artifact and culture.

**AMST 207 Contemporary American Cultures (3)** World views, values, and social systems of contemporary American cultures explored through readings on selected groups such as middle-class suburbanites, old order Amish, and urban tramps.

**AMST 211 Technology and American Culture (3)** Historical and contemporary technological innovations in American society, with special emphasis on the humanities. Varied social and cultural responses to one contemporary technological issue, e.g. environmental pollution, genetic engineering, communications technology, and psychopharmacology.

**AMST 212 Diversity in American Culture (3)** Exploration of the role of ethnic 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".

**AMST 298 Selected Topics in American Studies (3)** Repeatable to 6 credits if content differs. Cultural study of a specific theme or issue involving artifacts and documents from both past and contemporary American experience.

**AMST 330 Critics of American Culture (3)** Prerequisite: prior course in AMST, HIST, or SOCY. Philosophies of American social purpose and promise. Readings from "classical" American thinkers, contemporary social commentators, and American studies scholars.

**AMST 398 Independent Studies (1-3)** Prerequisite: permission of department. Repeatable to 6 credits. Provides the student with the opportunity to pursue independent, interdisciplinary research and reading in specific areas of American culture studies.

**AMST 418 Cultural Themes in America (3)** Repeatable to 6 credits if content differs. Examination of structure and development of American culture through themes such as "growing up American", "culture and mental disorders", "race", "ethnicity", "regionalism", "landscape", "humor".

**AMST 428 American Cultural Eras (3)** Repeatable to 6 credits if content differs. 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", "American culture in the Great Depression".

**AMST 429 Perspectives on Popular Culture (3)** Repeatable to 6 credits if content differs. Topics in popular culture studies, including the examination of particular genres, themes, and issues.

**AMST 432 Literature and American Society (3)** Prerequisite: prior course in AMST, SOCY, American literature, or American history. Examination of the relationship between literature and society: including literature as cultural communication and the institutional framework governing its production, distribution, conservation and evaluation.

**AMST 450 Seminar in American Studies (3)** Prerequisite: nine hours prior coursework in American Studies, including AMST 201. Senior standing. For AMST majors only. 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.

### ANSC—Animal and Avian Sciences

The following courses may involve the use of animals. Students who are concerned about the use of animals in teaching have the responsibility to contact the instructor, prior to course enrollment, to determine whether animals are to be used in the course, whether class exercises involving animals are optional or required and what alternatives, if any, are available.

**ANSC 101 Principles of Animal Science (3)** Two hours of lecture and two hours of laboratory per week. A comprehensive course, including the development of animal science, its contributions to the economy, characteristics of animal products, factors of efficient and economical production and distribution.

**ANSC 211 Anatomy of Domestic Animals (4)** Three hours of lecture and two hours of laboratory per week. Prerequisite: BIOL 105. A systematic gross and microscopic comparative study of the anatomy of the major domestic animals. Special emphasis is placed on those systems important in animal production.

**ANSC 212 Applied Animal Physiology (3)** Prerequisite: ANSC 211 or equivalent. The physiology of domesticated animals with emphasis on functions related to production, and the physiological adaptation to environmental influences.

**ANSC 214 Applied Animal Physiology Laboratory (1)** Three hours of laboratory per week. Pre- or corequisite: ANSC 212. Application of physiological laboratory techniques to laboratory and domestic animals.

**ANSC 215 Comparative Animal Nutrition (3)** Prerequisites: ANSC 101 and (CHEM 104 or CHEM 233). Formerly ANSC 402. Nutrients and their fundamental role in animal metabolism, in relation to their biochemical role in metabolism, digestion, absorption, and their deficiency symptoms.

**ANSC 220 Livestock Management (4)** Prerequisite: ANSC 101. Formerly ANSC 221. Management of meat animals including beef, sheep, and swine. Breeding, feeding management and marketing practices at the leading edge of technology for maximum economic efficiency.

**ANSC 222 Meats (3)** Two hours of lecture and three hours of laboratory per week. Prerequisite: ANSC 220. Formerly ANSC 422. Meat and the factors influencing acceptability, marketing, and quality of fresh meats. Laboratory periods are conducted in packing houses, meat distribution centers, retail outlets and University Meats Laboratory.

**ANSC 230 Equine Science (3)** Prerequisite: ANSC 101. For students who intend to be involved in the care and management of horses. The principles of nutrition, anatomy, physiology, health and disease, growth, locomotion and management techniques are emphasized.

**ANSC 231 Equine Science Practicum (1)** Pre- or corequisite: ANSC 230. Formerly ANSC 431. Application of the principles discussed in ANSC 230 to the management of horses focusing on management decisions associated with small business operations in the horse industry.

**ANSC 240 Dairy Cattle Management (2)** Prerequisite: ANSC 220. All aspects of dairy production, including nutrition, reproduction, mastitis control, milking management, farmstead facilities, financial management and forage production.

**ANSC 241 Dairy Cattle Management Practicum (1)** Three hours of laboratory per week. Prerequisite: ANSC 240. Formerly ANSC 242. Practicum to parallel ANSC 240. Field trips required.

**ANSC 244 Dairy Cattle Type Appraisal (1)** Two laboratory periods. Prerequisite: permission of department. Laboratory. Analysis of dairy cattle type with emphasis on the comparative judging of dairy cattle.

**ANSC 251 Beef and Sheep Management Practicum (1)** Three hours of laboratory per week. Prerequisite: ANSC 220. Credit will be granted for only one of the following: ANSC 220 or ANSC 424. Formerly ANSC 424. Practicum to parallel ANSC 220. Field trips required.

**ANSC 252 Introduction to the Diseases of Wildlife (3)** Two hours of lecture and one hour of discussion/recitation per week. Prerequisite: BIOL 105 or equivalent or permission of department. 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.

**ANSC 262 Commercial Poultry Management (3)** Prerequisite: ANSC 101. A symposium of finance, investment. Plant layout. Specialization, purchase of supplies and management problems in baby chick, egg, broiler and turkey production; foremanship, advertising, selling. By-products, production and financial records. Field trips required.

**ANSC 271 Swine Management Practicum (1)** Three hours of laboratory per week. Prerequisite: ANSC 220. Formerly ANSC 421. Practicum to parallel ANSC 220. Field trips required.

**ANSC 289 Animal Agriculture Tour (1)** 24 hours of laboratory and 5 hours of discussion per semester. Prerequisite: ANSC 101. Repeatable to 2 credits if content differs. An intensive field study of farms, businesses and related organizations involved in animal agriculture. Emphasis on animal care and management, facilities, products, procedures, and career opportunities. Up to five hours of discussion and a three-day field trip during spring break are required.

**ANSC 305 Companion Animal Care (3)** Prerequisite: BIOL 105. 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.

**ANSC 315 Applied Animal Nutrition (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: ANSC 215. Formerly ANSC 203. 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.

**ANSC 327 Quantitative Domestic Animal Genetics (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: BIOL 222. Population and quantitative genetics as applied to domestic

livestock: concepts of variation, heredity and relationship, breeding systems. Genetic evaluation, selection for improvement, and measuring genetic progress will be emphasized.

**ANSC 332 Horse Management (3)** Prerequisite: ANSC 230. Major topics include nutrition, reproduction, breeding, performance evaluation, basic training and management techniques.

**ANSC 350 Ornithology (4)** Three hours of lecture and three hours of laboratory per week. Three mandatory field trips. Prerequisite: BIOL 105. Includes systematics, anatomy, physiology, behavior, life histories, ecology, population dynamics, evolution and conservation of birds.

**ANSC 370 Animal Agriculture: Scientific and Cultural Perspectives (3)** Prerequisite: BIOL 105. Study will focus on the enhancement of biological efficiency that permits more extensive options for choice of human activities, within the limitations of ecological constraints. The course examines the growth of knowledge, of both cultural and scientific origin, as applied in the development of successful human-animal systems.

**ANSC 397 Senior Seminar (1)** Prerequisite: permission of department. Career and professional opportunities. Overview of professional organizations and appropriate private and governmental agencies. Preparation and presentation of animal science topics.

**ANSC 398 Seminar (1)** Repeatable to 2 credits if content differs. Presentation and discussion of current literature and research work in animal science.

**ANSC 399 Special Problems in Animal Science (1-2)** Work assigned in proportion to amount of credit. A course designed for advanced undergraduates in which specific problems relating to animal science will be assigned.

**ANSC 401 Fundamentals of Nutrition (3)** Prerequisites: CHEM 104 and ANSC 212. Recommended: BCHM 261. A study of the fundamental role of all nutrients in the body including their digestion, absorption and metabolism. Dietary requirements and nutritional deficiency syndromes of laboratory and farm animals and humans.

**ANSC 406 Environmental Physiology (3)** Prerequisite: anatomy and physiology. The specific anatomical and physiological modifications employed by animals adapted to certain stressful environments will be considered. Particular emphasis will be placed on the problems of temperature regulation and water balance. Specific areas for consideration will include: animals in cold (including hibernation), animals in dry heat, diving animals and animals in high altitudes.

**ANSC 412 Introduction to Diseases of Animals (3)** Two lectures and one laboratory period per week. Prerequisites: MICB 200 and BIOL 105. This course gives basic instruction in the nature of disease: including causation, immunity, methods of diagnosis, economic importance, public health aspects and prevention and control of the common diseases of sheep, cattle, swine, horses and poultry.

**ANSC 413 Laboratory Animal Management (3)** A comprehensive course in care and management of laboratory animals. Emphasis will be placed on physiology, anatomy and special uses for the different species. Disease prevention and regulations for maintaining animal colonies will be covered. Field trips will be required.

**ANSC 415 Parasitic Diseases of Domestic Animals (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: ANSC 412 or equivalent. A study of parasitic diseases resulting from protozoan and helminth infection and arthropod infestation. Emphasis on parasites of veterinary importance: their identification; life cycles, pathological effects and control by management.

**ANSC 420 Animal Production Systems (4)** Two hours of lecture and four hours of laboratory per week. Prerequisites: ANSC 101, ANSC 220, and (ANSC 240 or ANSC 262). Formerly ANSC 423. Effects of management and economic decisions on animal production enterprises. Computer simulations of intensive and extensive production units.

**ANSC 430 Food Microbiology (2)** Prerequisite: MICB 200 or equivalent. Also offered as NFSC 430. Credit will be granted for only one of the following: ANSC 430 or NFSC 430. 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.

**ANSC 434 Food Microbiology Laboratory (2)** Four hours of laboratory per week. Pre- or corequisite: ANSC 430 or NFSC 430. Also offered as NFSC 434. Credit will be granted for only one of the following: ANSC 434 or NFSC 434. A study of techniques and procedures used in the microbiological examination of foods.

**ANSC 443 Physiology and Biochemistry of Lactation (3)** *Prerequisite:* ANSC 212 or equivalent; and BCHM 261 or BCHM 461. The physiology and biochemistry of milk production in domestic animals, particularly cattle. Mammary gland development and maintenance from the embryo to the fully developed lactating gland. Abnormalities of the mammary gland.

**ANSC 446 Physiology of Mammalian Reproduction (3)** *Prerequisite:* ZOOL 422 or ANSC 212. Anatomy and physiology of reproductive processes in domesticated and wild mammals.

**ANSC 447 Physiology of Mammalian Reproduction Laboratory (1)** *Three hours of laboratory per week. Pre- or corequisite:* ANSC 446. Animal handling, artificial insemination procedures and analytical techniques useful in animal management and reproductive research.

**ANSC 451 Dairy Products Processing (3)** *Two hours of lecture and two hours of laboratory per week. Recommended:* CHEM 103 or equivalent. Formerly NFSC 451. Method of production of fluid milk, butter, cheese, condensed and evaporated milk and milk products and ice cream.

**ANSC 452 Avian Physiology (2)** *Two two-hour lecture/laboratory/demonstration periods per week. Prerequisite:* a basic course in animal anatomy or physiology. The digestive, immune, excretory, respiratory, muscle, circulatory, endocrine and nervous systems of avian species. Laboratory exercises include use of anesthetics, suturing techniques, use of a polygraph and instrumentation for analyzing blood, urine, liver, kidney and brain tissue.

**ANSC 453 Animal Welfare (3)** *Prerequisite:* ANSC 101 or ZOOL 210 or permission of instructor. Ethical concerns pertinent to the use of animals in modern society. Historical and philosophical aspects of human/animal interrelationships, animal intelligence and awareness, and the treatment of animals in agriculture and scientific research will be considered.

**ANSC 455 Applied Animal Behavior (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites:* (ANSC 101 or BIOL 106) and BIOL 222. Principles of animal behavior applied to production systems in animal agriculture.

**ANSC 461 Technology of Market Eggs and Poultry (3)** *Two hours of lecture and two hours of laboratory per week. Formerly NFSC 461.* A study of the technological factors concerned with the processing, storage, and marketing of eggs and poultry and the factors affecting their quality.

**ANSC 489 Current Topics in Animal Science (1-3)** *Prerequisite:* permission of department. Repeatable to 6 credits if content differs. Examination of current developments in the animal sciences.

## ANTH—Anthropology

**ANTH 220 Introduction to Biological Anthropology (4)** *Three hours of lecture and two hours of laboratory per week. Credit will be granted for only one of the following: ANTH 101 or ANTH 220. Formerly ANTH 101.* Human biological evolution including the biology of contemporary human groups, non-human primate social behavior, and the fossil, biochemical, and molecular evidence for human evolution. Includes a laboratory study of human population genetics, biochemical variation, and anatomical diversity in modern and fossil human and non-human primate groups.

**ANTH 240 Introduction to Archaeology (3)** *Credit will be granted for only one of the following: ANTH 240 or ANTH 241. Formerly ANTH 241.* 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.

**ANTH 242 Chesapeake: An Archaeology of Maryland (3)** Human presence in the Chesapeake from the first arrival of Native Americans to the present. Emphasis is upon the historical archaeology of the region from European contact through the Nineteenth Century.

**ANTH 260 Introduction to Sociocultural Anthropology and Linguistics (3)** *Credit will be granted for only one of the following: ANTH 102 or ANTH 260. Formerly ANTH 102.* 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.

**ANTH 262 Culture and Environment (3)** *Prerequisite:* ANTH 260 or permission of department. *Credit will be granted for only one of the following: ANTH 221 or ANTH 262. Formerly ANTH 221.* Theory and method in cultural ecology and the formulation of a critical perspective on the explanation of the concept of adaptation. Includes the ecological understanding of gender differences and considers conflicting natural resource management strategies and environmental degradation.

**ANTH 298 Special Topics in Anthropology (3)** *Repeatable to 6 credits if content differs.* Anthropological perspectives on selected topics of broad general interest.

**ANTH 320 Human Evolution (4)** *Prerequisite:* ANTH 220. *Credit will be granted for only one of the following: ANTH 320 or ANTH 361. Formerly ANTH 361.* Assessment of the fossil, biochemical, and molecular evidence for human evolution from the divergence of hominids from the pongid line to modern times. Includes a laboratory survey of the basic principles of human evolution as seen by comparative anatomical study of fossil specimens and assessments of the molecular and biochemical data.

**ANTH 340 Method and Theory in Archaeology (3)** *Prerequisite:* ANTH 240. 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.

**ANTH 342 Archaeology of New World (3)** *Prerequisite:* ANTH 240. *Credit will be granted for only one of the following: ANTH 342 or ANTH 451. Formerly ANTH 451.* Prehistoric and European cultures in North and South America, with a focus on the means of archaeological interpretation.

**ANTH 360 Method and Theory in Sociocultural Anthropology (3)** *Prerequisite:* ANTH 260. Theoretical approaches and research methods in sociocultural anthropology. Emphasis on current debates, new directions, and their historical antecedents.

**ANTH 362 Diversity in Complex Societies (3)** *Prerequisite:* ANTH 260 or permission of department. Methodological and theoretical approaches in anthropology to complex society through selected case study material that highlights the relationship between gender, class and cultural diversity as it shapes modern social life. Cross-cultural comparison and the different perspectives of minority and feminist scholars will also be stressed.

**ANTH 364 The Anthropology of Religion (3)** *Prerequisite:* ANTH 260. *Credit will be granted for only one of the following: ANTH 364 or ANTH 434. Formerly ANTH 434.* Comparative study of religion in social, cultural, political, and economic context. Combines the history of schools of interpretation with a survey of theoretical alternatives and a focus on selected case studies.

**ANTH 368 Regional Ethnography (3)** *Prerequisite:* ANTH 260 or permission of department. *Repeatable to 6 credits if content differs.* 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.

**ANTH 380 Culture and Discourse (3)** *Prerequisite:* ANTH 260 or equivalent or permission of department. *Recommended:* LING 200 or equivalent. *Credit will be granted for only one of the following: ANTH 380 or ANTH 371. Formerly ANTH 371.* 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.

**ANTH 398 Independent Study (1-3)** *Prerequisite:* permission of department. *Repeatable to 6 credits if content differs.* Independent interdisciplinary research and reading in specific areas of anthropology.

**ANTH 420 Origins of Modern Humans (3)** *Prerequisite:* ANTH 320 or permission of department. Principles of taxonomy as applied to the fossil evidence for human emergence; a discussion of fossils; biological and cultural change; data on molecular and cellular evolution; and a discussion of demographic and ecological patterns as they effect evolutionary change from region to region.

**ANTH 428 Special Topics in Bioanthropology (3)** *Prerequisite:* permission of department. *Repeatable to 6 credits if content differs.* 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.

**ANTH 440 Historical Archaeology (3)** *Prerequisite:* ANTH 240. The expansion of European culture through colonization of outposts and countries around the world after 1450 is explored through material remains and artifacts from areas that may include Africa, India, South Africa, Australia, and the Western Hemisphere.

**ANTH 448 Special Topics in Archaeology (3)** *Prerequisite:* ANTH 240. *Repeatable to 6 credits if content differs.* 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.

**ANTH 460 Interpretive Anthropology (3)** *Prerequisite:* ANTH 260 or permission of department. Anthropological approaches which seek to explain human behavior in terms of meaning and their relationships to other aspects of social life.

**ANTH 462 Kinship and Social Organizations (3)** *Prerequisite:* ANTH 260. *Recommended:* ANTH 360. *Credit will be granted for only one of the following: ANTH 462 or ANTH 431. Formerly ANTH 431.* Cross-cultural study of customary social phenomena, as

encountered through ethnographic inquiry. Attention on a wide sample of social behaviors and social structures, including those characteristic of complex, state-level socio-cultural systems. It will employ methods and insights deriving from historical data, as well as from those resulting from a wide range of intensive ethnographic inquiries.

**ANTH 464 Sustainable Grassroots Development (3)** *Prerequisite:* ANTH 262 or equivalent. Explores anthropological approaches to economic development, particularly the new sub-field of sustainable development. Examines the local-level social, political and economic consequences of development and the potential for grassroots strategies to manage resources.

**ANTH 468 Special Topics in Cultural Anthropology (3)** *Prerequisite:* ANTH 360 or permission of department. *Repeatable to 6 credits if content differs.* Advanced courses in varying specialty areas of cultural anthropology that respond to new theoretical developments, faculty research interests, or specialties of visiting scholars.

**ANTH 470 History and Philosophy of Anthropological Inquiry (3)** *Prerequisite:* ANTH 220 or ANTH 240 or ANTH 260. *Recommended:* ANTH 320 or ANTH 340 or ANTH 360 or ANTH 380. *Credit will be granted for only one of the following: ANTH 470 or ANTH 397. Formerly ANTH 397.* Important philosophical and historical aspects of anthropological theorizing. Attention will be given on the Ontological and Epistemological (the latter including Methodological) assumptions of the major camps and paradigms in anthropology over the past one hundred or so years, especially the last three decades. A focus on developments in cultural anthropology, while addressing the other subfields of anthropology.

**ANTH 476 Senior Research (3-4)** *For ANTH majors only. Credit will be granted for only one of the following: ANTH 476 or ANTH 486.* 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 a senior thesis in anthropology.

**ANTH 477 Senior Thesis (3-4)** *Prerequisite:* ANTH 476; permission of department. *For ANTH majors only. Credit will be granted for only one of the following: ANTH 477 or ANTH 487.* Capstone course in which students write a senior thesis on independent research into a current problem in anthropology. The thesis is defined before a committee of faculty.

**ANTH 478 Special Topics in Linguistics (3)** *Prerequisite:* ANTH 380 or permission of department. *Recommended:* LING 200 or equivalent. *Repeatable to 6 credits if content differs.* Advanced courses in specialty areas that respond to new theoretical developments and faculty research interests in linguistics.

**ANTH 486 Honors Research (3-4)** *Prerequisites:* permission of department; admission to University Honors Program or Anthropology Honors Program. *For ANTH majors only. Credit will be granted for only one of the following: ANTH 486 or ANTH 476.* 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.

**ANTH 487 Honors Thesis (3-4)** *Prerequisites:* ANTH 486; permission of department; admission to University Honors Program or Anthropology Honors Program. *For ANTH majors only. Credit will be granted for only one of the following: ANTH 487 or ANTH 477.* Capstone course in which students write a thesis on the results of independent research into a current problem in anthropology.

**ANTH 496 Field Methods in Archaeology (6)** *Formerly ANTH 499.* Field training in the techniques of archaeological survey and excavation.

**ANTH 498 Ethnographic Fieldwork (3-8)** *Prerequisite:* permission of department. *Repeatable to 8 credits if content differs.* Field training in the collection, recording and interpretation of ethnographic data.

**ANTH 499 Fieldwork in Biological Anthropology (3-8)** *Prerequisite:* permission of department. *Repeatable to 8 credits if content differs.* Field training in techniques of human biology, primatology, or paleoanthropology.

## ARCH—Architecture

**ARCH 170 Introduction to the Built Environment (3)** Introduction to conceptual, perceptual, behavioral and technical aspects of environmental design; methods of analysis, problem solving and project implementation.

**ARCH 220 History of Architecture I (3)** Survey of Western architectural history to the Renaissance. With consideration of parallel developments in the Eastern World.

**ARCH 221 History of Architecture II (3)** *Prerequisite:* ARCH 220 or permission of department. Survey of Western architectural history from the Renaissance to the Twentieth Century. With consideration of parallel developments in the Eastern World.

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**ARCH 223 History of Non-Western Architecture (3)** Survey of architectural history including prehistoric and vernacular; ancient civilizations of Egypt, Mesopotamia and the Indus valley; the Islamic world; Hindu and Buddhist traditions of Asia; and pre-European Africa and the Americas.

**ARCH 242 Drawing I (2)** Introduces the student to basic techniques of sketching and use of various media.

**ARCH 312 Architectural Structures I (3)** Prerequisites: MATH 220; and PHYS 122. Recommended: ARCH 401. For ARCH majors only. Principles of behavior displayed in architectural structural systems, elements and materials; equilibrium and stability, distribution of forces and stresses, strength and stiffness. Resolutions of forces, reactions, movements, shears, deflection, and buckling of systems and elements.

**ARCH 313 Environmental Control and Systems I (3)** Prerequisite: MATH 220, PHYS 122, ARCH 401. For majors only. Theory, quantification, and architectural design applications for mechanical systems and acoustics.

**ARCH 343 Drawing II: Line Drawing (3)** Studio, four hours per week. Six hours of laboratory per week. Prerequisite: ARCH 400 or permission of department. For ARCH majors only. Basic free hand line drawing for architectural perception and design.

**ARCH 375 Architectural Construction and Materials (3)** Prerequisite: MATH 220, PHYS 122. For majors only. Construction processes of building; related terminology; review of primary building materials; physical characteristics; use and performance of materials as related to environmental forces.

**ARCH 400 Architecture Studio I (6)** Three hours of lecture and nine hours of studio per week. Prerequisite: ARCH majors only. Introduction to the processes of visual and architectural design including field problems.

**ARCH 401 Architecture Studio II (6)** Three hours of lecture and nine hours of studio per week. Prerequisite: ARCH 400 with a grade of C or better. For ARCH majors only. Continuation of ARCH 400.

**ARCH 402 Architecture Studio III (6)** Three hours of lecture and nine hours of studio per week. Prerequisite: ARCH 401 with a grade of C or better. For ARCH majors only. Design projects involving the elements of environmental control, basic structural systems, building processes and materials.

**ARCH 403 Architecture Studio IV (6)** Prerequisite: ARCH 402 with a grade of C or better. For ARCH majors only. Three hours of lecture and nine hours of studio per week. Design projects involving forms generated by different structural systems, environmental controls and methods of construction.

**ARCH 408 Selected Topics in Architecture Studio (1-6)** Prerequisite: ARCH 403 or equivalent and permission of department. Repeatable to 6 credits if content differs. Topical problems in architecture and urban design.

**ARCH 410 Technology I (4)** Prerequisites: MATH 220; and (PHYS 121 and PHYS 122) or PHYS 117). Corequisite: ARCH 400. For ARCH majors only. First course in a four course sequence which develops the knowledge and skills of architectural technology. Addresses climate, human responses to climate, available materials, topography and impact on culture. Principles of assembly, basic structural principles and philosophies of construction.

**ARCH 411 Technology II (4)** Prerequisite: ARCH 410. Corequisite: ARCH 401. For ARCH majors only. Second course in a four course sequence. Building construction processes and terminology; use and performance characteristics of primary building materials; principles of structural behavior related to the building systems; equilibrium and stability, stiffness and strength, types of stress, distribution of force and stress, resolution of forces, reactions, bending moments, shear, deflection, buckling.

**ARCH 412 Technology III (4)** Prerequisite: ARCH 411. Corequisite: ARCH 402. For ARCH majors only. Design of steel, timber, and reinforced concrete elements, and subsystems; analysis of architectural building systems. Introduction to design for both natural and other hazards.

**ARCH 413 Technology IV (4)** Prerequisite: ARCH 412. Corequisite: ARCH 403. For ARCH majors only. Final course in a four course sequence. Theory, quantification, and architectural design applications for water systems, fire protection, electrical systems, illumination, signal equipment, and transportation systems.

**ARCH 415 Environmental Control and Systems II (3)** Prerequisite: ARCH 313, ARCH 402. For ARCH majors only. Theory, quantification, and architectural design applications for water systems, fire protection, electrical systems, illumination, signal equipment, and transportation systems.

**ARCH 418 Selected Topics in Architectural Science (1-4)** Prerequisite: permission of department. Repeatable to 7 credits if content differs.

**ARCH 419 Independent Studies in Architectural Science (1-4)** Repeatable to 7 credits. Proposed work must have a faculty sponsor and receive approval of the curriculum committee.

**ARCH 420 History of American Architecture (3)** Prerequisite: ARCH 221 or permission of department. American architecture from the late 17th to the 20th century.

**ARCH 422 History of Greek Architecture (3)** Prerequisite: ARCH 220 or permission of department. Survey of Greek architecture from 750-100 B.C.

**ARCH 423 History of Roman Architecture (3)** Prerequisite: ARCH 220 or permission of department. Survey of Roman architecture from 500 B.C. To A.D. 325.

**ARCH 426 Fundamentals of Architecture (3)** Prerequisite: admission to 3 1/2 year M. ARCH program. Thematic introduction of a variety of skills, issues, and ways of thinking that bear directly on the design and understanding of the built world.

**ARCH 427 Theories of Architecture (3)** Prerequisite: ARCH 221 or permission of department. For ARCH majors only. Selected historical and modern theories of architectural design.

**ARCH 428 Selected Topics in Architectural History (1-3)** Prerequisite: permission of department. Repeatable to 7 credits if content differs.

**ARCH 429 Independent Studies in Architectural History (1-4)** Repeatable to 6 credits. Proposed work must have a faculty sponsor and receive approval of the curriculum committee.

**ARCH 432 History of Medieval Architecture (3)** Prerequisite: ARCH 220 or permission of department. Architecture of western Europe from the early Christian and Byzantine periods through the late Gothic, with consideration of parallel developments in the eastern world.

**ARCH 433 History of Renaissance Architecture (3)** Prerequisite: ARCH 221 or permission of department. Renaissance architectural principles and trends in the 15th and 16th centuries and their modifications in the Baroque period.

**ARCH 434 History of Modern Architecture (3)** Prerequisite: ARCH 221 or permission of department. Architectural trends and principles from 1750 to the present, with emphasis on developments since the mid-19th century.

**ARCH 435 History of Contemporary Architecture (3)** For ARCH majors only. Concentration on the developments in architecture in Europe and the U.S. since World War II, their antecedents in the 1920s and 1930s, and the various reactions to modernism in the post-war era.

**ARCH 436 History of Islamic Architecture (3)** Prerequisite: ARCH 220 or permission of department. Survey of Islamic architecture from the seventh through the eighteenth century.

**ARCH 443 Visual Communication (2)** Two hours of lecture and two hours of laboratory per week. Prerequisite: admission to the 3 1/2 year M. ARCH program. For ARCH majors only. 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.

**ARCH 445 Visual Analysis of Architecture (3)** Two hours of lecture and two hours of studio per week. Prerequisite: ARCH 401 and ARCH 343, or permission of department. Visual principles of architectural design through graphic analysis.

**ARCH 448 Selected Topics in Visual Studies (1-4)** Prerequisite: permission of department. Repeatable to 7 credits if content differs.

**ARCH 449 Independent Studies in Visual Studies (1-4)** Repeatable to 6 credits. Proposed work must have a faculty sponsor and receive approval of the curriculum committee.

**ARCH 450 Introduction to Urban Planning (3)** Introduction to city planning theory, methodology and techniques, dealing with normative, urban, structural, economic, social aspects of the city; urban planning as a process. Architectural majors or by permission of the instructor. Lecture, seminar, 3 hours per week.

**ARCH 451 Urban Design Seminar (3)** Prerequisite: ARCH 350 or permission of department. 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.

**ARCH 453 Urban Problems Seminar (3)** Prerequisite: permission of department. A case study of urban development issues, dealing primarily with socio-economic aspects of changes in the built environment.

**ARCH 454 Theories of Urban Form (3)** Theories of planning and design of urban spaces, building complexes, and new communities.

**ARCH 458 Selected Topics in Urban Planning (1-4)** Prerequisite: permission of department. Repeatable to 7 credits if content differs.

**ARCH 459 Independent Studies in Urban Planning (1-4)** Repeatable to 6 credits. Proposed work must have a faculty sponsor and receive approval of the curriculum committee.

**ARCH 460 Site Analysis and Design (3)** Prerequisite: ARCH majors only or permission of department. Principles and methods of site analysis; the influence of natural and man-made site factors on site design and architectural form.

**ARCH 470 Computer Applications in Architecture (3)** Prerequisite: ARCH 400 or permission of department. Introduction to computer programming and utilization, with emphasis on architectural applications.

**ARCH 472 Economic Determinants in Architecture (3)** Introduction to economic factors influencing architectural form and design, including land economics, real estate, financing, project development, financial planning, construction and cost control.

**ARCH 478 Selected Topics in Architecture (1-4)** Prerequisite: permission of department. Repeatable to 7 credits if content differs.

**ARCH 479 Independent Studies in Architecture (1-4)** Repeatable to 6 credits. Proposed work must have a faculty sponsor and receive approval of the curriculum committee.

**ARCH 480 Problems and Methods of Architectural Preservation (3)** Prerequisite: ARCH 420 or permission of department. Theory and practice of preservation in America, with emphasis on the problems and techniques of community preservation.

**ARCH 481 The Architect in Archaeology (3)** Prerequisite: permission of department. The role of the architect in field archaeology and the analysis of excavating, recording, and publishing selected archaeological expeditions.

**ARCH 482 The Archaeology of Roman and Byzantine Palestine (3)** Archaeological sites in Palestine (Israel and Jordan) from the reign of Herod the Great to the Moslem conquest.

**ARCH 483 Field Archaeology (3)** Prerequisite: permission of department. Participation in field archaeology with an excavation officially recognized by proper authorities of local government.

**ARCH 488 Selected Topics in Architectural Preservation (1-4)** Prerequisite: permission of department. Repeatable to 7 credits if content differs.

**ARCH 489 Independent Studies in Architectural Preservation (1-4)** Repeatable to 6 credits. Proposed work must have a faculty sponsor and receive approval of the curriculum committee.

## AREC—Agricultural and Resource Economics

**AREC 240 Introduction to Economics and the Environment (3)** 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.

**AREC 250 Elements of Agricultural and Resource Economics (3)** An introduction to economic principles of production, marketing, agricultural prices and incomes, farm labor, credit, agricultural policies, and government programs.

**AREC 306 Farm Management (3)** The organization and operation of the farm business to obtain an income consistent with family resources and objectives. Principles of production economics and other related fields as applied to the individual farm business.

**AREC 332 Introduction to Natural Resource Policy (3)** Prerequisite: AREC 240. Credit will be granted for only one of the following: AREC 432 or AREC 332. Formerly AREC 432. Development of natural resource policy and analysis of the evolution of public intervention in the use of natural resources. Examination of present policies and of conflicts between private individuals, public interest groups, and government agencies.

**AREC 365 World Hunger, Population, and Food Supplies (3)** 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.

**AREC 382 Computer-Based Analysis in Agricultural and Resource Economics (3)** Two hours of lecture and two hours of laboratory per week. Prerequisites: ECON 203 or equivalent and CMSC 103 or equivalent. Recommended: STAT 100. Exploration of basic economic concepts using a computer spreadsheet. Topics include price deflation, index numbers, activity analysis, time series

analysis, forecasting, and economic optimization. Prior experience with spreadsheets is not required.

**AREC 399 Special Problems (1-2)** Concentrated reading and study in some phase of a problem in agricultural economics.

**AREC 404 Prices of Agricultural Products (3)** *Prerequisite:* ECON 306. An introduction to agricultural price behavior. The use of price information in the decision-making process, the relation of supply and demand in determining agricultural prices, and the relation of prices to grade, time, location, and stages of processing in the marketing system. Elementary methods of price analysis, the concept of parity and the role of price support programs in agricultural decisions.

**AREC 405 Economics of Agricultural Production (3)** *Prerequisite:* ECON 306. The use and application of production economics in agriculture and resource industries through graphical and mathematical approaches. Production functions, cost functions, multiple product and joint production, and production processes through time.

**AREC 407 Agricultural Finance (3)** *Pre- or corequisite:* ECON 306. Application of economic principles to develop criteria for a sound farm business, including credit source and use, preparing and filing income tax returns, methods of appraising farm properties, the summary and analysis of farm records, leading to effective control and profitable operation of the farm business.

**AREC 414 Agricultural Business Management (3)** *Prerequisite:* ECON 306. The different forms of businesses. Management functions, business indicators, measures of performance, and operational analysis. Case studies are used to show applications of management techniques.

**AREC 427 Economics of Agricultural Marketing Systems (3)** *Prerequisite:* ECON 306. Basic economic theory as applied to the marketing of agricultural products, including price, cost, and financial analysis. Current developments affecting market structure including effects of contractual arrangement, vertical integration, governmental policies and regulation.

**AREC 433 Food and Agricultural Policy (3)** *Prerequisite:* ECON 306. 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.

**AREC 445 Agricultural Development, Population Growth and the Environment (3)** *Prerequisite:* ECON 306. 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.

**AREC 453 Natural Resources and Public Policy (3)** *Prerequisite:* ECON 306. 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.

**AREC 484 Econometric Applications in Agriculture and Environmental/Natural (3) Resources** *Prerequisite:* ECON 321 or equivalent. *Corequisite:* ECON 306. Application of econometric techniques to problems in agriculture, environment, and natural resources. Emphasis on the assumptions and computational techniques necessary to structure, estimate, and test economic models in the fields of agricultural, environmental, and resource economics.

**AREC 489 Special Topics in Agricultural and Resources Economics (3)** *Repeatable to 9 credits.*

## ARHU—Arts and Humanities

**ARHU 100 Honors Humanities First Year Seminar (3)** *One hour of lecture and two hours of discussion/recitation per week. Prerequisite:* admission to Honors Humanities. Interdisciplinary introduction to basic issues in the history and methodologies of the humanities.

**ARHU 298 Special Problems in Arts and Humanities (3)** *Repeatable if content differs.*

**ARHU 308 Critical Eras: An Interdisciplinary View (3)** *Repeatable to 6 credits if content differs.* 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.

**ARHU 309 Forms and Forces of Human Experience: An Interdisciplinary Exploration (3)** *Prerequisite:* one course in at least one of the departments participating in the particular section. *Repeatable to 6 credits if content differs.* An interdisciplinary analysis of a particular social or cultural topic, attitude, or concern.

**ARHU 390 Cross-Cultural Perspectives on Quality (3)** *Third course in a series of four courses in the IBM TO program.* Examines strategic quality management in a globalized setting with emphasis on cross-cultural communication and culturally influenced perception of quality. The third of four courses in the IBM TO curriculum.

**ARHU 439 Interdisciplinary Studies in Arts and Humanities (3)** *Repeatable to 6 credits if content differs.* An interdisciplinary exploration of chronological, geographical or thematic topics in Arts and Humanities.

**ARHU 498 Special Topics in Arts and Humanities (3)** *Repeatable if content differs.*

## ARSC—Air Science

**ARSC 100 The Air Force Today I (1)** Freshmen course for AFROTC cadets. Study of topics relating to the Air Force and defense. Focuses on organizational structure and missions of the Air Force; officership; and an introduction to both written and oral communication skills. Open to all university students. AFROTC cadets must also register for ARSC 159.

**ARSC 101 The Air Force Today II (1)** Continuation of ARSC 100 for freshmen AFROTC cadets. The mission, organization and systems of the U.S. Air Force offensive, defensive, and aerospace support forces and the use of these forces to support contemporary societal demands. Open to all university students. AFROTC cadets must also register for ARSC 159.

**ARSC 159 Air Force Officer Lab (1)** *Two hours of laboratory per week. Corequisite:* any other ARSC course. *For AFROTC cadets only. This course does not carry credit towards any degree at the University. Repeatable to 8 credits if content differs.* Offers Air Force ROTC cadet officer's practical experience in military leadership, management, organization, and customs. May include visits to military installations and flight orientation. Open only to AFROTC cadets.

**ARSC 200 The Development of Air Power I (1)** 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. Open to all university students. AFROTC cadets must also register for ARSC 159.

**ARSC 201 The Development of Air Power II (1)** 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. Open to all university students. AFROTC cadets must also register for ARSC 159.

**ARSC 205 The U.S. Air Force and Air Power (4)** *Open only to applicants selected by AFROTC to compete for entrance into the two-year AFROTC program as a contract cadet.* Six week field training session held during summer months at designated Air Force bases. Successful completion is a pre-requisite for acceptance into the two year AFROTC program. Course content consists of a combination of academics, physical training and leadership laboratory experiences approximating those four year cadets gain in ARSC 100/101 and ARSC 200/201.

**ARSC 310 Management and Leadership I (3)** Junior level course for AFROTC cadets. The study of leadership and quality management fundamentals, professional knowledge, Air Force doctrine, and communicative skills. Case studies are used to examine leadership and management situations. Open to all university students. AFROTC cadets must also register for ARSC 159.

**ARSC 311 Management and Leadership II (3)** Continuation of ARSC 310 for junior level AFROTC cadets. Study of leadership and management skills and leadership ethics as well as communication skills required of Air Force officers. Open to all university students. AFROTC cadets also register for ARSC 159.

**ARSC 320 National Security Forces in Contemporary American Society I (3)** Senior level course for AFROTC cadets. 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. Open to all university students. AFROTC cadets must also register for ARSC 159.

**ARSC 321 National Security Forces in Contemporary American Society II (3)** Senior level course for AFROTC cadets. This course examines various subjects including: the military law/justice, preparation for active duty, and current issues affecting military professionalism. Open to all university students. AFROTC cadets must also register for ARSC 159.

## ARTH—Art History & Archaeology

**ARTH 100 Introduction to Art (3)** *No credit toward the major can be received for this course.* Major approaches to understanding the visual arts, and includes analysis of techniques, subject matter, and form. Painting, sculpture, architecture, and the graphic arts.

**ARTH 200 Art of the Western World to 1300 (3)** *Formerly ARTH 260.* Painting, sculpture, and architecture from prehistoric times to the Renaissance.

**ARTH 201 Art of the Western World after 1300 (3)** *Formerly ARTH 261.* Painting, sculpture, and architecture from the Renaissance to the present.

**ARTH 275 Art and Archaeology of Africa (3)** *Formerly ARTH 284.* Appreciation of the art of African cultures. A survey of African culture through painting, sculpture, and architecture from prehistoric times to the present.

**ARTH 289 Special Topics in Art History and Archaeology (3)** *Repeatable to 6 credits if content differs.* Selected topics in the visual arts to introduce students to the history of various modes of visual expression and communication.

**ARTH 290 Art of Asia (3)** *Formerly ARTH 262.* South and East Asian art from prehistory through the mid-nineteenth century.

**ARTH 355 Twentieth-Century Art (3)** *No credit toward the major can be received for this course.* Survey of major trends in painting and sculpture, in Europe and America, from approximately 1900 to the present.

**ARTH 378 Special Topics for Honors Students (3)** *Prerequisites:* admission to art history honors and permission of department. *For ARTH majors only. Repeatable to 6 credits.* Writing of a research paper. With an instructor's permission work may be done in conjunction with a graduate colloquium or seminar.

**ARTH 379 Honors Thesis (3-6)** *Prerequisites:* admission to art history honors and permission of department. *For ARTH majors only. Repeatable to 6 credits.* Research and writing of an honors thesis under the supervision of a faculty advisor.

**ARTH 380 Masterpieces of Painting (3)** *No credit toward the major can be received for this course. Formerly ARTH 320.* Selected masterworks of painting, revealing the creative process, artistic personality, and cultural context of these works.

**ARTH 381 Masterpieces of Sculpture (3)** *No credit toward the major can be received for this course. Formerly ARTH 330.* Selected masterworks of sculpture, revealing the creative process, artistic personality, and cultural context of these works.

**ARTH 382 Masterpieces of Architecture (3)** *No credit toward the major can be received for this course. Formerly ARTH 340.* Selected masterworks of architecture, revealing the creative process, artistic personality, and cultural context of these works.

**ARTH 390 Art of China (3)** *Formerly ARTH 406.* A chronological survey of Chinese painting, sculpture, and the applied arts.

**ARTH 395 Art of Japan (3)** *Formerly ARTH 407.* A chronological survey of Japanese painting, sculpture, architecture, and the applied arts.

**ARTH 400 Egyptian Art and Archaeology (3)** *Formerly ARTH 404.* 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.

**ARTH 401 Aegean Art and Archaeology (3)** *Formerly ARTH 404.* 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.

**ARTH 402 Greek Art and Archaeology (3)** 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.

**ARTH 403 Roman Art and Archaeology (3)** 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.

**ARTH 405 Late Roman and Early Christian Art and Archaeology (3)** *Formerly ARTH 410.* Painting, sculpture, architecture, and the minor arts from the early third century through the sixth century A.D.

**ARTH 406 Byzantine Art and Archaeology (3)** *Formerly ARTH 411.* Painting, sculpture, architecture, and the minor arts from the seventh century to 1453 A.D.

**ARTH 407 Art and Archaeology of Mosaics (3)** Mosaic pavements in their archaeological, art historical, and architectural

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context from circa 300 B.C. through circa A.D. 700.

**ARTH 410 Early Medieval Art (3)** Formerly ARTH 412. Painting, sculpture and architecture in Western Europe, ca. 500-1150.

**ARTH 411 Gothic Art (3)** Formerly ARTH 413. Painting, sculpture and architecture in Western Europe, ca. 1150-1400.

**ARTH 415 Fifteenth-Century Italian Renaissance Art (3)** Formerly ARTH 424. Painting, sculpture, architecture, and the decorative arts of the fifteenth century in Italy.

**ARTH 416 Sixteenth-Century Italian Renaissance Art (3)** Painting, sculpture, architecture, and the decorative arts of the sixteenth century in Italy.

**ARTH 418 Special Problems in Italian Renaissance Art (3)** Repeatable to 6 credits if content differs. Focus upon Aspects of painting, sculpture, and architecture of Renaissance.

**ARTH 420 Fourteenth and Fifteenth-Century Northern European Art (3)** Formerly ARTH 416. The art of northern Europe with an emphasis on painting in the Netherlands and France.

**ARTH 425 Sixteenth-Century Northern European Painting (3)** Formerly ARTH 417. Painting in France, Germany, England, and the Low Countries during the Renaissance and Reformation.

**ARTH 426 Renaissance and Baroque Sculpture in Northern Europe (3)** Sculpture in France, Germany, England, and the Low Countries from the fourteenth to the seventeenth century.

**ARTH 430 Seventeenth-Century European Art (3)** Painting, sculpture and architecture concentrating on Italy, Spain, France, and England.

**ARTH 435 Seventeenth-Century Art in the Netherlands (3)** Formerly ARTH 431. Painting, sculpture and architecture in seventeenth-century Netherlands.

**ARTH 443 Eighteenth-Century European Art (3)** From the Rococo to Neo-classicism, major developments in painting, architecture, sculpture, and the landscape garden in eighteenth-century France, England, Italy, Spain, and Germany.

**ARTH 444 British Painting, Hogarth to the Pre-Raphaelites (3)** A survey of British painting focusing on the establishment of a strong native school in the genres of history painting, narrative subjects, portraiture, sporting art, and landscape.

**ARTH 445 Nineteenth-Century European Art to 1850 (3)** Formerly ARTH 440. The major trends from Neo-Classicism to Romanticism in painting, sculpture and architecture in Europe.

**ARTH 446 Nineteenth-Century European Art from 1850 (3)** Formerly ARTH 441. The major trends from Realism through Impressionism to Symbolism and Art Nouveau, in painting, sculpture, and architecture.

**ARTH 453 History of American Art to 1876 (3)** Painting, sculpture, architecture, and decorative arts in North America from the colonial period to 1876.

**ARTH 454 Nineteenth and Twentieth Century Sculpture (3)** Trends in sculpture from Neo-Classicism to the present.

**ARTH 455 Twentieth-Century Art to 1945 (3)** Formerly ARTH 450. Painting, sculpture and architecture in Europe and America from the late nineteenth century to the end of World War II.

**ARTH 456 Twentieth-Century Art from 1945 (3)** Formerly ARTH 451. Painting, sculpture and architecture in Europe and America from 1945 to the present.

**ARTH 457 History of Photography (3)** Formerly ARTH 452. History of photography as art from its inception in 1839 to the present.

**ARTH 460 American Art Since 1876 (3)** Formerly ARTH 477. Painting, sculpture, architecture, and the decorative arts in North America after 1876.

**ARTH 462 Twentieth-Century Black American Art (3)** Formerly ARTH 474. The visual arts of Black Americans in the twentieth century, including crafts and decorative arts.

**ARTH 466 Feminist Perspectives on Women in Art (3)** Also offered as WMST 466. Credit will be granted for only one of the following: ARTH 466 or WMST 466. Principal focus on European and American women artists of the 19th and 20th centuries, in the context of the new scholarship on women.

**ARTH 470 Latin American Art and Archaeology before 1500 (3)** Pre-Hispanic painting, sculpture, and architecture, with a focus on the major archaeological monuments of Mexico.

**ARTH 471 Latin American Art and Archaeology after 1500 (3)** The effect of mingling European visual ideas with pre-Hispanic traditions. The formation of Latin American colonial art. How native American people transformed European ideas and forms.

**ARTH 475 Ancient Art and Archaeology of Africa (3)** Formerly ARTH 462. Art of the African continent from rock art through the nineteenth century. The cultural meaning of painting, sculpture, architecture, and artifacts from major archaeological sites.

**ARTH 476 Living Art of Africa (3)** Formerly ARTH 463. Art styles among the segmentary, centralised and nomadic people of Africa. The iconography and function of their art and its relationship to their various societies, cults and ceremonies.

**ARTH 483 Structure and Analysis of Art (3)** Basic concepts of structuralism applied to the analysis of art. Visual examples, including photography, cartoons, painting, and sculpture, emphasize the underlying logic of narrative themes in Western art ranging from the time of Giotto to the present.

**ARTH 484 Archaeological Theories, Methods, and Practice (3)** 45 semester hours. An examination of the theories, methods, and practices of New and Old World archaeology.

**ARTH 489 Special Topics in Art History (3)** Prerequisite: permission of department. Repeatable to 6 credits.

**ARTH 490 Chinese Painting (3)** Chinese painting history from the second century B.C. through the twentieth century, covering cultural, stylistic and theoretical aspects.

**ARTH 495 Japanese Painting (3)** Formerly ARTH 405. Japanese painting from the sixth through the nineteenth century, including Buddhist icon painting, narrative scrolls, and Zen-related ink painting.

**ARTH 498 Directed Studies in Art History I (2-3)** Prerequisite: permission of department. Repeatable if content differs. Junior standing.

**ARTH 499 Directed Studies in Art History II (2-3)**

## ARTT—Art Studio

**ARTT 100 Two Dimensional Art Fundamentals (3)** Two hours of lecture and two hours of laboratory per week. Credit will be granted for only one of the following: ARTT 100, ARTS 100, DESN 101, or APDS 101. Formerly ARTS 100. Principles and elements of pictorial space examined through the manipulation and organization of various materials.

**ARTT 110 Elements of Drawing I (3)** Six hours of laboratory per week. Formerly ARTS 110. Media and related techniques to depict still-life, figure and nature.

**ARTT 150 Introduction to Art Theory (3)** Examination of contemporary art; review of global, philosophical and critical positions by the examination of works of art.

**ARTT 200 Three Dimensional Art Fundamentals (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: ARTT 100. Credit will be granted for only one of the following: ARTT 200, ARTS 200, DESN 102, or APDS 102. Formerly ARTS 200. Three-dimensional form and space examined through the manipulation and organization of various materials.

**ARTT 208 Intermediate Special Topics in Art (3)** Six hours of laboratory per week. Prerequisites: ARTT 110; and ARTT 200. Repeatable to 6 credits if content differs. Formerly ARTS 208. Development of student's work on an intermediate studio level within the context of a special topic.

**ARTT 210 Elements of Drawing II (3)** Six hours of laboratory per week. Prerequisite: ARTT 110. Formerly ARTS 210. Continuation of ARTT 110 with additional emphasis on pictorial space.

**ARTT 250 Elements of Design (3)** Six hours of laboratory per week. Prerequisites: ARTT 100 and ARTT 200. Investigation of basic design principles and methods. Introduction to basic typography, layout, illustration, exhibit design and product/package design.

**ARTT 320 Elements of Painting (3)** Six hours of laboratory per week. Prerequisite: ARTT 210. Formerly ARTS 320. Basic tools and language of painting. Oil and/or water-based paints.

**ARTT 330 Elements of Sculpture: Metal Casting (3)** Six hours of laboratory per week. Prerequisites: ARTT 200; and ARTT 210. Formerly ARTS 330. Basic sculptural techniques and processes related to metal casting.

**ARTT 331 Elements of Sculpture: Steel (3)** Six hours of laboratory per week. Prerequisites: ARTT 200; and ARTT 210. Basic techniques related to steel fabricated sculpture: torch cutting and welding, arc welding, hot forging.

**ARTT 332 Elements of Sculpture: Stone (3)** Six hours of laboratory per week. Prerequisites: ARTT 200; and ARTT 210. Formerly ARTT 335. Basic sculptural techniques and processes using stone and related materials.

**ARTT 333 Elements of Sculpture: Wood and Mixed Media (3)** Six hours of laboratory per week. Prerequisites: ARTT 200; and ARTT 210. Basic sculptural techniques and processes using wood and mixed media.

**ARTT 334 Elements of Sculpture: Construction (3)** Six hours of laboratory per week. Prerequisite: ARTT 210. Formerly ARTS 334. Basic techniques and processes related to metals, plastics, fiberglass and wood construction.

**ARTT 340 Elements of Printmaking: Intaglio (3)** Six hours of laboratory per week. Prerequisite: ARTT 210. Formerly ARTS 340. Basic techniques and processes related to etching, aquatint and drypoint.

**ARTT 341 Elements of Printmaking: Woodcut and Relief (3)** Six hours of laboratory per week. Prerequisite: ARTT 210. Formerly ARTS 341. Basic techniques and processes related to woodcuts, linocuts and other relief media.

**ARTT 342 Elements of Printmaking: Collagraphy (3)** Six hours of laboratory per week. Prerequisite: ARTT 210. Formerly ARTS 342. Basic techniques and processes related to collagraph printing.

**ARTT 343 Elements of Printmaking: Screen Printing (3)** Six hours of laboratory per week. Prerequisite: ARTT 210. Formerly ARTS 343. Basic techniques and processes related to serigraph and silkscreen printing.

**ARTT 344 Elements of Printmaking: Lithography (3)** Six hours of laboratory per week. Prerequisite: ARTT 210. Formerly ARTS 344. Basic techniques and processes related to drawing, preparing and printing images on lithograph stones or plates.

**ARTT 350 Elements of Illustration (3)** Six hours of laboratory per week. Prerequisite: ARTT 250. Introduction to a variety of media and techniques of editorial illustration.

**ARTT 351 Elements of Graphic Design (3)** Six hours of laboratory per week. Prerequisite: ARTT 250. Introduction to corporate identity, institutional, visual communication, logo, multi-page collateral publication, super graphics and marketing graphics.

**ARTT 352 Three-Dimensional Design Application (3)** Six hours of laboratory per week. Prerequisite: ARTT 250. Graphic design and color concepts applied to three-dimensional objects and architectural environments.

**ARTT 353 Elements of Photography (3)** Prerequisites: (ARTT 100 and ARTT 110) or permission of department. Introduction to black and white photography. Basic technical and aesthetic vocabulary, camera mechanics and darkroom techniques. Introduction to the photographic message and meaning in both fine art and design concept.

**ARTT 354 Elements of Computer Graphics (3)** Six hours of laboratory per week. Prerequisites: (ARTT 100 and ARTT 110) or permission of department. Introduction to computer graphics, imaging, illustration and mixed media.

**ARTT 404 Experiments in Visual Processes (3)** Six hours of laboratory per week. Prerequisite: ARTT 220 or ARTT 330 or ARTT 340. Formerly ARTS 404. Investigation and execution of process oriented art. Group and individual experimental projects.

**ARTT 418 Drawing (3)** Six hours of laboratory per week. Prerequisite: ARTT 210. Repeatable to 12 credits. Formerly ARTS 418. Original compositions from the figure and nature, supplemented by problems of personal and expressive drawing.

**ARTT 428 Painting (3)** Six hours of laboratory per week. Prerequisite: ARTT 320. Repeatable to 12 credits. Formerly ARTS 428. Original compositions based upon nature, figure, still life and expressive painting emphasizing development of personal directions.

**ARTT 438 Sculpture (3)** Six hours of laboratory per week. Prerequisites: one 300-level sculpture course; and permission of department. Repeatable to 12 credits. Formerly ARTS 438. Continuation of 300-level elements of sculpture courses with emphasis on developing personal directions in chosen media.

**ARTT 448 Printmaking (3)** Six hours of laboratory per week. Prerequisites: one 300-level printmaking course; and permission of department. Repeatable to 12 credits. Formerly ARTS 448. Continuation of 300-level elements of printmaking courses with emphasis on developing personal directions in chosen media.

**ARTT 449 Advanced Photography (3)** Six hours of laboratory per week. Prerequisite: ARTT 353. Repeatable to 12 credits if content differs. Advanced photographic techniques and theory. Digital photography, image and text, non-silver photography, instant photography, color photography and other special tools.

**ARTT 458 Graphic Design and Illustration (3)** Six hours of laboratory per week. Prerequisites: ARTT 350 and ARTT 351. Repeatable to 12 credits if content differs. Advanced techniques and theory of graphic design and illustration. Image and text, poster, magazine, film, and television graphics, propaganda symbolism included.

**ARTT 459 Three-Dimensional Design (3)** Six hours of laboratory per week. Prerequisite: ARTT 352. Repeatable to 12 credits if content differs. Advanced techniques and theory of product design, furniture design, exhibit design and package design.

**ARTT 460 Seminar in Art Theory (3)** Senior standing. Exploration of relationship between content and processes of art in a contemporary multi-cultural context.

**ARTT 461 Readings in Art Theory (3)** Prerequisite: senior standing or permission of department. Reading and critical analysis in contemporary art.

**ARTT 462 Artist's Survival Seminar (3)** Prerequisite: senior standing or permission of department. Business aspects of being an artist with emphasis on starting and maintaining a professional career.

**ARTT 463 Principles and Theory: African-American Art (3)** Not open to students who have completed ARTH 474. Formerly ARTH 474. Principles basic to the establishment of aesthetic theories common to an ethnic or minority art examined through the works of art by Americans of African ancestry.

**ARTT 468 Seminar on the Interrelationship between Art and Art Theory (3)** Prerequisite: permission of department. Repeatable to 6 credits if content differs. Formerly ARTS 468. The relationship between a student's work and the theoretical context of contemporary art.

**ARTT 478 Papermaking (3)** Six hours of laboratory per week. Prerequisite: permission of department. Repeatable to 6 credits if content differs. Traditional and contemporary Western papermaking techniques with emphasis on creative approaches and continued individual artistic growth.

**ARTT 479 Computer Graphics (3)** Six hours of laboratory per week. Prerequisite: ARTT 354. Repeatable to 12 credits if content differs. Advanced techniques and theory of computer imaging, graphics, illustration, and mixed media.

**ARTT 489 Advanced Special Topics in Art (3)** Six hours of laboratory per week. Prerequisite: permission of department. Repeatable to 6 credits if content differs. Formerly ARTS 489. Development of student's work on an advanced studio level within the context of a special topic.

**ARTT 498 Directed Studies in Studio Art (2-3)** Prerequisite: permission of department. For advanced students. Repeatable if content differs. Formerly ARTS 498.

## ASTR—Astronomy

**ASTR 100 Introduction to Astronomy (3)** Credit for ASTR 100 cannot be obtained after, or simultaneously with, receiving credit for any astronomy course numbered 150 or higher. Credit will be granted for only one of the following: ASTR 100 or ASTR 101. An elementary course in descriptive astronomy, especially appropriate for non-science students. Sun, moon, planets, stars and nebulae, galaxies, evolution.

**ASTR 101 General Astronomy (4)** Three hours of lecture, two hours of laboratory, and one hour of discussion/recitation per week. Not open to students who have completed ASTR 100 or any astronomy course numbered higher than 100. Credit will be granted for only one of the following: ASTR 100 or ASTR 101. 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 observing sessions if weather permits.

**ASTR 110 Astronomy Laboratory (1)** Two hours of laboratory per week. Pre- or corequisite: ASTR 100. Exercises include use of photographs of moon, stars, nebulae and galaxies and spectra; experiments demonstrating scientific concepts used in astronomy. Daytime and nighttime observations if weather permits. Appropriate for non-science majors.

**ASTR 111 Observational Astronomy Laboratory (1)** Two hours of laboratory per week. Corequisite: ASTR 100. Single evening laboratory projects plus semester-long observing projects involving work both in and out of class. Lunar surface features; the night-time sky; changing positions of sun, moon, and planets; stellar spectra; observation of stars and nebulae in our galaxy.

**ASTR 120 Introductory Astrophysics-Solar System (3)** Pre- or corequisite: MATH 115. Not open to students who have completed ASTR 100, ASTR 101 or ASTR 200. Credit will be granted for only one of the following: ASTR 100, ASTR 101 or ASTR 200. 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.).

**ASTR 195 Astronomy for the Modern World (2)** Prerequisite: Freshman astronomy major or strong interest in physical sciences. Freshman standing. Not open to students who have completed any

200 level astronomy or physics courses. Faculty astronomers will share their experiences, current astronomical research topics will be explored, and controversies in astronomy will be examined in a seminar setting. Research using BIMA (the Berkeley-Illinois-Maryland Array) for millimeter-wave astronomy, the Hubble Space Telescope and traditional observatory facilities will be explored.

**ASTR 200 Introductory Astronomy and Astrophysics (3)** Prerequisite: PHYS 161 or PHYS 171. Credit will be granted for only one of the following: ASTR 100 or ASTR 200. For science, mathematics, computer science and engineering majors only. Qualitative study of astronomy including exploration of the solar system, types of stars and galaxies observed. Mostly stresses analysis using algebra. Some use of calculus for celestial mechanics and other dynamical problems.

**ASTR 220 Collisions in Space (3)** Not open to astronomy students. Appropriate for non-science majors. Application of scientific method to the study of collisions in space. Impact cratering on planets and satellites. Possible implications for the Earth. Interactions between stars and galaxies. Possible effects due to supermassive black holes. Events like the 1994 comet crash on Jupiter and data from the Hubble Space Telescope will be highlighted.

**ASTR 288 Special Projects in Astronomy (1-3)** Prerequisite: permission of department. Repeatable to 6 credits. Independent study, short research projects, tutorial reading, and assisting with faculty research and teaching under special supervision.

**ASTR 300 Stars and Stellar Systems (3)** Prerequisite: ASTR 100 and completion of University Studies requirement in the natural sciences or permission of department. Designed primarily for non-physical-science majors. Study of stars-types, properties, evolution, and distribution in space: supernovae, pulsars, and black holes.

**ASTR 310 Optical Astronomy Techniques (3)** Three hours of lecture and one hour of laboratory per week. Prerequisites: (PHYS 273 and PHYS 276) or (PHYS 263 and PHYS 263A) or permission of department. For ASTR majors only. 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, optical instruments. Effects of the atmosphere. Practical work at the observatory using a CCD camera. Some night-time observing sessions.

**ASTR 315 Navigation (3)** Prerequisite: plane trigonometry. Theory and practice of navigation without landmarks, with emphasis on celestial navigation and some discussion of electronic navigation. Spherical trigonometry as necessary. Extensive practical work at times to be arranged.

**ASTR 330 Solar-System Astronomy (3)** Prerequisite: ASTR 100 and completion of University Studies requirement in the natural science or permission of department. Designed primarily for non-physical-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.

**ASTR 340 Cosmology (3)** Prerequisites: ASTR 101 or ASTR 100 and completion of the CORE Distributive Studies requirement in Mathematics and the Sciences or the USP natural sciences requirement; or permission of department. Designed for non-physical sciences 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.

**ASTR 350 Astronomy and Astrophysics (4)** Prerequisites: ASTR 200 and (PHYS 272 or PHYS 262 or PHYS 142) or permission of department. Corequisite: PHYS 273 or PHYS 263. Topics in astronomy with emphasis on physical concepts. Stellar spectra, stellar evolution and collapsed objects, ionized nebulae, molecular clouds and star formation, stellar dynamics, cosmology.

**ASTR 380 Life in the Universe (3)** Prerequisite: ASTR 100 and completion of University Studies requirement in the natural science or permission of department. Designed primarily for non-physical science majors. Study of the astronomical perspective on the conditions for the origin and existence of life. Communication with extraterrestrial life.

**ASTR 398 Special Topics in Astronomy (3)** Prerequisite: junior standing or permission of department. Repeatable to 6 credits if content differs. This course is designed primarily for students not majoring in astronomy and is suitable for non-science 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.

**ASTR 399 Honors Seminar (1-16)** Enrollment is limited to students admitted to the honors program in astronomy. Credit according to work done.

**ASTR 400 Stellar Astrophysics (3)** Prerequisite: ASTR 350. Corequisite: PHYS 420 or PHYS 421. Radiation processes in stars and interstellar space, stellar atmospheres, stellar structure and evolution.

**ASTR 410 Radio Astronomy Techniques (3)** Three hours of lecture and one hour of laboratory per week. Prerequisites: (PHYS 273 and PHYS 276) or (PHYS 263 and PHYS 263A) or permission of department. Introduction to current observational techniques in radio astronomy. The radio sky, coordinates and catalogs, antenna theory, Fourier transforms, interferometry and arrays, aperture synthesis, radio detectors. Practical work at observatory with a two-element interferometer.

**ASTR 420 Introduction to Galactic Research (3)** Prerequisite: PHYS 272 and ASTR 350 or equivalent or permission of department. Methods of galactic research, stellar motions, clusters of stars, evolution of the galaxy, study of our own and nearby galaxies.

**ASTR 430 The Solar System (3)** Prerequisite: MATH 246 and either PHYS 263 or PHYS 273, or permission of department. The structure of planetary atmospheres, radiative transfer in planetary atmospheres, remote sensing of planetary surfaces, interior structure of planets. Structure of comets. Brief discussions of asteroids, satellite systems, and solar system evolution. Intended for students majoring in any of the physical sciences.

**ASTR 440 Introduction to Extra-Galactic Astronomy (3)** Prerequisite: PHYS 272 and ASTR 350 or equivalent, or permission of department. Properties of normal and peculiar galaxies, including radio galaxies and quasars; expansion of the universe and cosmology.

**ASTR 450 Celestial Mechanics (3)** Prerequisite: PHYS 410 or permission of department. Celestial mechanics, orbit theory, equations of motion.

**ASTR 498 Special Problems in Astronomy (1-6)** Prerequisite: major in physics or astronomy or permission of department. Research or special study. Credit according to work done.

## BCHM—Biochemistry

**BCHM 261 Elements of Biochemistry (3)** Prerequisite: CHEM 104 or CHEM 233 or CHEM 235. Not open to students who have completed BCHM 461. For undergraduate students who desire a one-semester biochemistry course rather than a two-semester sequence. Basic chemistry and metabolism of most molecules of biological importance.

**BCHM 361 Origins of Biochemistry (3)** Prerequisite: any distributive studies course in chemistry or any of the biological sciences. The development of our understanding of life processes. Emphasis on a consideration of ideas and findings that have led to diseases, hormonal mechanisms, photosynthesis and genetic engineering. Intended for non-science majors.

**BCHM 399 Undergraduate Research in Biochemistry (1-3)** Prerequisite: permission of department. Junior standing. Repeatable to 6 credits if content differs. Basic biochemical research conducted under the supervision of a faculty member.

**BCHM 461 Biochemistry I (3)** Prerequisite: CHEM 243 or CHEM 247. A comprehensive introduction to general biochemistry. The chemistry and metabolism of carbohydrates, lipids, nucleic acids, and proteins.

**BCHM 462 Biochemistry II (3)** Prerequisite: BCHM 461. A continuation of BCHM 461.

**BCHM 464 Biochemistry Laboratory (3)** One hour of lecture and five hours of laboratory per week. Corequisite: BCHM 462. For BCHM and CHEM majors only.

**BCHM 465 Biochemistry III (3)** Prerequisite: BCHM 462. An advanced course in biochemistry.

## BIOL—Biology

**BIOL 101 Concepts of Biology (3)** An introductory lecture course for the non-science major emphasizing the fundamental processes and interdependence of living organisms and the biological implications associated with human influence in the biological world. This course will not count toward graduation requirements for any student in the College of Life Sciences or the College of Agriculture.

**BIOL 102 Laboratory in Biology (1)** Three hours of laboratory per week. Pre- or corequisite: BIOL 101. A course designed for non-science students to illustrate the concepts underlying the organization and interrelationships of living organisms. This course will not count toward graduation requirements for any student in the College of Life Sciences or the College of Agriculture.

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**BIOL 105 Principles of Biology I (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: placement in MATH 110 or higher. For science majors. Credit will be granted for only one of the following: BIOL 101 or BIOL 105. Basic principles of biology with special emphasis on cellular and molecular biology.

**BIOL 106 Principles of Biology II (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: BIOL 105. For science majors. Basic principles of biology with special emphasis on organismic, ecological and evolutionary biology.

**BIOL 222 Principles of Genetics (4)** Three hours of lecture and two hours of discussion/recitation per week. Prerequisites: BIOL 105, one year college chemistry. Credit will be granted for only one of the following: ZOOL 213, HORT 274, or ANSC 201. Principles and mechanisms of heredity and gene expression. Considers plant, animal, and microbial organisms.

**BIOL 258 Special Projects (1-3)** For College Park Scholars-Life Sciences students only. Repeatable to 6 credits if content differs. Credit to be determined by CPS Director. Must be completed by end of sophomore year. Cannot be used to satisfy a biology requirement.

**BIOL 288 Field Experience (1-6)** Prerequisite: permission of department. Repeatable to 12 credits if content differs. An individual experience arranged by the student with the instructor. Does not satisfy biology major requirements.

**BIOL 322 Eukaryotic Genetics Laboratory (2)** Three hours of laboratory and one hour of discussion/recitation per week. Prerequisite: BIOL 222 or equivalent. Also offered as ZOOL 322. Credit will be granted for only one of the following: ZOOL 213, BIOL 322 or ZOOL 322. Experiments using lower and higher eukaryotes will be done by students. Exercises will apply the genetic concepts underlying Mendelian and chromosomal theory of heredity; gene-environment interactions and the induction and detection of mutations. Major emphasis will be on the analysis and interpretation of data as well as clarity and completeness of the laboratory records.

**BIOL 398 Honors Research Problems in Biology (1-3)** Prerequisite: Participation in the General Honors Program and/or the General Biological Sciences Honors Program. Repeatable to 6 credits. Research in biology under the direction and close supervision of a member of the faculty.

**BIOL 399 Honors Seminar in Biology (1)** Prerequisite: Participation in the General Honors Program and/or the General Biological Science Honors Program, and previous or concurrent enrollment in BIOL 398. Repeatable to 2 credits. Discussion and presentation of special topics, current literature, problems and progress in all areas of biological research.

**BIOL 488 Topics in Environmental Biology for Secondary and Middle School (4-12) Teachers** Prerequisite: permission of department. Repeatable to 12 credits if content differs.

**BIOL 489 Topics in Biology for Secondary and Middle School Teachers (1-8)** Prerequisites: Teacher certification, at least two years of high school and/or middle school science teaching experience and permission of department. Repeatable to 12 credits if content differs. An examination of selected topics in the biological sciences conducted through lecture/discussion, laboratory experimentation, and field research.

**BIOL 490 Selected Topics in Human Biology for Secondary School Teachers (1-8)** Prerequisites: teacher certification, at least two years of high school and/or middle school teaching experience, and permission of department. Repeatable to 12 credits if content differs. An examination of selected topics in human biological sciences conducted through lecture/discussion, laboratory experimentation, and field research.

**BIOL 495 Global Greenhouse Effect (3)** Two hours of lecture and two hours of discussion/recitation per week. Prerequisites: BIOL 105; and BIOL 106. For students majoring in the College of Life Sciences, College of Agriculture and College of Education only. 90 semester hours. Senior standing. An interdisciplinary investigation of global greenhouse warming - its causes, probable consequences, and ways to deal with it in the next 100 years.

## BIOM—Biometrics

**BIOM 301 Introduction to Biometrics (3)** Two hours of lecture and one hour of discussion/recitation per week. Prerequisite: MATH 115. 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.

**BIOM 401 Biostatistics I (4)** Three hours of lecture and one hour of discussion/recitation per week. Prerequisite: BIOM 301. Descriptive statistics, probability models useful in biology, expectations, hypothesis testing, goodness of fit tests, central limit theorem, point and interval estimates, analysis of variance, regression, correlation, sampling, rank tests. Emphasis on the

uses and the limitations of these methods in biology.

**BIOM 405 Computer Applications in Biometrics (1)** Two hours of laboratory per week. Corequisite: BIOM 401. An introduction to computer usage in statistical analyses. Topics include file manipulation, formatting data, transformations, descriptive statistics, graphical displays of data, and several introductory inferential statistical procedures.

## BMGT—Business and Management

**BMGT 110 Introduction to Business and Management (3)** Not open to BMGT students who have completed 56 or more credit hours. All others may take it anytime. A survey of the field of business, including its environment, organization, overall and functional management, and current issues and developments.

**BMGT 190 Introduction to Design and Quality (3)** Prerequisite: permission of College. Also offered as ENES 190. Exposes engineering and business students to the principles of total quality, using experiential team learning and technology aided approaches. The first of four courses in total quality.

**BMGT 201 Introduction to Business Computing (3)** Two hours of lecture and one hour of laboratory per week. Not open to students who have completed BMGT 301 prior to Fall 1997. Basic literacy course using common business computer-based applications. Considers the role of information technology in the modern workplace, as well as the use of computing applications in problem solving.

**BMGT 220 Principles of Accounting I (3)** Sophomore standing. 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.

**BMGT 221 Principles of Accounting II (3)** Prerequisite: BMGT 220. 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.

**BMGT 230 Business Statistics (3)** Prerequisite: MATH 220. Not open to students who have completed BMGT 231, ENEE 324, or STAT 400. Credit will be granted for only one of the following: AREC 484, BIOM 301, BMGT 230, CNEC 400, ECON 321, EDMS 451, GEOG 305, GVPT 422, PSYC 200, SOCY 201, URSP 350, or TEXT 400. 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, decision theory and the application of these concepts to problem solving in business and management. This course does not meet requirements for management science and statistics majors.

**BMGT 231 Statistical Models For Business (3)** Prerequisite: MATH 141 or permission of department Required for management science and statistics and decision and information sciences majors. Credit will be granted for only one of the following: BMGT 231, ENEE 324, or STAT 400. An introductory course in statistical concepts including probability from a naive set theory approach, random variables and their properties, and the probability distributions of selected discrete and continuous random variables. The concepts of sampling, sampling distributions, and the application of these concepts to estimation and hypothesis testing are included as are brief surveys of the regression and anova models.

**BMGT 290 Methods for Measuring Quality (3)** Prerequisite: BMGT 190 or ENES 190. Also offered as ENES 380. Provides engineering and business students an understanding of the need and use of measurement techniques that lead to continuous improvement. The second course of four courses in total quality.

**BMGT 301 Survey of Business Information Systems and Technology (3)** Introductory course for the decision and information science major. Covers the components of modern business information systems, as well as the consequences of information technology on society and the environment.

**BMGT 302 Business Computer Application Programming (3)** Prerequisite: BMGT 301. For decision and information science majors only. Considers characteristics of business data programming and common software development processes and practices. Covers the designing, writing, documenting, and testing of an efficient, structured program in visual basic.

**BMGT 310 Intermediate Accounting I (3)** Prerequisite: BMGT 221. Comprehensive analysis of financial accounting topics related to financial statement preparation and external reporting.

**BMGT 311 Intermediate Accounting II (3)** Prerequisite: BMGT 310. Continuation of BMGT 310.

**BMGT 321 Cost Accounting (3)** Prerequisite: BMGT 221. 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.

**BMGT 323 Income Tax Accounting (3)** Prerequisite: BMGT 221. Introduction to federal income taxation of individuals. Examination of tax laws by use of illustrative examples and problems.

**BMGT 326 Accounting Systems (3)** Prerequisites: BMGT 301; and BMGT 321. A study of the control aspects of accounting systems. Topics include: standard setting; administrative, operational, and security controls; cost effectiveness of systems; audit implications of a computer-based information environment.

**BMGT 332 Operations Research For Management Decisions (3)** Prerequisite: BMGT 230. Surveys the philosophy, techniques, and applications of operations research to managerial decision making. The course is designed primarily for students not majoring in management science or statistics. Techniques covered include linear programming, transportation and assignment models, Markov processes, inventory and queueing models. Emphasis is placed on formulating and solving decision problems in the functional areas of management.

**BMGT 340 Business Finance (3)** Prerequisites: BMGT 221; and (BMGT 230 or BMGT 231). The principles and practices involved in the organization, financing, and rehabilitation of business enterprises; the various types of securities and their use in raising funds, apportioning income, risk, and control; intercorporate relations; and new developments. Emphasis on solution of problems of financial policy faced by management.

**BMGT 343 Investments (3)** Prerequisite: BMGT 340. An introduction to financial investments. Topics include securities and securities markets; investment risks, returns, and constraints; portfolio policies; and institutional investment policies.

**BMGT 350 Marketing Principles and Organization (3)** Prerequisite: ECON 203 or ECON 205. 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.

**BMGT 353 Retail Management (3)** Prerequisites: BMGT 220; and BMGT 350. Application of marketing concepts in planning and implementing retail strategy. Analysis of retail institutions (store and nonstore). Evaluation of how trends in the environment-the consumer market, competition, the economy and technology-affect location, merchandise, pricing, communication, service, operations and financial strategies.

**BMGT 354 Promotion Management (3)** Prerequisite: BMGT 350. Marketing communications theory with an in-depth treatment of all elements of the promotion mix, including advertising, sales promotion, direct marketing, public relations, and personal selling. Concepts applied through class exercises, team project, presentation, and discussions.

**BMGT 357 Retailing and Marketing Internship (3-6)** Prerequisites: BMGT 350 and permission of department. For BMGT majors only. 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.

**BMGT 360 Human Resource Management (3)** The basic course in human resource management includes manpower planning, recruitment, selection, development, compensation, and appraisal of employees. Explores the impact of scientific management and unionism on these functions.

**BMGT 362 Labor Relations (3)** A study of the development and methods of organized groups in industry with reference to the settlement of labor disputes. An economic and legal analysis of labor union and employer association activities, arbitration, mediation, and conciliation; collective bargaining, trade agreements, strikes, boycotts, lockouts, company unions, employee representation, and injunctions.

**BMGT 364 Management and Organization Theory (3)** The development of management and organization theory, nature of the management process and function and its future development. The role of the manager as an organizer and director, the communication process, goals and responsibilities.

**BMGT 370 Introduction to Transportation Management (3)** Prerequisite: ECON 203; or ECON 205. An overview of the transportation sector, including providers, users and government agencies. Examines contemporary public policy issues such as deregulation along with managerial strategies in transportation.

**BMGT 372 Introduction to Logistics Management (3)** The study of logistic functions of business involved in the movement and storage of supplies, work-in-progress and finished goods. The

trade-offs between cost and service and the purchase and supply of raw materials; the warehousing and control of inventory; industrial packaging; materials handling within warehouses; and the distribution of finished goods to customers required to minimize costs, maximize profits or increase customer service levels.

**BMGT 373 Logistics and Transportation Internship (3)** Prerequisites: BMGT 370 and BMGT 372 (one of these courses may be taken as a corequisite) and permission of department. Involves supervised work experience in logistics and/or transportation. Students will be expected to relate course material to work experience in an analysis of a firm's operations.

**BMGT 380 Business Law I (3)** 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.

**BMGT 381 Business Law II (3)** Prerequisite: BMGT 380 or permission of department. The Uniform Commercial Code including sales, commercial paper, secured transactions, bulk sales and documents of title. The law of partnerships and corporations. Reorganization and liquidation under the bankruptcy laws. The law of real property, landlord and tenant relationships and decedents' estates.

**BMGT 385 Production Management (3)** Studies the operation of a manufacturing enterprise, concentrating on the economies of production. Introduces analytical method so that the broad problem areas of system design, operation and control can be based upon the analytical method.

**BMGT 390 Competing on Quality in a Global Economy (3)** Prerequisite: BMGT 290 or ENES 380. Also offered as ENES 390. Examines strategic quality management in a globalized setting. Global marketing, international finance, and cross cultural concepts will be emphasized. The third course of four courses in total quality.

**BMGT 392 Introduction to International Business Management (3)** Prerequisite: ECON 203; or ECON 205. 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.

**BMGT 393 Real Estate Principles (3)** Prerequisite: ECON 203; or ECON 205. The nature and uses of real estate, real estate as a business, basic principles, construction problems and home ownership, city planning, and public control and ownership of real estate.

**BMGT 398 Individual Study in Business and Management (1-3)** Prerequisite: permission of department. Repeatable to 6 credits.

**BMGT 402 Database Systems (3)** Prerequisite: BMGT 301. Introduction to basic concepts of database management systems. Relational databases, query languages and design will be covered. File-processing techniques are examined.

**BMGT 403 Systems Analysis and Design (3)** Prerequisite: BMGT 301. Techniques and tools applicable to the analysis and design of computer-based information systems. System life cycle, requirements analysis, logical design of data bases, performance evaluation. Emphasis on case studies. Project required that involves the design, analysis and implementation of an information system.

**BMGT 404 Seminar in Decision Support Systems (3)** Prerequisite: BMGT 301. Design of computer systems to solve business problems and to support decision making. Human and organizational factors are considered. Emphasis on case studies.

**BMGT 405 Business Telecommunications (3)** Prerequisite: BMGT 301. Concepts of business data communications and data processing. Application of these ideas in computer networks, including basic principles of telecommunications technology, computer network technology, data management in distributed database systems and management of the technical and functional components of telecommunications technology.

**BMGT 407 Info Systems Projects (3)** Prerequisite: 12 hours of information systems. For decision and information sciences majors only. Senior standing. Senior capstone course for the decision and information sciences major. Collected knowledge from the DIS 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.

**BMGT 410 Fund Accounting (3)** Prerequisite: BMGT 310. An introduction to the fund-based theory and practice of accounting as applied to governmental entities and not-for-profit associations.

**BMGT 411 Ethics and Professionalism in Accounting (3)** Prerequisite: BMGT 311. For accounting majors only. Senior standing. Analysis and discussion of issues relating to ethics and professionalism in accounting.

**BMGT 417 Advanced Tax Accounting (3)** Prerequisites: BMGT 311; and BMGT 323. Federal taxation of corporations, partnerships, fiduciaries, and gratuitous transfers. Tools and techniques of tax research for compliance and planning.

**BMGT 420 Undergraduate Accounting Seminar (3)** Prerequisite: senior standing as an accounting major or permission of department. Enrollment limited to upper one-third of senior class. Seminar coverage of outstanding current non-text literature, current problems and case studies in accounting.

**BMGT 422 Auditing Theory and Practice (3)** Prerequisite: BMGT 311. A study of the independent accountant's attest function, generally accepted auditing standards, compliance and substantive tests, and report forms and opinions.

**BMGT 424 Advanced Accounting (3)** Prerequisite: BMGT 311. Advanced accounting theory applied to specialized topics and current problems. Emphasis on consolidated statements and partnership accounting.

**BMGT 426 Advanced Cost Accounting (3)** Prerequisite: BMGT 321. Advanced cost accounting with emphasis on managerial aspects of internal record-keeping and control systems.

**BMGT 427 Advanced Auditing Theory and Practice (3)** Prerequisite: BMGT 422. An examination and in-depth study of special auditing topics such as statistical sampling, professional ethics, EDP auditing, legal liability, and SEC accounting.

**BMGT 430 Linear Statistical Models in Business (3)** Prerequisite: BMGT 230 or BMGT 231 or permission of department. Model building involving an intensive study of the general linear stochastic model and the applications of this model to business problems. The model is derived in matrix form and this form is used to analyze both the regression and ANOVA formulations of the general linear model.

**BMGT 431 Design of Statistical Experiments in Business (3)** Prerequisite: BMGT 230 or BMGT 231. Surveys ANOVA models, basic and advanced experimental design concepts. Non-parametric tests and correlations are emphasized. Applications of these techniques to business problems in primarily the marketing and behavioral sciences are stressed.

**BMGT 434 Introduction to Optimization Theory (3)** Prerequisite: MATH 220; or permission of department. Primarily for students majoring in management science and statistics. Linear programming, postoptimality analysis, network algorithms, dynamic programming, nonlinear programming and single variable minimization.

**BMGT 435 Introduction to Applied Probability Models (3)** Prerequisite: BMGT 231 or permission of department. Statistical models in management. Review of probability theory, Monte Carlo methods, discrete event simulation, Markov chains, queueing analysis, other topics depending upon time. Gauss, a higher-level computer language, will be introduced in the class and the students will carry out various exercises using this language.

**BMGT 440 Financial Management (3)** Prerequisite: BMGT 340. Analysis and discussion of cases and readings relating to financial decisions of the firm. The application of finance concepts to the solution of financial problems is emphasized.

**BMGT 443 Security Analysis and Valuation (3)** Prerequisite: BMGT 343. Study and application of the concepts, methods, models, and empirical findings to the analysis, valuation, and selection of securities, especially common stock.

**BMGT 444 Futures Contracts and Options (3)** Prerequisite: BMGT 343. 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.

**BMGT 445 Commercial Bank Management (3)** Prerequisites: BMGT 340; and ECON 430. 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.

**BMGT 446 International Finance (3)** Prerequisite: BMGT 340. 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.

**BMGT 447 Internship and Research in Finance (3)** Prerequisites: BMGT 340; and BMGT 343 (or 400 level finance elective); and core requirements in business and management; and permission of department. Recommended: finance major courses. For finance majors only. Supervised, sponsored internship in a corporation or financial institution. Analysis of approved research topic in corporate finance, investments or financial institutions/markets.

**BMGT 451 Consumer Analysis (3)** Prerequisite: BMGT 350. Recommended: PSYC 100; and PSYC 221. Not open to students who have completed CNEC 437. Credit will be granted for only one of the following: BMGT 451 or CNEC 437. 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.

**BMGT 452 Marketing Research Methods (3)** Prerequisites: BMGT 230; and BMGT 451. Formerly BMGT 450. Focuses on aiding marketing decision making through exploratory, descriptive, and casual research. Develops student skills in evaluating and writing market research proposals, interpreting and analyzing subsequent reports, and appraising their usefulness to managers; designing studies including selection of data collection method, development of data collection instrument, sample design, collection and analysis of data, and reporting the results.

**BMGT 453 Industrial Marketing (3)** Prerequisites: BMGT 350 plus one other marketing course. The industrial and business sector of the marketing system is considered rather than the household or ultimate consumer sector. Industrial products range from raw materials and supplies to the major equipment in a plant, business office, or institution. Topics include product planning and introduction, market analysis and forecasting, channels, pricing, field sales force management, advertising, marketing cost analysis, and government relations. Particular attention is given to industrial, business and institutional buying policies and practice and to the analysis of buyer behavior.

**BMGT 454 International Marketing (3)** Prerequisites: BMGT 350 plus one other marketing course. Marketing functions from the international executive's viewpoint, including coverage of international 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 international marketing.

**BMGT 455 Sales Management (3)** Prerequisite: BMGT 350. 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.

**BMGT 456 Advertising (3)** Prerequisite: BMGT 350. Develops skills in constructing effective advertising. Examines how to formulate an advertising message, which creative tactics to use in communicating that message and which media uses to ensure that the target receives the message. In addition, the role of advertising agencies, measuring advertising effectiveness, and regulatory and ethical issues in advertising will be discussed.

**BMGT 457 Marketing Policies and Strategies (3)** Prerequisite: BMGT 451. Corequisite: BMGT 452. This capstone course ties together concepts from all the various marketing courses 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.

**BMGT 460 Human Resource Management: Analysis and Problems (3)** Prerequisite: BMGT 360. Recommended: BMGT 230. Research findings, special readings, case analysis, simulation, and field investigations are used to develop a better understanding of personnel problems, alternative solutions and their practical ramifications.

**BMGT 461 Entrepreneurship (3)** 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.

**BMGT 462 Employment Law for Business (3)** Restricted to BMGT majors with 72 hours completed. Legal framework of industrial relations with special emphasis on employment discrimination, i.e., wrongful termination, sex discrimination, sexual harassment, age discrimination, disability, etc.

**BMGT 464 Organizational Behavior (3)** Prerequisite: BMGT 364. An examination of research and theory concerning the forces which contribute to the behavior of organizational members. Topics covered include: work group behavior, supervisory behavior, intergroup relations, employee goals and attitudes, communication problems, organizational change, and organizational goals and design.

## 154 Approved Courses

**BMGT 467 Undergraduate Seminar in Human Resource Management (3)** *Prerequisite: permission of department.* This course is open only to the top one-third of undergraduate majors in human resource management and is offered during the fall semester of each year. Guest lecturers make periodic presentations.

**BMGT 470 Advanced Transportation Management (3)** *Prerequisites: BMGT 370; and BMGT 372.* The study of the wide range of issues facing managers in each of the transportation modes. This includes decisions on market entry, pricing, competitive responses, service levels, marketing strategies, capital structure, and growth objectives. Specific management decisions and overall strategies pursued by management in each of the modes are compared and contrasted. The decisions of transportation managers in other countries are presented for international comparisons.

**BMGT 472 Advanced Logistics Operations (3)** *Prerequisite: BMGT 372.* Analysis of the operational aspects of logistics management, including purchasing policies, transportation planning, and inventory control. Attention is directed toward total logistics cost minimization and the establishment of a sustainable competitive advantage based on logistical activities.

**BMGT 473 Advanced Transportation Policies (3)** *Prerequisite: BMGT 370.* An analysis of the impact of government policies on carrier management in the various transportation modes. Specific attention is given to the impact of various deregulation measures on carriers and shippers; determination of appropriate funding levels for infrastructure improvements and suitable cost allocation schemes; determination of appropriate truck sizes and weights on interstate highways; and determination of effective policies for transportation safety and labor. The transportation policies and problems of other countries are presented for international comparisons.

**BMGT 474 Urban Transportation Systems (3)** *Prerequisite: ECON 203; or ECON 205.* An analysis of the role of urban transportation in present and future urban development including current and prospective levels of funding for urban transportation systems, capital and operating subsidies, allocation of funds between highways and transit congestion and pollution in urban area, and the allocation of highway costs across a variety of users including commercial motor truck as well as auto travel. Assessment of ability of new technologies, such as intelligent highways, to assist in achieving efficiency goals.

**BMGT 475 Advanced Logistics Strategy (3)** *Prerequisites: BMGT 370; and BMGT 372.* Analysis of the strategic aspects of logistics management including policies, procedures and measurement as applied to all dimensions of logistics customer service. Attention is directed toward profit maximization through the establishment of appropriate customer service levels.

**BMGT 476 Applied Computer Models in Logistics and Transportation Management (3)** *Prerequisites: BMGT 301 and BMGT 370 and BMGT 372.* Introduction to the expanding base of computer software in the logistics and transportation fields. Applications include: inventory control, location decisions, and vehicle routing.

**BMGT 477 International Logistics and Transportation Management (3)** *Prerequisites: BMGT 370; and BMGT 372.* The study of the importance of total logistics costs for U.S. industries attempting to compete in a global economy. Coverage of the structure, service, pricing, and competitive relationships among U.S. international carriers and transport intermediaries, e.g. the flows of international freight (exports and imports) throughout the U.S. and the role of ports and critical gateways. Foreign trade practices and their impact on the logistics costs of U.S. importers and exporters.

**BMGT 480 Legal Environment of Business (3)** *Junior standing.* Principal ideas in law stressing those relevant for the modern business executive with focus on legal reasoning as it has evolved in this country. Leading antitrust cases illustrating the reasoning process as well as the interplay of business, philosophy, and the various conceptions of the nature of law which give direction to the process. Examination of contemporary legal problems and proposed solutions, especially those most likely to affect the business community.

**BMGT 481 Public Utilities (3)** *Prerequisite: ECON 203; or ECON 205.* Using the regulated industries as specific examples, attention is focused on broad and general problems in such diverse fields as constitutional law, administrative law, public administration, government control of business, advanced economic theory, accounting, valuation and depreciation, taxation, finance, engineering, and management.

**BMGT 482 Business and Government (3)** *Prerequisite: ECON 203; or ECON 205.* Focus is on the complex interrelationships between business and government. Explores areas in which business and government are allies (cooperative research and financing program) and adversaries (regulation). Emphasizes a strategic management approach by business to government involvement in economic affairs.

**BMGT 485 Advanced Production Management (3)** *Prerequisite: BMGT 385.* A study of typical problems encountered by the factory manager. The objective is to develop the ability to analyze and solve problems in management control of production and in the formulation of production policies. Among the topics covered are plant location, production planning and control, methods analysis, and time study.

**BMGT 486 Total Quality Management (3)** *Prerequisite: BMGT 230 or equivalent.* Total Quality Management and the synergy required between functions to obtain the customer's quality demands. Statistical tools which are mandatory in any successful quality effort.

**BMGT 490 The Total Quality Practicum (3)** *Prerequisite: BMGT 390 or ENES 390. Also offered as ENES 490.* Capstone course for the four course total quality program. Based on a major project undertaken by student teams in an industry environment emphasizing integrative aspects of total quality, each project will be supervised by a joint faculty/industry team with differing areas of expertise. Requires extensive out-of-class work.

**BMGT 493 Honors Study (3)** *Prerequisite: permission of department.* 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.

**BMGT 494 Honors Study (3)** *Prerequisite: BMGT 493, and continued candidacy for honors in Business and Management.* 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.

**BMGT 495 Business Policies (3)** *Prerequisites: BMGT 340; and BMGT 350; and BMGT 364.* A case study course where students apply what they have learned of general management principles and their specialized functional applications to the overall management function in the enterprise.

**BMGT 496 Business Ethics and Society (3)** *Prerequisite: one course in BMGT; or permission of department.* A study of the standards of business conduct, moral, values, and 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.

**BMGT 498 Special Topics in Business and Management (3)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs.* Special topics in business and management designed to meet the changing needs and interests of students and faculty.

## BSOS—Behavioral and Social Sciences

**BSOS 288 Special Topics in Behavioral and Social Sciences (1-3)** *Repeatable to 6 credits if content differs.* Introductory special topics course focusing on an interdisciplinary topic related to behavioral and social sciences.

**BSOS 308 Contemporary Issues: Interdisciplinary Approaches (3)** *Repeatable to 6 credits if content differs.* An interdisciplinary analysis of current public policy issues of international, national and community import. Senior standing recommended.

**BSOS 346 Internship in Political Institutions: State and Local Government (3-6)** *Prerequisite: permission of department.* This course offers students supervised placements in state and local governmental agencies. Attendance at the seminar and discussion section is required.

**BSOS 356 Internship in Political Institutions: Federal and International (3-6)** *Prerequisite: permission of department.* This course offers students supervised placements in national and international governmental agencies. Attendance at the seminar and discussion section is required.

**BSOS 359 Contemporary Issues in Political Leadership and Participation (3)** *Prerequisite: permission of department. Repeatable to 9 credits if content differs.* Special topics in political leadership and participation.

**BSOS 366 Internship in Community Service Organizations (3-6)** *Prerequisite: permission of department.* This course offers students supervised placements in non-profit community organizations. Attendance at the seminar and discussion section is required.

**BSOS 388 Behavioral and Social Sciences Special Topics (1-3)** *Repeatable to 6 credits if content differs.* Advanced special topics course focusing on an interdisciplinary topic related to the Behavioral and Social Sciences.

**BSOS 396 Fellowship Program in Political Leadership (3-6)** *Prerequisite: permission of department and acceptance of full-time fellowship program. Corequisite: BSOS 346, BSOS 356 or BSOS 366.* Individual instruction course.

**BSOS 399 Directed Study in Behavioral and Social Sciences (1-6)** *Prerequisite: permission of department.* Guidance for the advanced student capable of interdisciplinary study on special projects under the supervision of the Assistant Dean for Student Affairs.

## CCJS—Criminology and Criminal Justice

**CCJS 100 Introduction to Criminal Justice (3)** *Formerly CJUS 100.* 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.

**CCJS 105 Introduction to Criminology (3)** *Formerly CRIM 220.* Criminal behavior and the methods of its study; causation; typologies of criminal acts and offenders; punishment, correction and incapacitation; prevention of crime.

**CCJS 188 Topics in Criminology and Criminal Justice (3)** *Prerequisite: CCJS 100 or CCJS 105. Repeatable to 6 credits if content differs.* 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.

**CCJS 200 Statistics for Criminology and Criminal Justice (3)** *Two hours of lecture and one hour of discussion/recitation per week. Prerequisites: MATH 111 and (CCJS 100 or CCJS 105) or permission of department.* 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.

**CCJS 230 Criminal Law in Action (3)** *Formerly CJUS 230.* 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.

**CCJS 234 Law of Criminal Investigation (3)** *Prerequisite: CCJS 230. Formerly CJUS 234.* General principles and theories of criminal procedure. Due process. Arrest, search and seizure. Recent developments. Study and evaluation of evidence and proof.

**CCJS 288 Special Topics in Law and Justice (3)** *Prerequisites: CCJS 105 and CCJS 230. Repeatable to 6 credits if content differs.* 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.

**CCJS 300 Criminological and Criminal Justice Research Methods (3)** *Prerequisites: CCJS 100 and CCJS 105; and one of the following: CCJS 200 or SOCY 201 or PSYC 200 or ECON 321 or BMGT 230. Formerly CJUS 300.* 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.

**CCJS 320 Introduction to Criminalistics (3)** *Prerequisite: CCJS 234. Formerly CJUS 320.* An introduction to modern methods used in the detection, investigation and solution of crimes. Practical analysis of evidence in a criminal investigation laboratory, including photography, fingerprints and other impressions, ballistics, glass, hair, handwriting and document examination, drug analysis, and lie detection.

**CCJS 330 Contemporary Criminological Issues (3)** *Prerequisite: CCJS 105. Formerly CRIM 330.* Career criminals, prison overcrowding, prediction, ecological studies of crime, family and delinquency and similar criminological problems. Enforcement procedures for civil law and similar legal problems. Admissibility of evidence. Representation. Indigent's right to counsel.

**CCJS 331 Contemporary Legal Policy Issues (3)** *Prerequisites: CCJS 230; and CCJS 234 or equivalent. Formerly CJUS 330.* 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.

**CCJS 340 Concepts of Law Enforcement Administration (3)** *Prerequisite: CCJS 100 or equivalent. Formerly CJUS 340.* An introduction to concepts of organization and management as these relate to law enforcement. Principles of structure, process, policy and procedure, communication and authority, division of work and

organizational controls. Human element in the organization. Informal interaction and bureaucracy.

**CCJS 350 Juvenile Delinquency (3)** *Prerequisite:* CCJS 105. Formerly CRIM 450. Juvenile delinquency in relation to the general problem of crime; analysis of factors underlying juvenile delinquency; treatment and prevention; organization and social responsibility of law enforcement.

**CCJS 352 Drugs and Crime (3)** *Prerequisite:* CCJS 100. Formerly CJUS 352. An analysis of the role of criminal justice in the control of drug use and abuse.

**CCJS 357 Industrial and Retail Security Administration (3)** *Prerequisite:* CCJS 100 or permission of department. Formerly CJUS 360. The origins of contemporary private security systems. Organization and management of industrial and retail protective units.

**CCJS 359 Field Training in Criminology and Corrections (1-6)** *Prerequisite:* six credits in criminology and permission of department. Repeatable to 6 credits. Formerly CRIM 359. Supervised field training in public or private social agencies. Group meetings, individual conferences and written program reports.

**CCJS 360 Victimology (3)** *Prerequisite:* CCJS 105. Formerly CRIM 360. 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.

**CCJS 370 Race, Crime and Criminal Justice (3)** *Prerequisite:* CCJS 100 or equivalent. Role and treatment of racial/ethnic minorities in the criminal justice system. Course will provide students with historic and theoretical framework for understanding this dynamic.

**CCJS 388 Independent Reading Course in Criminology and Criminal Justice (3)** *Prerequisites:* CCJS 100 and CCJS 105. For honor students only. Formerly CRIM 388. Designed for the needs of honor students in criminology and criminal justice.

**CCJS 389 Independent Research in Criminology and Criminal Justice (3)** *Prerequisite:* CCJS 105. For honor students only. Formerly CRIM 389. Designed for the needs of honor students in criminology and criminal justice.

**CCJS 398 Law Enforcement Field Training (1-6)** *Prerequisite:* 6 credits of CCJS; and permission of department. Repeatable to 6 credits. Formerly CJUS 398. Supervised, structured and focused field training in law enforcement agencies.

**CCJS 399 Independent Study in Criminology and Criminal Justice (1-3)** *Prerequisites:* 12 credits in criminology and criminal justice and permission of department. Repeatable to 6 credits. Formerly CRIM 399. Integrated reading or research under direction and supervision of a faculty member.

**CCJS 400 Criminal Courts (3)** *Prerequisites:* CCJS 100 or permission of department; and CCJS 300. Formerly CJUS 400. Criminal courts in the United States at all levels; judges, prosecutors, defenders, clerks, court administrators, and the nature of their jobs; problems facing courts and prosecutors today and problems of administration; reforms.

**CCJS 432 Law of Corrections (3)** *Prerequisites:* CCJS 230 or CCJS 234; and CCJS 105; and CCJS 300. Formerly CRIM 432. A review of the law of criminal corrections from sentencing to final release or release on parole. Probation, punishments, special treatments for special offenders, parole and pardon, and the prisoner's civil rights are also examined.

**CCJS 444 Advanced Law Enforcement Administration (3)** *Prerequisites:* CCJS 340 or permission of department; and CCJS 300. Formerly CJUS 444. 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.

**CCJS 451 Crime and Delinquency Prevention (3)** *Prerequisites:* CCJS 105 or CCJS 350 or permission of department; and CCJS 300. Formerly CRIM 451. Methods and programs in prevention of crime and delinquency.

**CCJS 452 Treatment of Criminals and Delinquents (3)** *Prerequisites:* CCJS 105 or CCJS 350 or permission of department; and CCJS 300. Formerly CRIM 452. Processes and methods used to modify criminal and delinquent behavior.

**CCJS 453 White Collar and Organized Crime (3)** *Prerequisites:* CCJS 105 or CCJS 350; and CCJS 300. Formerly CRIM 456. Definition, detection, prosecution, sentencing and impact of white collar and organized crime. Special consideration given to the role of federal law and enforcement practices.

**CCJS 454 Contemporary Criminological Theory (3)** *Prerequisites:* CCJS 105; and CCJS 300; and CCJS 350. Formerly CRIM 454. Brief historical overview of criminological theory up to the 50's. Deviance. Labeling. Typologies. Most recent research in

criminalistic subcultures and middle class delinquency. Recent proposals for "decriminalization".

**CCJS 455 Dynamics of Planned Change in Criminal Justice I (3)** *Prerequisite:* CCJS 300 and permission of department. Formerly CJUS 455. An examination of conceptual and practical issues related to planned change in criminal justice. Emphasis on the development of innovative ideas using a research and development approach to change.

**CCJS 456 Dynamics of Planned Change in Criminal Justice II (3)** *Prerequisite:* CCJS 455 or permission of department. Formerly CJUS 456. An examination of conceptual and practical issues related to planned change in criminal justice. Emphasis on change strategies and tactics which are appropriate for criminal justice personnel in entry level positions.

**CCJS 457 Comparative Criminology and Criminal Justice (3)** *Prerequisites:* CCJS 105 or CCJS 350; and CCJS 300. Formerly CRIM 457. Comparison of law and criminal justice systems in different countries. Special emphasis on the methods of comparative legal analysis, international cooperation in criminal justice, and crime and development.

**CCJS 461 Psychology of Criminal Behavior (3)** *Prerequisites:* CCJS 105 or equivalent; and CCJS 300; and PSYC 330 or PSYC 353. Formerly CRIM 455. Biological, environmental, and personality factors which influence criminal behaviors. Biopsychology 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.

**CCJS 462 Special Problems in Security Administration (3)** *Prerequisites:* CCJS 300 and CCJS 357. Formerly CJUS 462. An advanced course for students desiring to focus on specific concerns in the study of private security organizations; business intelligence and espionage; vulnerability and criticality analyses in physical security; transportation, banking, hospital and military security problems; uniformed security forces; national defense information; and others.

**CCJS 498 Selected Topics in Criminology and Criminal Justice (3)** *Prerequisite:* CCJS 300 and permission of department. Repeatable to 6 credits if content differs. Formerly CRIM 498. Topics of special interest to advanced undergraduates in criminology and criminal justice. Offered in response to student request and faculty interest.

## CHEM—Chemistry

**CHEM 001 Introduction to College Chemistry (2)** *Two hours of lecture and one hour of laboratory per week. This course is recommended for students who do not qualify for MATH 110 or higher and who must take CHEM 103. Special fee. This course does not carry credit towards any degree at the University. An introduction to the study of matter.*

**CHEM 102 Chemistry of Our Environment (4)** *Three hours of lecture, three hours of laboratory, and one hour of discussion/recitation per week. Credit will be granted for only one of the following: CHEM 102, or CHEM 103, or CHEM 105, or CHEM 107, or CHEM 111, or CHEM 121. Basic chemical principles with applications in cosmochemistry, geochemistry, biochemistry and nuclear chemistry. Emphasis is on the development of our environment and on our effect upon it. This course does not fulfill most chemistry requirements of the professional colleges and schools.*

**CHEM 103 General Chemistry I (4)** *Three hours of lecture, three hours of laboratory, and one hour of discussion/recitation per week. Prerequisite:* placement in MATH 110 or higher. Recommended: placement in MATH 115 or higher. Credit will be granted for only one of the following: CHEM 102, CHEM 103, CHEM 105, CHEM 107, CHEM 111, CHEM 143. The first semester of a chemistry sequence intended for students whose curricula require a year or more of chemistry. The nature and composition of matter, chemical calculations, elements and inorganic compounds.

**CHEM 104 Fundamentals of Organic and Biochemistry (4)** *Three hours of lecture, three hours of laboratory, and one hour of discussion/recitation per week. Prerequisite:* CHEM 103 or CHEM 105. Credit will be granted for only one of the following: CHEM 104 or CHEM 233 (or CHEM 235). Intended for students whose curricula require one year of chemistry. Students requiring two or more years of chemistry should register for CHEM 233 or CHEM 235. The chemistry of carbon: aliphatic compounds, aromatic compounds, stereochemistry, halides, amines, and amides, acids, esters, carbohydrates, and natural products.

**CHEM 109 College Chemistry Laboratory (1-2)** *Prerequisite:* permission of department. Laboratory work as required for transfer students whose lower division work at other universities has not included laboratory work.

**CHEM 113 General Chemistry II (4)** *Three hours of lecture, three hours of laboratory, and one hour of discussion/recitation per*

*week. Prerequisite:* CHEM 103 or CHEM 105. Credit will be granted for only one of the following: CHEM 113 or CHEM 115. Kinetics; homogeneous, heterogeneous, and ionic equilibria; oxidation-reduction; electrochemistry; chemistry of the elements.

**CHEM 121 Chemistry in the Modern World (3)** *Three hours of lecture and one hour of discussion/recitation per week. Credit will be granted for only one of the following: CHEM 102, or CHEM 103, or CHEM 105, or CHEM 107, or CHEM 111, or CHEM 121. Basic chemical principles and terminology with applications to the chemistry of everyday life including food, metals, plastics and fibres. This course does not fulfill most chemistry requirements of the professional schools and colleges. When CHEM 121 and CHEM 122 are taken concurrently, together they fulfill the CORE laboratory science requirement.*

**CHEM 122 Laboratory Chemistry (1)** *Pre- or corequisite:* CHEM 121. Credit will be granted for only one of the following: CHEM 102, or CHEM 103, or CHEM 105, or CHEM 111, or CHEM 122. Formerly CHEM 111. Includes experiments illustrating the chemical principles and chemical applications in the modern world presented in CHEM 121. When CHEM 122 and CHEM 121 are taken concurrently, together they fulfill the CORE laboratory science requirement.

**CHEM 133 General Chemistry for Engineers (4)** *Three hours of lecture, three hours of laboratory, and one hour of discussion/recitation per week. Prerequisite:* one year of high school chemistry. Corequisite: MATH 140. For ENGR majors only. Not open to students who have completed CHEM 102, CHEM 103, CHEM 107, CHEM 111, CHEM 113, CHEM 143 or CHEM 153. The nature and composition of matter, solutions, chemical reactions, equilibria, kinetics, thermodynamics, and electrochemistry.

**CHEM 143 General and Analytical Chemistry I (5)** *Three hours of lecture, six hours of laboratory, and one hour of discussion/recitation per week. Prerequisite:* placement in MATH 115 or higher. For CHEM majors only. Credit will be granted for only one of the following: CHEM 103, CHEM 122, CHEM 102, CHEM 143. The first semester of a chemistry sequence for chemistry and biochemistry majors. Stoichiometry, molecular structure and the equilibrium of acids, bases and buffers. Lab topics will focus on inorganic chemistry and quantitative analysis.

**CHEM 153 General and Analytical Chemistry II (5)** *Three hours of lecture, six hours of laboratory, and one hour of discussion/recitation per week. Prerequisite:* CHEM 143 with grade of C or better. For CHEM and BCHM majors only. Credit will be granted for only one of the following: CHEM 102, CHEM 122, CHEM 113. The second semester of a course sequence for chemistry and biochemistry majors. Kinetics, ionic equilibria, redox reactions, electrochemistry, descriptive inorganic chemistry. Labs focus on inorganic chemistry and quantitative analysis.

**CHEM 227 Inorganic and Analytical Chemistry Lab (4)** *Two hours of lecture and six hours of laboratory per week. Prerequisite:* CHEM 113. Laboratory in inorganic chemistry and quantitative analysis for chemistry and biochemistry majors who did NOT take CHEM 143 and CHEM 153.

**CHEM 233 Organic Chemistry I (4)** *Three hours of lecture, three hours of laboratory, and one hour of discussion/recitation per week. Prerequisite:* CHEM 113 or CHEM 153. Credit will be granted for only one of the following: CHEM 104, CHEM 233, CHEM 255. The chemistry of carbon: aliphatic compounds, aromatic compounds, stereochemistry, arenes, halides, alcohols, esters, and spectroscopy.

**CHEM 237 Principles of Organic Chemistry I (4)** *Three hours of lecture and four hours of laboratory per week. Prerequisite:* CHEM 113 or CHEM 153 or permission of department. For CHEM, BCHM, and ENCH majors and honors students only. Credit will be granted for only one of the following: CHEM 233, CHEM 235 or CHEM 237. The chemistry of carbons: aliphatic compounds, aromatic compounds, stereochemistry, arenes, halides, alcohols, esters, and spectroscopy.

**CHEM 243 Organic Chemistry II (4)** *Three hours of lecture, three hours of laboratory, and one hour of discussion/recitation per week. Prerequisite:* CHEM 233. Credit will be granted for only one of the following: CHEM 243 or CHEM 247. A continuation of CHEM 233 with emphasis on molecular structure: substitution reactions; carbonium ions; aromaticity; synthetic processes; macromolecules.

**CHEM 247 Principles of Organic Chemistry II (4)** *Three hours of lecture and four hours of laboratory per week. Prerequisite:* CHEM 237 or permission of department. For CHEM, BCHM, and ENCH majors and honors students only. Credit will be granted for only one of the following: CHEM 243 or CHEM 247. A continuation of CHEM 237 with emphasis on molecular structure, substitution reactions; carbonium ions; aromaticity; synthetic processes; macromolecules.

**CHEM 287 Computer Programming for the Biological and Chemical Sciences (4)** *Three hours of lecture and three hours of laboratory per week. Prerequisite:* one year of college chemistry or biological science. Introduction to a structured programming language (PASCAL), with examples and applications chosen from the biological and chemical sciences.

## 156 Approved Courses

**CHEM 374 Technology, Energy and Risk (3)** *Prerequisite: completion of USP Distributive Studies Area B.* Decision-making in a technological, democratic society. Current issues such as acid rain, nuclear power, synthetic organic chemicals.

**CHEM 395 Professional Issues in Chemistry and Biochemistry (1)** *Junior standing. For CHEM and BCHM majors only.* Seminar on professional issues. Professional responsibilities, ethics, interview techniques, career opportunities, graduate/professional school, race and gender issues.

**CHEM 398 Special Projects (2)** Honors projects for undergraduate students.

**CHEM 399 Introduction to Chemical Research (1-3)** *Prerequisite: permission of department. Junior standing. Repeatable to 6 credits.* Basic (chemical) research conducted under the supervision of a faculty member.

**CHEM 401 Inorganic Chemistry (3)** *Prerequisite: CHEM 243 or CHEM 247.*

**CHEM 403 Radiochemistry (3)** *Prerequisite: one year of college chemistry and one year of college physics.* 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.

**CHEM 421 Advanced Quantitative Analysis (3)** *Pre- or corequisites: CHEM 482 and CHEM 483.* An examination of some advanced topics in quantitative analysis including nonaqueous titrations, precipitation phenomena, complex equilibria, and the analytical chemistry of the less familiar elements.

**CHEM 425 Instrumental Methods of Analysis (3)** *One hour of lecture, six hours of laboratory, and one hour of discussion/recitation per week. Prerequisite: CHEM 227 or CHEM 153.* Modern instrumentation in analytical chemistry. Electronics, spectroscopy, chromatography and electrochemistry.

**CHEM 441 Advanced Organic Chemistry (3)** *Prerequisite: CHEM 481.* An advanced study of the compounds of carbon, with special emphasis on molecular orbital theory and organic reaction mechanisms.

**CHEM 450 Ethics in Science and Engineering (3)** *Prerequisite: 8 credits laboratory science or permission of department.* Ethical issues in science and their resolutions. Topics will be ethics and scientific truth, ethics and other scientists, and ethics and society.

**CHEM 460 Structure Determination Using Spectroscopic Methods (3)** *Prerequisite: CHEM 243 or CHEM 247. Formerly CHEM 660.* The use of infrared, ultraviolet-visible, proton and carbon-13 nuclear magnetic resonance and mass spectroscopy for structure determination in organic chemistry.

**CHEM 474 Environmental Chemistry (3)** *Prerequisite: CHEM 481 or equivalent.* The sources of various elements and chemical reactions between them in the atmosphere and hydrosphere are treated. Causes and biological effects of air and water pollution by certain elements are discussed.

**CHEM 481 Physical Chemistry I (3)** *Prerequisite: CHEM 113 or CHEM 153 or CHEM 133; and MATH 141; and PHYS 142.* A course primarily for chemists and chemical engineers.

**CHEM 482 Physical Chemistry II (3)** *Prerequisite: CHEM 481.* A course primarily for chemists and chemical engineers.

**CHEM 483 Physical Chemistry Laboratory I (2)** One hour lecture-recitation and one three-hour laboratory period per week *Corequisite: CHEM 481.* An introduction to the principles and application of quantitative techniques in physical chemical measurements. Experiments will be coordinated with topics in CHEM 481.

**CHEM 484 Physical Chemistry Laboratory II (2)** One hour lecture-recitation and one three-hour laboratory period per week. *Prerequisite: CHEM 481 and CHEM 483. Corequisite: CHEM 482.* A continuation of CHEM 483. Advanced quantitative techniques necessary in physical chemical measurements. Experiments will be coordinated with topics in CHEM 482.

**CHEM 485 Advanced Physical Chemistry (2)** *Prerequisite: CHEM 482.* Quantum chemistry and other selected topics.

**CHEM 487 Computer Applications in the Biological and Chemical Sciences (4)** *Three hours of lecture, three hours of laboratory, and one hour of discussion/recitation per week. Prerequisite: CHEM 113 and CHEM 287 or equivalent; and knowledge of a scientific programming language (PASCAL, FORTRAN or "C").* The utilization of computers to solve chemical and biological problems, with emphasis on the utilization of available software rather than "de novo" programming.

**CHEM 491 Advanced Organic Chemistry Laboratory (4)** *One hour of lecture and 10 hours of laboratory per week. Prerequisite: CHEM 243. Formerly CHEM 433 and CHEM 443. Credit will be granted for only one of the following: CHEM 433 and CHEM 443 or*

*CHEM 491.* Advanced synthetic techniques in organic chemistry with an emphasis on spectroscopy for structure determination.

**CHEM 492 Advanced Inorganic Chemistry Laboratory (3)** *One hour of lecture and eight hours of laboratory per week. Corequisite: CHEM 401.* Synthetic and structural inorganic chemistry. Emphasis on spectroscopy methods for structure determination. Students complete an individual special project. (Designed to satisfy the university requirement for a capstone course in chemistry.)

**CHEM 498 Special Topics in Chemistry (3)** Three lectures or two lectures and one three-hour laboratory per week. *Prerequisite varies with the nature of the topic being considered. Course may be repeated for credit if the subject matter is substantially different, but not more than three credits may be accepted in satisfaction of major supporting area requirements for chemistry majors.*

## CHIN—Chinese

**CHIN 101 Intensive Elementary Chinese I (6)** *Non-majors admitted only after a placement interview.* Introduction to speaking, reading, and writing Chinese with an emphasis on mastering the essentials of pronunciation, basic characters and structural patterns.

**CHIN 102 Elementary Spoken Chinese (3)** *Prerequisite: CHIN 101 or equivalent. Non-majors admitted only after a placement interview.* Continued study of grammatical patterns and vocabulary buildup with particular emphasis on conversation. May be taken in conjunction with CHIN 103.

**CHIN 103 Elementary Written Chinese (3)** *Prerequisite: CHIN 101 or equivalent. Non-majors admitted only after a placement interview.* Continued study of grammatical patterns and buildup of vocabulary with particular emphasis on reading and writing. May be taken in conjunction with CHIN 102.

**CHIN 105 Elementary Chinese-Accelerated Track (3)** *Prerequisite: permission of department. Not open to students who have completed CHIN 101, CHIN 102, or CHIN 103.* Accelerated instruction in Mandarin Chinese at the elementary level for students with prior Chinese language background, either through home use or formal instruction.

**CHIN 201 Intermediate Spoken Chinese I (3)** *Prerequisite: CHIN 102 or equivalent. Non-majors admitted only after a placement interview.* Emphasis on development of conversational skills with vocabulary build-up and controlled conversation.

**CHIN 202 Intermediate Written Chinese I (3)** *Prerequisite: CHIN 103 or equivalent. Non-majors admitted only after a placement interview.* Reading and writing skills with emphasis on grammar and Chinese characters.

**CHIN 203 Intermediate Spoken Chinese II (3)** *Prerequisite: CHIN 201 or equivalent. Non-majors admitted only after a placement interview.* Continuation of CHIN 201.

**CHIN 204 Intermediate Written Chinese II (3)** *Prerequisite: CHIN 202 or equivalent. Non-majors admitted only after a placement interview.* Continuation of CHIN 202.

**CHIN 205 Intermediate Chinese-Accelerated Track (3)** *Prerequisite: permission of department. Not open to students who have completed CHIN 201, CHIN 202, CHIN 203, or CHIN 204.* Accelerated instruction in Mandarin Chinese at the intermediate level for students with prior Chinese language background, either through home use or formal instruction.

**CHIN 213 Chinese Poetry into English: An Introduction (3)** Issues in the intercultural and interlingual interpretation of foreign literature through the study of Western translations of and scholarship on selected Chinese poets. No knowledge of Chinese required.

**CHIN 301 Advanced Chinese I (3)** *Prerequisite: CHIN 202 or equivalent. Non-majors admitted only after a placement interview.* Readings in expository and fictional writing with conversation and composition.

**CHIN 302 Advanced Chinese II (3)** *Prerequisite: CHIN 301 or equivalent. Non-majors admitted only after a placement interview.* Continuation of CHIN 301.

**CHIN 303 Business Chinese I (3)** *Prerequisites: CHIN 203; and CHIN 204 or equivalent. Non-majors admitted only after a placement interview.* 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.

**CHIN 304 Business Chinese II (3)** *Prerequisite: CHIN 303 or equivalent. Non-majors admitted only after a placement interview.* Continuation of CHIN 303.

**CHIN 305 Life in China through TV Plays I (3)** *Prerequisite: CHIN 203, CHIN 204 or permission of department.* Using authentic Chinese language material in short TV plays to learn about society and life in China.

**CHIN 306 Life in China through TV Plays II (3)** *Prerequisite: CHIN 305 or permission of department.* Continuation of CHIN 305 using authentic Chinese language material in TV plays to learn about society and life in China.

**CHIN 313 Chinese Poetry and Prose in Translation (3)** 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.

**CHIN 314 Chinese Fiction and Drama in Translation (3)** Representative short stories, novels, and plays from the third through the nineteenth centuries. No knowledge of Chinese is required.

**CHIN 315 Modern Chinese Literature in Translation (3)** 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.

**CHIN 331 Chinese Calligraphy: Theory and Practice (3)** Beginning brushwork and lectures on the culture. Characters for practice selected to correspond to lecture topics. History of the writing system: major scripts, modes, and styles.

**CHIN 388 Topics in Chinese Literature in Translation (3)** *Repeatable to 6 credits if content differs.* Analysis of significant themes and structures in Chinese literature. No knowledge of Chinese required.

**CHIN 401 Readings in Modern Chinese I (3)** *Prerequisite: CHIN 302 or equivalent. Non-majors admitted only after a placement interview.* Readings in history, politics, economics, sociology, and literature. Emphasis on wide-ranging, rapid reading, reinforced by conversations and compositions.

**CHIN 402 Readings in Modern Chinese II (3)** *Prerequisite: CHIN 401 or equivalent. Non-majors admitted only after a placement interview.* Continuation of CHIN 401.

**CHIN 403 Classical Chinese I (3)** *Prerequisite: CHIN 302.* Introductory classical Chinese using literary and historical sources in the original language.

**CHIN 404 Classical Chinese II (3)** *Prerequisite: CHIN 302.* Further classical studies by various writers from famous ancient philosophers to prominent scholars before the new culture movement.

**CHIN 405 Advanced Conversation and Composition (3)** *Prerequisite: CHIN 302 or permission of instructor. Non-majors admitted only after a placement interview.* Practice in writing essays, letters, and reports on selected topics. Conversation directed toward everyday situations and topics related to life in China. Conducted in Chinese.

**CHIN 415 Readings in Current Newspapers and Periodicals (3)** *Prerequisite: CHIN 402 or equivalent. Non-majors admitted only after a placement interview.* Reading of periodical literature on selected topics with discussions and essays in Chinese.

**CHIN 421 Sounds and Transcriptions of Mandarin Chinese (3)** Production and recognition of Mandarin speech sounds and tones, their phonological patterns, comparison with English, and representation by the various Romanization systems.

**CHIN 422 Advanced Chinese Grammar (3)** Chinese sentence patterns studied contrasted with English and in terms of current pedagogical as well as linguistic theories.

**CHIN 431 Translation and Interpretation I (3)** *Prerequisite: CHIN 302 or equivalent and permission of department.* Theory and practice of Chinese/English translation and interpretation with emphasis on translation.

**CHIN 432 Translation and Interpretation II (3)** *Prerequisite: CHIN 402 or equivalent and permission of department.* Workshop on Chinese/English translation and interpretation, with emphasis on seminar (consecutive) interpretation and introduction to conference (simultaneous) interpretation.

**CHIN 441 Traditional Chinese Fiction (3)** *Prerequisite: permission of department.* Major works of fiction from the 4th century tales of the marvelous through the 19th century Ching novel. Taught in Chinese.

**CHIN 442 Modern Chinese Fiction (3)** *Prerequisite: permission of department.* Examination, through selected texts, of the writer's role as shaper and reflector of the Republican and Communist revolutions. Taught in Chinese.

**CHIN 499 Directed Study in Chinese (1-3)** *Prerequisite: permission of instructor. Repeatable to 6 credits if content differs.* Readings in Chinese under faculty supervision.

## CLAS—Classics

**CLAS 100 Classical Foundations (3)** Aspects of the ancient world taught through the medium of influential classical texts.

**CLAS 170 Greek and Roman Mythology (3)** Taught in English, no prerequisite: cannot be taken for language credit. This course is particularly recommended for students planning to major in foreign languages, English, history, the fine arts, or journalism.

**CLAS 270 Greek Literature in Translation (3)** Selections in translation of Greek literature from Homer to Lucian, with special emphasis on epic and dramatic poetry. No knowledge of Greek or Latin is required.

**CLAS 271 Roman Literature in Translation (3)** Selections in translation of Latin literature to the time of Apuleius. Special emphasis will be placed on poetry of the Augustan Age. No knowledge of Latin is required.

**CLAS 309 Special Topics in Classical Literature (3)** Repeatable to 9 credits if content differs. Readings in translation.

**CLAS 310 Ancient Philosophy (3)** Prerequisite: six credits in classics or philosophy. Credit will be granted for only one of the following: CLAS 310 or PHIL 310. The origins and development of philosophy and science in Ancient Greece, focusing on the pre-Socratics, Socrates, Plato and Aristotle.

**CLAS 315 Greek and Roman Athletics (3)** 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.

**CLAS 320 Women in Classical Antiquity (3)** Also offered as WMST 320. Credit will be granted for only one of the following: CLAS 320 or WMST 320. 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.

**CLAS 330 Greek and Roman Religion (3)** Survey of Greek and Roman religious beliefs and practices from Minoan-Mycenaean period to rise of Christianity.

**CLAS 372 Classical Epic (3)** Introduction to major classical epic poems in translation.

**CLAS 374 Greek Tragedy in Translation (3)** 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*.

**CLAS 375 Ancient Comedy (3)** Representative plays by Aristophanes, Menander, Plautus and Terence in translation; examination of Greek tradition in Roman and postclassical periods.

**CLAS 376 The Ancient Novel (3)** Reading and analysis of ancient fictional prose narratives.

**CLAS 380 Ancient Biography (3)** Analysis of ancient biographies as literature in translation.

**CLAS 411 Greek Drama (3)** Also offered as CMLT 411. Credit will be granted for only one of the following: CLAS 411 or CMLT 411. The chief works of Aeschylus, Sophocles, Euripides, and Aristophanes in English translations.

**CLAS 420 The Classical Tradition (3)** Examination of the role of classical tradition in western thought, with particular regard to the classical tradition in America.

**CLAS 470 Advanced Greek and Roman Mythology (3)** Prerequisite: CLAS 170 or permission of department. Selected themes and characters of Greek and Roman myth. History of the study of myth and research methods in mythology.

**CLAS 488 Independent Study in Classical Civilization (3)** Prerequisite: permission of department. Repeatable to 6 credits if content differs.

**CLAS 495 Senior Thesis in Classics (3)** Prerequisite: permission of department. Prior departmental approval of research topic is required. Available to all students who wish to pursue a specific research topic.

**CLAS 499 Independent Study in Classical Languages and Literatures (1-3)** Prerequisite: permission of department.

## CMLT—Comparative Literature

**CMLT 214 Film Form and Culture (3)** Introduction to film forms in international perspective. Emphasis on the techniques of film analysis, distinctions among film genres, and the history of cinema.

**CMLT 235 Introduction to the Literatures of the African Diaspora (3)** Credit will be granted for only one of the following: CMLT 235 or ENGL 235. Introduction to authors, periods, and genres reflecting the diversity of African and African Diaspora cultures.

**CMLT 270 Global Literature and Social Change (3)** 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.

**CMLT 275 World Literature by Women (3)** Also offered as WMST 275. Credit will be granted for only one of the following: CMLT 275 or WMST 275. Comparative study of selected works by women writers of several countries, exploring points of intersection and divergence in women's literary representations.

**CMLT 277 Literatures of the Americas (3)** 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.

**CMLT 280 Film Art in a Global Society (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: CMLT 214 or equivalent. Introduction to global manifestations of film as an art form, with attention to cross-cultural differences and to the effects of commercial systems on indigenous production practices.

**CMLT 291 International Perspectives on Lesbian and Gay Studies (3)** Exploration of the construction and representation of sexualities in cultures around the globe, with particular emphasis on literature and media.

**CMLT 298 Topics in Comparative Studies (3-6)** Repeatable to 9 credits if content differs.

**CMLT 415 The Hebrew Bible (3)** A study of sources, development and literary types.

**CMLT 461 Romanticism: Early Stages (3)** Emphasis on England, France and Germany.

**CMLT 462 Romanticism: Flowering and Influence (3)** Emphasis on England, France and Germany.

**CMLT 469 The Continental Novel (3)** The novel in translation from Stendhal through the existentialists, selected from literatures of France, Germany, Italy, Russia, and Spain.

**CMLT 479 Major Contemporary Authors (3)**

**CMLT 488 Genres (3)** Repeatable to 6 credits if content differs. A study of a recognized literary form, such as tragedy, film, satire, literary criticism, comedy, tragicomedy, etc.

**CMLT 489 Major Writers (3)** Each semester two major writers from different cultures and languages will be studied. Authors will be chosen on the basis of significant relationships of cultural and aesthetic contexts, analogies between their respective works, and the importance of each writer to his literary tradition.

**CMLT 498 Selected Topics in Comparative Studies (3)**

## CMPS—Computer, Mathematical and Physical Sciences

**CMPS 299 Special Topics (1-3)** For CMPS majors only. Repeatable to 3 credits if content differs.

## CMSC—Computer Science

**CMSC 102 Introduction to Information Technology (3)** For non-majors only. Not open to students who have completed CMSC 113 or CMSC 214. Credit will be granted for only one of the following: CMSC 102 or CMSC 214 or CMSC 113. (If CMSC 102 is taken before CMSC 214 or CMSC 113, then credit will be granted for both). Computer terminology and concepts. Introduction to database management systems, spreadsheets, and word processors. Introduction to networks and to the Internet in particular. Importing information from network to local application.

**CMSC 103 Introduction to Computing (3)** Not open to students who have completed CMSC 113 or CMSC 214. Credit will be granted for only one of the following: CMSC 103 or CMSC 214 or CMSC 113. (If CMSC 103 is taken before CMSC 214 or CMSC 113, then credit will be granted for both). An introduction to computing for non-computer science majors. Basic terminology and concepts of computing. Hands-on experience on personal computer with applications software such as word processor, spreadsheet, and database management system. Social issues of computing. (Not applicable to the major requirements in computer science.)

**CMSC 104 FORTRAN Programming (4)** Three hours of lecture and two hours of laboratory per week. Prerequisite: MATH 110. Not applicable to the major requirements in computer science. Not open to students who have completed CMSC 113 or CMSC 214. Design and analysis of programs in FORTRAN. An introduction to

computing, using structured programming concepts.

**CMSC 105 Pascal Programming (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: MATH 110. Not applicable to major requirements in computer science. Will not qualify a student to take the CMSC 112 exemption examination. Not open to students who have completed CMSC 113 or CMSC 214. Credit will be granted for only one of the following: CMSC 105, CMSC 112, or CMSC 120 (if CMSC 105 is taken before CMSC 112, then credit will be granted for both). Design and analysis of programs in Pascal. An introduction to computer programming, using structured programming concepts.

**CMSC 106 Introduction to C Programming (4)** Three hours of lecture and two hours of laboratory per week. Prerequisite: MATH 110. Not applicable to the major requirements in computer science. Credit will not be granted for CMSC 106 if students already have credit for either CMSC 113 or CMSC 114. Not open to students who have completed CMSC 113 or CMSC 114. Design and analysis of programs in C. An introduction to computing using structured programming concepts. CMPS majors will be given priority for registration until the first day of classes.

**CMSC 107 Introduction to the UNIX Operating System (3)** Recommended: prior experience with computing. Effective use of UNIX tools for students of all disciplines. UNIX file system; shell programming; text editing; filters; pipes; macro processing; data analysis; text processing; document maintenance.

**CMSC 113 Computer Science II (4)** Three hours of lecture and two hours of laboratory per week. Prerequisites: (CMSC 150 and CMSC 112, each with a grade of C or better) or permission of department based on satisfactory performance on the computer science placement exam. Corequisite: MATH 141. Credit will be granted for only one of the following: CMSC 113 and CMSC 120. A continuation of CMSC 112. Intended for computer science majors.

**CMSC 114 Computer Science I (4)** Three hours of lecture and two hours of laboratory per week. Prerequisite: (CMSC 105 or CMSC 106) with a grade of C or better or score of 4 or 5 on Pascal AP exam or permission of department based on satisfactory performance on the department's placement exams. Corequisite: MATH 140. Credit will be granted for only one of the following: CMSC 114 or CMSC 113. With CMSC 214, this course forms a one-year sequence for computer science majors. Introduction to UNIX. Procedural and data abstraction using C++.

**CMSC 150 Introduction to Discrete Structures (4)** Three hours of lecture and two hours of discussion/recitation per week. Pre- or corequisite: MATH 140. Formerly CMSC 250. 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.

**CMSC 211 Assembly Language Programming (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: CMSC 113 or CMSC 120. Assembly language programming, assemblers, loaders, linkage editors, and macros.

**CMSC 214 Computer Science II (4)** Three hours of lecture and two hours of laboratory per week. Prerequisites: CMSC 114 with a grade of C or better or score of 4 or 5 on C++ AP exam or permission of department based on satisfactory performance on the department's placement exam; and CMSC 150 with a grade of C or better or an acceptable score on the department's CMSC 150 exemption exam. Corequisite: MATH 141. Credit will be granted for only one of the following: CMSC 214 or CMSC 113. Elementary data structures, recursion, and object-oriented programming using C++.

**CMSC 251 Algorithms (3)** Prerequisites: (CMSC 112 or CMSC 114) with a grade of C or better; CMSC 150 with a grade of C or better; and MATH 140. 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.

**CMSC 305 Advanced Pascal and Elementary Data Structures (4)** Prerequisite: CMSC 105 or CMSC 112. Not applicable to the major requirements in computer science. Credit will be granted for only one of the following: CMSC 113, CMSC 305, or CMSC 220. Stacks, queues, ordered linked lists, binary trees. Recursion. Sorting and searching. Emphasis on program design and on algorithm development and analysis. A continuation of CMSC 105.

**CMSC 306 C++ and Elementary Data Structures (4)** Three hours of lecture and two hours of laboratory per week. Prerequisite: CMSC 106. Credit will be granted for only one of the following: CMSC 113 or CMSC 306. An introduction to object-oriented programming using C++. Recursion, pointers, elementary data structures including linked lists and trees. Data abstraction, inheritance. Not applicable to the major requirements in computer science.

**CMSC 307 Internet and Other Networks (3)** Prerequisite: CMSC 107. An introduction to types of networks for computers and to the utilities available on the Internet. Not applicable to major requirements in computer science.

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**CMSC 311 Computer Organization (3)** *Prerequisite:* (CMSC 113 or CMSC 214) with a grade of C or better. Introduction to assembly language. Design of digital logic circuits. Organization of central processors, including instruction sets, register transfer operations, control microprogramming, data representation, and arithmetic algorithms. Memory and input/output organization.

**CMSC 330 Organization of Programming Languages (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite:* (CMSC 113 or CMSC 214) with a grade of C or better. The semantics of programming languages and their runtime organization. Several different models of languages are discussed, including procedural (e.g., C, Pascal), functional (e.g., ML, LISP), rule-based (e.g., Prolog), and object-oriented (e.g., C++, Smalltalk). Runtime structures, including dynamic versus static scope rules, storage for strings, arrays, records, and object inheritance are explored.

**CMSC 390 Honors Paper (3)** *Prerequisite:* admission to CMSC Honors Program. Special study or research directed toward preparation of honors paper.

**CMSC 400 Introduction to Computer Systems and Software (3)** *Prerequisite:* MATH 141 and experience with a high-level programming language and (graduate standing or permission of department). Assembly language and instruction execution for Von Neumann Architectures. Records, arrays, pointers, parameters, and recursive procedures. I/O structures and interrupt handling. Finite state automata. Course is intended primarily for graduate students in other disciplines. CMSC 400 may not be counted for credit in the graduate or undergraduate program in computer science.

**CMSC 411 Computer Systems Architecture (3)** *Prerequisites:* a grade of C or better in CMSC 311 and CMSC 330; or CMSC 400; and permission of department; or CMSC graduate student. Input/output processors and techniques. Intra-system communication, buses, caches. Addressing and memory hierarchies. Microprogramming, parallelism, and pipelining.

**CMSC 412 Operating Systems (4)** *Three hours of lecture and two hours of laboratory per week. Prerequisites:* (a grade of C or better in CMSC 311 and CMSC 330) or a grade of C or better in CMSC 400; and permission of department; or CMSC graduate student. An introduction to batch systems, spooling systems, and third-generation multiprogramming systems. Description of the parts of an operating system in terms of function, structure, and implementation. Basic resource allocation policies.

**CMSC 415 Systems Programming (3)** *Prerequisites:* CMSC 412 with a grade of C or better; and permission of department; or CMSC graduate student. Basic algorithms of operating system software. Memory management using linkage editors and loaders, dynamic relocation with base registers, paging. File systems and input/output control. Processor allocation for multiprogramming, timesharing. Emphasis on practical systems programming, including projects such as a simple linkage editor, a stand-alone executive, a file system, etc.

**CMSC 417 Computer Networks (3)** *Prerequisites:* (CMSC 113 or CMSC 214) with a grade of C or better; and CMSC 251 with a grade of C or better. 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.

**CMSC 420 Data Structures (3)** *Prerequisites:* a grade of C or better in CMSC 330 or CMSC 400; and permission of department; or CMSC graduate student. Description, properties, and storage allocation of data structures including lists and trees. Algorithms for manipulating structures. Applications from areas such as data processing, information retrieval, symbol manipulation, and operating systems.

**CMSC 421 Introduction to Artificial Intelligence (3)** *Prerequisites:* a grade of C or better in CMSC 251 and CMSC 330; and permission of department; or CMSC graduate student. *Recommended:* CMSC 420. Areas and issues in artificial intelligence, including search, inference, knowledge representation, learning, vision, natural languages, expert systems, robotics. Implementation and application of programming languages (e.g. LISP, PROLOG, SMALLTALK), programming techniques (e.g. pattern matching, discrimination networks) and control structures (e.g. agendas, data dependencies).

**CMSC 422 Programming Robots (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites:* (CMSC 113 or CMSC 214) with a grade of C or better and permission of department. An examination of programming issues involved in creating autonomous robots, which can interact with their environments in "intelligent" ways. Topics include traditional robotics, behavior-based robotics, sensor processing, sensor-based control, programming robotic behaviors. Team programming project. Note: Not for credit in graduate program for computer science.

**CMSC 424 Database Design (3)** *Prerequisite:* CMSC 420 with a grade of C or better; and permission of department; or CMSC graduate student. *Recommended:* CMSC 450. Motivation for the database approach as a mechanism for modeling the real world. Review of the three popular data models: relational, network, and

hierarchical. Comparison of permissible structures, integrity constraints, storage strategies, and query facilities. Theory of database design logic.

**CMSC 426 Image Processing (3)** *Prerequisite:* CMSC 420 and permission of department; or CMSC graduate student. An introduction to basic techniques of analysis and manipulation of pictorial data by computer. Image input/output devices, image processing software, enhancement, segmentation, property measurement, Fourier analysis. Computer encoding, processing, and analysis of curves.

**CMSC 427 Computer Graphics (3)** *Prerequisites:* MATH 240; and a grade of C or better in CMSC 420. An introduction to the principles of computer graphics. Includes an introduction to the mathematics of affine and projective transformations, perspective, curve and surface modeling, algorithms for hidden-surface removal, color models, methods for modeling illumination, shading, and reflection.

**CMSC 430 Theory of Language Translation (3)** *Prerequisites:* a grade of C or better in CMSC 330 or CMSC 400; and permission of department; or CMSC graduate student. Formal translation of programming languages, program syntax and semantics. Finite state recognizers and regular grammars. Context-free parsing techniques such as recursive descent, precedence, LL(k) and LR(k). Code generation, improvement, syntax-directed translation schema.

**CMSC 434 Human Factors in Computer and Information Systems (3)** *Prerequisites:* CMSC 330 with a grade of C or better and PSYC 100 and STAT 400 and permission of department; or CMSC graduate student. Human factors issues in the development of software, the use of database systems, and the design of interactive systems. Science base (theories, models, usability studies, and controlled experimentation), and software engineering with user interface development environments. Issues include: programming and command languages; menus, forms, and direct manipulation; graphical user interfaces, computer-supported cooperative work, information search and visualization; input/output devices; and display design.

**CMSC 435 Software Engineering (3)** *Prerequisites:* CMSC 420 with a grade of C or better; and permission of department; or CMSC graduate student. 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.

**CMSC 450 Logic for Computer Science (3)** *Prerequisites:* (CMSC 251 and MATH 141) with grade of C or better and permission of department; or CMSC graduate student. Also offered as MATH 450. Credit will be granted for only one of the following: MATH 445 or CMSC 450/MATH 450. Elementary development of propositional and first-order logic accessible to the advanced undergraduate computer science student, including the resolution method in propositional logic and Herbrand's Unsatisfiability Theorem in first-order logic. Included are the concepts of truth, interpretation, validity, provability, soundness, completeness, incompleteness, decidability and semi-decidability.

**CMSC 451 Design and Analysis of Computer Algorithms (3)** *Prerequisites:* a grade of C or better in CMSC 113 or CMSC 214 and a grade of C or better in CMSC 251; and permission of department. Fundamental techniques for designing efficient computer algorithms, proving their correctness, and analyzing their complexity. General topics include sorting, selection, graph algorithms, and basic algorithm design paradigms (such as divide-and-conquer, dynamic programming and greedy algorithms), lower bounds and NP-completeness.

**CMSC 452 Elementary Theory of Computation (3)** *Prerequisites:* (CMSC 113 or CMSC 214) with a grade of C or better; CMSC 251 with a grade of C or better. Alternative theoretical models of computation, types of automata, and their relations to formal grammars and languages.

**CMSC 456 Data Encryption and Security (3)** *Prerequisites:* CMSC 420 with a grade of C or better; and permission of department; or CMSC graduate student. *Recommended:* CMSC 451. Methods of protecting computer data from unauthorized use and users by data encryption and by access and information controls. Classical cryptographic systems. Introduction to several modern systems such as data encryption standard and public-key cryptosystems.

**CMSC 460 Computational Methods (3)** *Prerequisites:* (a grade of C or better in MATH 240 and MATH 241); and (CMSC 110 or CMSC 113); and permission of department; or CMSC graduate student. Also offered as MAPL 460. Credit will be granted for only one of the following: CMSC/MAPL 460 or CMSC/MAPL 466. 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.

**CMSC 466 Introduction to Numerical Analysis I (3)** *Prerequisites:* (a grade of C or better in MATH 240 and MATH 241); and (CMSC 110 or CMSC 113); and permission of department; or CMSC graduate student. Also offered as MAPL 466. Credit will be granted for only one of the following: CMSC/MAPL 460 or CMSC/MAPL 466. Floating point computations, direct methods for linear systems, interpolation, solution of nonlinear equations.

**CMSC 467 Introduction to Numerical Analysis II (3)** *Prerequisite:* MAPL/CMSC 466 with a grade of C or better; and permission of department; or CMSC graduate student. Also offered as MAPL 467. Credit will be granted for only one of the following: CMSC 467 or MAPL 467. Advanced interpolation, linear least squares, eigenvalue problems, ordinary differential equations, fast Fourier transforms.

**CMSC 475 Combinatorics and Graph Theory (3)** *Prerequisites:* MATH 240 and MATH 241; and permission of department; or CMSC graduate student. Also offered as MATH 475. 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.

**CMSC 477 Optimization (3)** *Prerequisites:* (CMSC/MAPL 460, or CMSC/MAPL 466, or CMSC/MAPL 467) with a grade of C or better; and permission of department; or CMSC graduate student. Also offered as MAPL 477. Credit will be granted for only one of the following: CMSC 477 or MAPL 477. Linear programming including the simplex algorithm and dual linear programs; convex sets and elements of convex programming; combinatorial optimization, integer programming.

**CMSC 498 Special Problems in Computer Science (1-3)** *Prerequisite:* permission of department. An individualized course designed to allow a student or students to pursue a specialized topic or project under the supervision of the senior staff. Credit according to work done.

## COOP—Cooperative Education Program

**COOP 098 Summer Co-Op Work Experience (0)** *Prerequisites:* satisfactory completion of 36 credits; and permission of the Program Director for Experiential Learning. Practical, full-time or part-time work experience in either private or government agencies which supplements and enhances the theories, principles, and practices in the normal education program. Students must register for COOP 098 if they are working during a summer semester.

**COOP 099 Co-Op Work Experience (0)** *Prerequisites:* satisfactory completion of 36 credits; and permission of the Program Director for Experiential Learning. Practical, full-time or part-time work experience in either private or government agencies which supplements and enhances the theories, principles, and practices in the normal education program. Students must register for COOP 099 if they are working during the fall or spring semester.

## CPSP—College Park Scholars Program

**CPSP 118 College Park Scholars Colloquium I (1-3)** *Prerequisite:* admission to College Park Scholars Program. Introductory colloquium for specific College Park Scholars Program.

**CPSP 120 Issues in Child Advocacy (3)** *Prerequisite:* admission to College Park Scholars Advocates for Children Program. Development of effective advocates for children through the integration of public policy making, grassroots organizing, public and media relations, research and technology strategies.

**CPSP 123 Issues in Environmental Studies (3)** *Prerequisite:* admission to College Park Scholars Environmental Studies Program. Development of understanding of environmental issues and their complexity. Identification of issues; analysis of conflicting arguments; examination of tools used by different disciplines to aid in decision-making in context of current environmental controversies.

**CPSP 124 Issues in International Studies (3)** *Prerequisite:* admission to College Park Scholars International Studies Program. Introduction to the study of international relations by providing students with framework to understand forces which shape the behavior of nation-states and contribute to international conflict and cooperation.

**CPSP 126 Issues in Public Leadership (3)** *Prerequisite:* admission to College Park Scholars Public Leadership Program. Development of effective leaders and change agents through analysis and application of leadership theories and definitions, personal leadership, tasks and processes of leadership, leader/follower interactions, group dynamics, and transformation of communities.

**CPSP 218 College Park Scholars Colloquium II (1-3)** *Prerequisite:* admission to College Park Scholars Program. Colloquium for specific College Park Scholars Program.

**CPSP 318 College Park Scholars Colloquium III (1-3)** *Prerequisite:* admission to College Park Scholars Program. Colloquium for specific College Park Scholars Program.

## DANC—Dance

**DANC 102 Rhythmic Training for Dance (2)** Basic approaches to rhythmic principles related to dance.

**DANC 109 Improvisation I (2)** *Repeatable to 4 credits.* An introduction to the process of spontaneous movement discovery involving solo and group movement experiences.

**DANC 128 Fundamentals of Ballet (2)** *For non-majors only. Repeatable to 4 credits.* Introduction to ballet technique and terminology for the beginning student.

**DANC 138 Introduction to Ethnic Dance (2)** *Repeatable to 4 credits with permission of department.* Traditional dances and music of selected cultures.

**DANC 148 Fundamentals of Modern Dance (2)** *For non-majors only. Repeatable to 4 credits.* Introduction to modern dance with emphasis on the development of fundamental movement skills.

**DANC 158 Fundamentals of Jazz (2)** *For non-majors only. Repeatable to 4 credits.* Introduction to the jazz style in dance for the beginning student.

**DANC 171 Movement Integration (2)** *One hour of lecture and two hours of laboratory per week.* Techniques for reducing tension and achieving integrated muscular control and coordination.

**DANC 199 Practicum in Choreography, Production and Performance I (1-3)** *Prerequisite:* permission of department. *Repeatable to 6 credits.* Choreography, production, and performance of student works, both on and off campus.

**DANC 200 Introduction to Dance (3)** 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.

**DANC 208 Choreography I (3)** *Prerequisites:* DANC 102 and DANC 109. *Repeatable to 6 credits.* Basic principles of dance composition: space, time dynamics, and movement invention. The development of critical awareness.

**DANC 210 Dance Production (3)** A survey of theatre crafts and techniques involved in dance production, including lighting, sound, set and costume design and construction, stage-management and videotaping.

**DANC 228 Ballet I (2)** *Prerequisite:* DANC 128 or dance major standing. *Repeatable to 4 credits.* Barre and center work for alignment, strength, flexibility and coordination. Introduction to ballet terminology.

**DANC 229 Ballet II (2)** *Prerequisite:* DANC 228 or audition. *Repeatable to 4 credits.* Continuation of DANC 228.

**DANC 248 Modern Dance I (3)** *Prerequisite:* DANC 148 of dance major standing. *Repeatable to 6 credits.* Dance movement placement, rhythm, dynamics, space and dance phrases.

**DANC 249 Modern Dance II (3)** *Prerequisite:* DANC 248 or audition. *Repeatable to 6 credits.* Continuation of DANC 248.

**DANC 258 Jazz I (2)** *Prerequisite:* DANC 158 or dance major standing. *Repeatable to 4 credits.* Jazz warmups and combinations emphasizing rhythm and movement isolations.

**DANC 259 Jazz II (2)** *Prerequisite:* DANC 258. *Repeatable to 4 credits.* Continuation of the principles of Jazz I. Emphasis on style and execution of movement.

**DANC 299 Practicum in Choreography, Production and Performance II (1-3)** *Prerequisite:* DANC 199 or permission of department. *Repeatable to 6 credits.* Continuation of DANC 199.

**DANC 302 Music Sources for Dance (3)** *Prerequisite:* DANC 102 or permission of department. Study of musical literature, improvisation and composition as they relate to dance. Techniques of instrumental accompaniment.

**DANC 305 Principles of Teaching Dance (3)** *Prerequisites:* DANC 102, DANC 208, and DANC 248. Theory and practice of dance instruction including methods, lesson plans and practice teaching.

**DANC 306 Creative Dance for Children (3)** *Prerequisite:* DANC 305 or equivalent. Communication of the essential elements of dance to children. The development of movement into simple forms to serve as a symbol of creative individual expression.

**DANC 308 Choreography II (3)** *Prerequisite:* DANC 208. *Repeatable to 6 credits.* Exploration of the formal elements of choreography; theme, development, repetition, contrast, transition, continuity and structure.

**DANC 309 Improvisation II (2)** *Prerequisite:* DANC 109 or audition. *Repeatable to 4 credits.* Continuation of DANC 109.

**DANC 310 Dance Lighting (3)** *Prerequisite:* DANC 210. Two lectures and two laboratory periods per week. Theory and practice of stage lighting with specific reference to designing for dance.

**DANC 328 Ballet III (2)** *Prerequisite:* DANC 229 or audition. *Repeatable to 4 credits.* Execution of the vocabulary of ballet movement with technical accuracy.

**DANC 329 Ballet IV (2)** *Prerequisite:* DANC 328 or audition. *Repeatable to 4 credits.* Continuation of DANC 328.

**DANC 348 Modern Dance III (3)** *Prerequisite:* DANC 249 or audition. *Repeatable to 6 credits.* The body as an instrument of expression; techniques for increasing kinesthetic sensitivity.

**DANC 349 Modern Dance IV (3)** *Prerequisite:* DANC 348 or audition. *Repeatable to 6 credits.* Continuation of DANC 348.

**DANC 365 Labanotation (3)** *Prerequisites:* DANC 102 and DANC 248. *Formerly DANC 266.* Introduction to Rudolf Laban's system of structural movement analysis.

**DANC 367 Dance in World Cultures (3)** An examination of non-Western dance forms, including classical, ceremonial, and folk-traditional in their historical and societal contexts.

**DANC 370 Kinesiology for Dancers (4)** A study of the biological and physical principles of movement and the effects of dancing upon the structure and function of the human body.

**DANC 379 Practicum in Dance (1-3)** *Repeatable to 12 credits.* Performing experience for the student dancer who has developed a professional level of competence.

**DANC 388 Choreography III (3)** *Prerequisite:* DANC 308 or equivalent. *Repeatable to 6 credits.* Theoretical and creative aspects of choreography for small groups. Emphasis on individual projects.

**DANC 398 Directed Studies in Dance (1-6)** *Prerequisite:* permission of department. *Repeatable to 6 credits.*

**DANC 399 Practicum in Choreography, Production and Performance III (1-3)** *Prerequisite:* DANC 299 or permission of department. *Repeatable to 6 credits.* Continuation of DANC 299.

**DANC 410 Technical Theater Production for Dance (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite:* DANC 210 or equivalent (or permission of department). A study of the theoretical principles of production and the practical application of those principles to the presentation of dance works.

**DANC 411 Dance Management and Administration (3)** Principles of dance management and administration, including organization of touring, bookings, budgets, public relations, grantsmanship and audience development.

**DANC 428 Advanced Ballet Technique I (1)** *Two hours of laboratory per week. Prerequisite:* DANC 329 or audition. *Repeatable to 3 credits.* Advanced ballet technique with emphasis on physical and expressive skills.

**DANC 429 Advanced Ballet Technique II (1)** *Two hours of laboratory per week. Prerequisite:* DANC 428. *Repeatable to 3 credits.* Intensive work in ballet technique for the professionally-oriented dancer.

**DANC 448 Modern Dance V (3)** *Prerequisite:* DANC 349 or audition. *Repeatable to 6 credits.* Complex phrases of modern dance movement with emphasis on articulation and expression.

**DANC 449 Modern Dance VI (3)** *Prerequisite:* DANC 448 or audition. *Repeatable to 6 credits.* Continuation of DANC 448.

**DANC 466 Laban Movement Analysis (3)** 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.

**DANC 468 Modern Repertory (3)** *Prerequisite:* DANC 349 or permission of department. *Repeatable to 6 credits if content differs.* Form, content, music, design and performance of modern dance works.

**DANC 471 Movement Behavior (3)** The social psychology of movement; reciprocity of physical and emotional behavior.

**DANC 479 Advanced Practicum in Dance (1-3)** *Repeatable to 6 credits.* Advanced level performing experience for the student dancer who has developed an advanced professional level of competence.

**DANC 482 History of Dance I (3)** *Prerequisite:* DANC 200. The development of dance from primitive times to the Middle Ages and the relationship of dance forms to patterns of culture.

**DANC 483 History of Dance II (3)** *Prerequisite:* DANC 200. The development of dance from the Renaissance period to the present time and the relationship of dance forms to patterns of culture.

**DANC 485 Seminar in Dance (3)** *Prerequisite:* DANC 483. *Senior standing. For DANC majors only. Formerly DANC 484.* Individual research leading to a presentation with written documentation of the process, serving as a culmination of undergraduate study for dance majors.

**DANC 489 Special Topics in Dance (1-3)** *Prerequisite:* permission of department. *Repeatable to 6 credits if content differs.* Theoretical, choreographic, pedagogic, or performance study.

**DANC 499 Practicum in Choreography, Production and Performance IV (1-6)** *Prerequisite:* permission of permission of department. *Repeatable to 6 credits.* Advanced workshop in dance presentation, including performing, production and planned field experiences.

## EALL—East Asian Languages and Literatures

**EALL 300 The Languages of East Asia (3)** 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. The course is taught in English.

## ECON—Economics

**ECON 105 Economics of Social Problems (3)** *Not open to students who have completed two of the following courses: ECON 201, or ECON 203, or ECON 205.* An introduction to modern economic and social problems: their nature, causes, and policy implications.

**ECON 201 Principles of Economics I (3)** *Prerequisite:* MATH 110 or placement in MATH 115 or above. *Credit will be granted for only one of the following: ECON 201 or ECON 205.* An introduction to the problems of unemployment, inflation, and economic growth. Emphasis on roles of monetary and fiscal policy in the conduct of macroeconomic policy. The efficacy of wage and price controls is analyzed.

**ECON 203 Principles of Economics II (3)** *Prerequisite:* MATH 110 or placement in MATH 115 or above. *Recommended: ECON 201.* This course emphasizes the behavior of individual consumers and business firms, problems of international trade and finance, the distribution of income, policies for eliminating poverty and discrimination, the problems of environmental pollution, and the impact of different market structures upon economic activity.

**ECON 205 Fundamentals of Economics (3)** *Prerequisite:* MATH 110 or placement in MATH 115 or above. *Students in the College of Business and Management are required to take ECON 201 and should not take ECON 205. Not open to students who have completed ECON 201. Credit will be granted for only one of the following: ECON 201 or ECON 205.* A one-semester introduction, for non-majors, to the principles of economics and their applications to the leading economic problems of society, including inflation, unemployment, poverty, urban renewal, income inequality, monopoly and market performance, environmental protection, and international trade.

**ECON 301 Current Issues in American Economic Policy (3)** *Prerequisites:* (ECON 201; and ECON 203) or ECON 205. Analysis of current economic problems and public policies. Inflation, unemployment, market power, government regulation, poverty and distribution of income, federal budget and tax policy, environment.

**ECON 305 Intermediate Macroeconomic Theory and Policy (3)** *Prerequisites:* ECON 201; and ECON 203; and MATH 220. *Credit will be granted for only one of the following: ECON 305 or ECON 405. Formerly ECON 401.* Analysis of the determination of national income, employment, and price levels. Discussion of consumption, investment, inflation, and government fiscal and monetary policy.

**ECON 306 Intermediate Microeconomic Theory (3)** *Prerequisites:* ECON 201; and ECON 203; and MATH 220. *Formerly ECON 403.* Analysis of the theories of consumer behavior and of the firm, market systems, distribution theory and the role of externalities.

**ECON 310 Evolution of Modern Capitalism in Western Europe and the United (3)** *States* 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

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form of private property in the means of production, and the relation of capitalism to war and revolution.

**ECON 311 American Economic Development (3)** *Prerequisites:* (ECON 201; and ECON 203) or ECON 205. An analysis of the major issues in the growth and development of the American economy. Basic economic theory related to such topics as agriculture, banking, industrialization, slavery, transportation, and the depression of the 1930's.

**ECON 315 Economic Development of Underdeveloped Areas (3)** *Prerequisites:* (ECON 201; and ECON 203) or ECON 205. Credit will be granted for only one of the following: ECON 315 or ECON 416. Formerly ECON 415. Analysis of the economic and social characteristics of underdeveloped areas. Recent theories of economic development, obstacles to development, policies and planning for development.

**ECON 316 Economic Development of Latin America (3)** *Prerequisites:* (ECON 201; and ECON 203) or ECON 205. Institutional characteristics of Latin America and an analysis of alternative strategies and policies for development.

**ECON 321 Economic Statistics (3)** *Prerequisite:* MATH 220 or equivalent. Not open to students who have completed BMGT 230 or BMGT 231. Formerly ECON 421. 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.

**ECON 355 Economics of Crime and Law Enforcement (3)** *Prerequisite:* (ECON 201; and ECON 203) or ECON 205. Economic analysis of crime and the criminal justice system, including such topics as the measurement of crime, economic models of crime, cost and benefits of police and prisons, private protection, gambling and other victimless crimes, and organized crime.

**ECON 361 Economics of American Industries (3)** *Prerequisites:* (ECON 201; and ECON 203) or ECON 205. A survey of industrial organization theory. Analysis of the structure, conduct, performance, and public policies in selected American industries.

**ECON 370 Labor Markets, Human Resources, and Trade Unions (3)** *Prerequisites:* (ECON 201; and ECON 203) or ECON 205. Credit will be granted for only one of the following: ECON 370 or ECON 470. A survey of labor markets and the American labor movement. Analysis of labor force growth and composition, problems of unemployment and labor market operations, theories of wage determination, the wage-price spiral, collective bargaining, and governmental regulation of employment and labor relations.

**ECON 374 Sex Roles in Economic Life (3)** *Prerequisites:* (ECON 201 and ECON 203) or ECON 205. Discrimination against women in the labor market; the division of labor in the home and the workplace by sex; the child care industry; women in poverty.

**ECON 375 Economics of Poverty and Discrimination (3)** *Prerequisites:* (ECON 201; and ECON 203) or ECON 205. The causes of the persistence of low income groups; 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.

**ECON 376 Consumers and Public Policy (3)** *Prerequisites:* ECON 201 and ECON 203. Credit will be granted for only one of the following: CNEC 310 or ECON 376. Formerly CNEC 310. The application of economic theory, including cost-benefit analysis, to an evaluation of policy decisions in the private and public sectors which affect the consumer. The economic, social, and political framework within which policy decisions are made.

**ECON 380 Comparative Economic Systems (3)** *Prerequisites:* (ECON 201; and ECON 203) or ECON 205. A comparative analysis of the theory and practice of various types of economic systems, with special attention being given to the economic systems of the United States, the Soviet Union, Mainland China, Western and Eastern Europe, and lesser developed countries.

**ECON 381 Environmental Economics (3)** *Prerequisite:* ECON 203 or ECON 205 or permission of department. Application of economic theory to problems of environmental quality and management. Theory of economic externalities, common property resources, alternative pollution control measures, and limits to economic growth.

**ECON 385 Economics of Natural Resources (3)** *Prerequisite:* ECON 203 or ECON 205. Economic analysis of natural resource problems, with special emphasis on the rate of use of exhaustible resources and the problems posed for the maintenance of growth.

**ECON 390 Economics and Public Policy (3)** *Prerequisites:* ECON 201 and ECON 203. Application of economic reasoning to public policy issues, many of which are not exclusively, or even primarily economic. Policies to save lives, to distribute transplantable human organs, to deter and punish crime, and to regulate discrimination in health insurance are examples.

**ECON 396 Independent Honors Study (3)** *Prerequisite:* candidacy for honors in economics or by permission of instructor. Normally

taken in senior year. Course will explore selected topics in economic theory and its application in depth. Analysis of methodologies in economic research and the development of student skills in research methods. Students will prepare workshop papers.

**ECON 397 Honors Thesis (3)** *Prerequisites:* ECON 396 and candidacy for honors in economics. General supervision will be provided through assembled meetings with the professor in charge of the course.

**ECON 398 Topics in Economics (3)** *Repeatable to 6 credits if content differs.* 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.

**ECON 399 Individual Reading and Research For Undergraduates (1-3)** *Prerequisite:* six hours of upper-division economics courses. Repeatable to 6 credits if content differs. By arrangement with individual faculty members. This course is designed for students desiring specialized instruction and guidance in subjects not covered in the course offerings. Before enrollment, the students must secure agreement from an individual faculty member to act as their supervisor. A program of reading, research and evaluation will be worked out between the student and the faculty member.

**ECON 402 Macroeconomic Models and Forecasting (3)** *Prerequisite:* ECON 305 or ECON 405. 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.

**ECON 407 Advanced Macroeconomics (3)** *Prerequisite:* ECON 305. 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.

**ECON 410 Comparative Institutional Economics (3)** *Prerequisite:* ECON 306. Determinants of institutional arrangements and the economic consequences of those arrangements for economic growth using transaction costs economics, the new institutional economics, and elementary game theory. Historical emergence of market institutions and nonpredatory governments in Europe and Japan, and the policy successes and failures of less-developed countries today.

**ECON 413 Information and Markets (3)** *Prerequisite:* ECON 306. Presents advanced microeconomic theory, concentrating on how information affects exchange and market outcomes, including insurance, signalling, reputations, and incentive contracts. Studies applications to various markets and policy questions.

**ECON 414 Game Theory (3)** *Prerequisites:* ECON 306 and (MATH 220 or MATH 140). Credit will be granted for only one of the following: ECON 414 or ECON 417. Formerly ECON 417. Studies the competitive and cooperative behavior that results when several parties with conflicting interests must work together. Learn how to use game theory to analyze situations of potential conflict. Applications are drawn from economics, business, and political science.

**ECON 415 Strategic Behavior and Incentives (3)** *Prerequisite:* ECON 414 or permission of department. Most decisions are not made in isolation, but involve interaction with others. Applies the foundations of game theory learned in ECON 414 to several important topics in business and economics. Emphasis is on topics of practical importance: negotiation, markets with few participants, pricing and incentives.

**ECON 416 Theory of Economic Development (3)** *Prerequisite:* ECON 305 or ECON 405. Credit will be granted for only one of the following: ECON 315 or ECON 416. Economic theory of the developing nations; role of innovation, capital formation, resources, institutions, trade and exchange rates, and governmental policies.

**ECON 418 Economic Development of Selected Areas (3)** *Prerequisite:* ECON 315 or ECON 416. Institutional characteristics of a specific area are discussed and alternate strategies and policies for development are analyzed.

**ECON 422 Quantitative Methods in Economics I (3)** *Prerequisite:* ECON 201; and ECON 203; and (ECON 321 or BMGT 230;) or permission of department. 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. Independent work relating the material in the course to an economic problem chosen by the student is required.

**ECON 423 Quantitative Methods in Economics II (3)** *Prerequisite:* ECON 422. Interaction between economic problems and specification and estimation of econometric models. Topics

include issues of autocorrelation, heteroscedasticity, functional form, simultaneous equation models, and qualitative choice models.

**ECON 424 Computer Methods in Economics (3)** *Prerequisites:* ECON 201; and ECON 203; and (ECON 321 or BMGT 230). Computer modelling of economic problems, including household and firm behavior, macroeconomic relationships, statistical models of economy, and simulation models.

**ECON 425 Mathematical Economics (3)** *Prerequisites:* ECON 305 or ECON 405, and ECON 306 or ECON 406, and MATH 220 or equivalent. Mathematical developments of theory of household and firm, general equilibrium and welfare economics, market imperfections, and role of information.

**ECON 430 Money and Banking (3)** *Prerequisites:* ECON 201 and ECON 203. Credit will be granted for only one of the following: ECON 430 or ECON 431. 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.

**ECON 431 Theory of Money, Prices and Economic Activity (3)** *Prerequisite:* ECON 305 or ECON 405. Credit will be granted for only one of the following: ECON 430 or ECON 431. Monetary theory and the role of money, financial institutions and interest rates in macro models. Analysis of money demand and supply and of the Monetarist-Keynesian debate as they affect inflation and stabilization policy.

**ECON 440 International Economics (3)** *Prerequisites:* ECON 201 and ECON 203. Credit will be granted for only one of the following: ECON 440 or ECON 441. A description of international trade and the analysis of international transactions, exchange rates, and balance of payments. Analysis of policies of protection, devaluation, and exchange rate stabilization and their consequences.

**ECON 441 Theory of International Economics (3)** *Prerequisite:* ECON 305 or ECON 405; and ECON 306 or ECON 406. Credit will be granted for only one of the following: ECON 440 or ECON 441. Theoretical treatment of international trade and international finance. Includes Ricardian and Heckscher-Ohlin theories of comparative advantage, analysis of tariffs and other trade barriers, international factor mobility, balance of payments adjustments, exchange rate determination, and fiscal and monetary policy in an open economy.

**ECON 450 Introduction to Public Sector Economics (3)** *Prerequisite:* (ECON 201; and ECON 203) or ECON 205. Credit will be granted for only one of the following: ECON 450 or ECON 454. The role of federal, state, and local governments in meeting public wants. Analysis of theories of taxation, public expenditures, government budgeting, benefit-cost analysis and income redistribution, and their policy applications.

**ECON 451 Public Choice and Public Policy (3)** *Prerequisite:* (ECON 201; and ECON 203), or ECON 205. 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.

**ECON 454 Theory of Public Finance and Fiscal Federalism (3)** *Prerequisite:* ECON 306 or ECON 406. Credit will be granted for only one of the following: ECON 450 or ECON 454. Study of welfare economics and the theory of public goods, taxation, public expenditures, benefit-cost analysis, and state and local finance. Applications of theory to current policy issues.

**ECON 456 Law and Economics (3)** *Prerequisite:* ECON 306. 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 issues in the rule and market environment.

**ECON 460 Industrial Organization (3)** *Prerequisite:* ECON 306 or ECON 406. Changing structure of the American economy; price policies in different industrial classifications of monopoly and competition in relation to problems of public policy.

**ECON 465 Health Care Economics (3)** *Prerequisite:* ECON 203 or ECON 205. Analysis of health care, the organization of its delivery and financing. Access to care; the role of insurance; regulation of hospitals, physicians, and the drug industry; role of technology; and limits on health care spending.

**ECON 470 Theory of Labor Economics (3)** *Prerequisite:* ECON 306. Credit will be granted for only one of the following: ECON 370 or ECON 470. An analytical treatment of theories of labor markets. Marginal productivity theory of labor demand; allocation of time in household labor supply models; theory of human capital; earnings differentials; market structure and the efficiency of labor markets; the role of trade unions; discrimination; and unemployment.

**ECON 471 Current Problems in Labor Economics (3)** *Prerequisite:* ECON 470 or permission of department. Emphasis on current policy issues. Topics include: the distribution of income; welfare reform and work incentives; employment and training programs; social insurance programs; unemployment policy; immigration, trade and labor market policy; international labor market comparisons; and the economics of human resource management.

**ECON 476 American Living Standards and Poverty (3)** *Prerequisite:* ECON 305 and ECON 321 or permission of department. Also offered as PUA 730. Post-World War II trends in U.S. living standards and income inequality. Areas studied include: industrial base, productivity, growth demographics, international competitiveness and the structure (and holders) of debt as they affect the level of U. S. income and income inequality.

**ECON 490 Survey of Urban Economic Problems and Policies (3)** *Prerequisites:* (ECON 201 and ECON 203) or ECON 205. An introduction to the study of urban economics through the examination of current policy issues. Topics may include suburbanization of jobs and residences, housing and urban renewal, urban transportation, development of new towns, ghetto economic development, problems in services such as education and police.

## EDCI—Curriculum and Instruction

**EDCI 273 Practicum in Ceramics (3)** *Eight hours of laboratory per week. For EDCI majors only. Not open to students who have completed a ceramics course. Formerly EDIT 273.* A lecture-studio course designed to introduce the use of clay and ceramics in a wide variety of educational settings.

**EDCI 280 School Service Semester (3)** Development of conceptual understanding of the teaching-learning process. Seminar to coordinate on-and off-campus experiences. One hour each week on campus with an arranged six hours each week in schools.

**EDCI 288 Special Topics in Teacher Education (1-3)** *Prerequisite:* permission of department. Repeatable to 6 credits if content differs.

**EDCI 298 Special Problems in Teacher Education (1-6)** *Prerequisite:* permission of department. Repeatable to 6 credits if content differs.

**EDCI 300 Discipline Based Art Education (C & I Art Methods) (3)** *Three hours of lecture and three hours of laboratory per week. Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 390; and EDHD 300S. *For art education majors only.* Methods of discipline based art education which reflects teaching of art history, aesthetics, art criticism, and art studio. Includes three hours of field work. Basic methods course in art education. Fulfills requirements for a special methods course.

**EDCI 301 Teaching Art in the Elementary School (3)** *For elementary and pre-elementary education majors only. Not open to art education majors.* Art methods and materials for elementary schools. Includes laboratory experiences with materials appropriate for elementary schools. Emphasis on emerging areas of art education for the elementary classroom teacher.

**EDCI 314 Teaching Language, Reading, Drama and Literature with Young Children (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 312; and EDCI 313; EDCI 443A; EDCI 488E; and EDHD 419A. *Corequisites:* EDCI 315; and EDCI 316; and EDCI 317; and EDHD 419B. *For early childhood education majors only.* Introduction to the teaching of reading in the context of the language arts; beginning reading instruction and utilization of literature, drama, and writing.

**EDCI 315 The Young Child in the Social Environment (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 312; and EDCI 313; and EDCI 443A; and EDCI 488E; and EDHD 419A. *Corequisites:* EDCI 314; and EDCI 316; and EDCI 317; and EDHD 419B. *For early childhood education majors only.* The child's understanding of people, social roles, society and various cultures; communicative skills and ability to develop satisfying relationships with peers and adults. Related techniques, materials and resources included.

**EDCI 316 The Teaching of Reading: Early Childhood (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 312; and EDCI 313; and EDCI 443A; and EDCI 488E; and EDHD 419A. *Corequisites:* EDCI 314; and EDCI 315; and EDCI 317; and EDHD 419B. *For early childhood education majors only.* The fundamentals of developmental reading instruction, including reading readiness, use of experience records, procedures in using basal readers, the improvement of comprehension, teaching reading in all areas of the curriculum, uses of children's literature, the program in word analysis, and diagnostic techniques.

**EDCI 317 The Young Child and the Physical Environment (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 312; and EDCI 313; and EDCI 443A; and EDCI 488E; and EDHD 419A. *Corequisites:* EDCI 314; and EDCI 315; and EDCI 316; and EDHD 419B. *For early childhood education majors only.* Teaching skills and background knowledge important in guiding the child to learn about the physical environment. The skills of quantification, observation, inference, space-time relationships, and classification.

**EDCI 320 Curriculum and Instruction in Secondary Education: Social Studies/ (3) History** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDHD 300S; and EDCI 390. *For education majors only.* Objectives, selection and organization of subject matter, appropriate methods, lesson plans, textbooks and other instructional materials, measurement and topics pertinent to social studies education. Includes emphasis on multi-cultural education.

**EDCI 321 Curriculum and Instruction in Secondary Education: Social Studies/ (3) Geography** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDHD 300S; and EDCI 390. *For education majors only.* Objectives, selection and organization of subject matter, appropriate methods, lesson plans, textbooks and other instructional materials, measurement, and topics pertinent to geography education.

**EDCI 322 Curriculum and Instruction in Elementary Education: Social Studies (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and EDCI 397; and EDHD 300E; and permission of department. *Corequisites:* EDCI 342; and EDCI 352; and EDCI 362; and EDCI 372. *For elementary education majors only.* Curriculum, organization and methods of teaching, evaluation of materials, and utilization of environmental resources. Emphasis on multicultural education. Includes laboratory/field experiences.

**EDCI 330 Curriculum and Instruction in Secondary Education: Foreign Language (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDHD 300S; and EDCI 390. *For education majors only.* Objectives, selection and organization of subject matter, appropriate methods, lesson plans, textbooks, and other instructional materials, measurement, and other topics pertinent to foreign language education.

**EDCI 340 Curriculum and Instruction in Secondary Education: English/ Speech/ Theatre (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDHD 300S; and EDCI 390. *Corequisite:* EDCI 447. *For education majors only.* Objectives, selection, and organization of subject matter, appropriate methods, lesson plans, textbooks and other instructional materials, measurement, and other topics.

**EDCI 342 Curriculum and Instruction in Elementary Education: Language (3) Arts** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and EDCI 397; and EDHD 300E; and permission of department. *Corequisites:* EDCI 322; and EDCI 352; and EDCI 362; and EDCI 372. *For elementary education majors only.* Listening, oral communication, functional writing, creative writing, spelling, handwriting, and creative expression. Includes laboratory/field experiences.

**EDCI 350 Curriculum and Instruction in Secondary Education: Mathematics (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDHD 300S; and EDCI 390; and six semester hours of 400-level mathematics courses. *For education majors only.* Objectives, selection and organization of subject matter, appropriate methods, lesson plans, textbooks and other instructional materials, measurement and topics. For pre-service mathematics teachers.

**EDCI 352 Curriculum and Instruction in Elementary Education: Mathematics (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and EDCI 397; and EDHD 300E; and permission of department; and MATH 210; and MATH 211. *Corequisites:* EDCI 322; and EDCI 342; and EDCI 362; and EDCI 372. *For elementary education majors only.* 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.

**EDCI 362 Curriculum and Instruction in Elementary Education: Reading (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and EDCI 397; and EDHD 300E; and permission of department. *Corequisites:* EDCI 322; and EDCI 342; and EDCI 352; and EDCI 372. *For elementary education majors only.* Fundamentals of developmental reading instruction, including reading readiness, use of experience stories, procedures in using basal readers, the improvement of comprehension, word analysis, and procedures for determining individual needs. Includes laboratory/field experiences.

**EDCI 370 Curriculum and Instruction in Secondary Education: Science (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDHD 300S; and EDCI 390. *For education majors only.* For pre-service science teachers. Preparing objectives, planning lessons, selecting

and organizing for classroom and laboratory instruction, determining appropriate teaching methods, selecting textbooks and other instructional materials, and measuring and evaluating student achievement. Includes laboratory/field experiences.

**EDCI 371 Computers in the Science Classroom and Laboratory (2)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and EDCI 370. *Corequisites:* EDCI 470; and EDCI 471. Fundamentals of microcomputer use in science classrooms and laboratories.

**EDCI 372 Curriculum and Instruction in Elementary Education: Science (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and EDCI 397; and EDHD 300E; and permission of department. *Corequisites:* EDCI 322; and EDCI 342; and EDCI 352; and EDCI 362. *For elementary education majors only.* 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.

**EDCI 380 Curriculum and Instruction: Elementary (3)** Focuses on developmental needs at various age levels, with emphasis upon the activities, materials and methods by which educational objectives are attained.

**EDCI 381 Schools and Children (3)** Role examination of parents and other community members as consumers and participants in schools. Not open for credit to students in teacher preparation programs.

**EDCI 385 Computers for Teachers (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA. *For education majors only.* Credit will be granted for only one of the following: EDCI 385; or EDCI 487; or EDIT 406; or EDIT 477; or EDCI 480. A first-level survey of instructional uses of computers, software, and related technology for preservice teachers.

**EDCI 390 Principles and Methods of Secondary Education (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA. *Corequisite:* EDHD 300S. *For education majors only.* Principles and methods of teaching in junior and senior high schools. Instructional problems common to all of the subject fields, considered in relation to the needs and interests of youth, social problems and the central values of society.

**EDCI 397 Principles and Methods of Teaching in Elementary Schools (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA. *For education majors only.* Teaching strategies, classroom interactive techniques, and procedures for planning and evaluating instruction in elementary schools. Emphasis on principles of effective instruction, classroom management, and adaptation of instruction for various student populations.

**EDCI 401 Student Teaching in Elementary School: Art (4-8)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 300. *For art education majors only.*

**EDCI 402 Student Teaching in Secondary Schools: Art (2-8)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 300. *For art education majors only.*

**EDCI 403 Teaching of Art Criticism in Public Schools (3)** Introduction to theories of art criticism. Trips to galleries and museums. Open to fine arts majors and students from other disciplines.

**EDCI 406 Computers, Art and Chaos Theory (3)** *Prerequisite:* permission of department. Computers in art education with focus on chaos theory, fractals as a means to integrate art, math, science in K-12 programs.

**EDCI 407 Practicum in Art Education: Three-Dimensional (3)** *For pre-art education and art education majors only.* A lecture-studio course to develop skills, material resources, and educational strategies for three-dimensional projects in school settings.

**EDCI 415 Methods of Teaching ESOL in Elementary Schools (3)** *Prerequisite:* EDCI 434 or permission of department. Analysis of elementary school classroom culture, social contexts, and instructional strategies which foster language development in elementary school content areas (i.e., math, social studies, art and science), consistent with current theories of child second language acquisition. For undergraduate and graduate prospective and current teachers of English to speakers of other languages.

**EDCI 416 Mainstreaming in Early Childhood Educational Settings (3)** Theoretical bases and applied practices for integrating handicapped children into regular early childhood programs.

**EDCI 420 Student Teaching Seminar in Secondary Education: Social Studies (3)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and EDCI 320 or EDCI 321. *Corequisite:* EDCI 421 or EDCI 422. An analysis of teaching theories, strategies, and techniques in the student teaching experience.

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**EDCI 421 Student Teaching in Secondary Schools: Social Studies/History (12)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 320. Corequisite: EDCI 420.

**EDCI 422 Student Teaching in Secondary Schools: Social Studies/Geography (12)** Prerequisite: EDCI 321. Corequisite: EDCI 420.

**EDCI 423 Social Studies in Early Childhood Education (3)** Curriculum, organization and methods of teaching, evaluation of materials and utilization of environmental resources. Emphasis on multicultural education. Primarily for in-service teachers, nursery school through grade 3.

**EDCI 424 Social Studies in the Elementary School (3)** Curriculum, organization and methods of teaching, evaluation of materials and utilization of environmental resources. Emphasis on multicultural education. Primarily for in-service teachers, grades 1-6.

**EDCI 425 Social Studies and Multicultural Education (3)** Seminar in general social science principles applicable to multicultural education. Cultural experiences arranged for each participant.

**EDCI 426 Methods of Teaching Social Studies in Secondary Schools (3)** Prerequisites: EDHD 300; and EDCI 390. Objectives, selection and organization of subject matter, appropriate methods, lesson plans, textbooks and other instructional materials, measurement and topics pertinent to social studies education. Includes emphasis on multicultural education. For in-service teachers.

**EDCI 430 Student Teaching Seminar in Secondary Education: Foreign Language (3)** Prerequisites: admission to teacher education program; and 2.5 GPA; and EDCI 330. Corequisite: EDCI 431. An analysis of teaching theories, strategies and techniques in the student teaching experience.

**EDCI 431 Student Teaching in Secondary Schools: Foreign Language (12)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 330. Corequisite: EDCI 430.

**EDCI 432 Foreign Language Methods in the Elementary School (3)** Methods and techniques for developmental approach to the teaching of modern foreign languages in elementary schools. Development of oral-aural skills in language development.

**EDCI 433 Introduction to Foreign Language Methods (3)** Prerequisites: EDHD 300; and EDCI 390; or permission of department. Objectives, selection and organization of subject matter, appropriate methods, lesson plans, textbooks and other instructional materials, measurement and topics pertinent to foreign language education. For in-service teachers.

**EDCI 434 Methods of Teaching English to Speakers of Other Languages (3)** A survey of the historical and current approaches, methods, and techniques of teaching English to speakers of other languages from grammar translation to audio-lingual to communicative approaches. Analysis of successful classroom practices which address the needs of cultural and language minority students.

**EDCI 435 Teaching Second Language Reading and Writing (3)** Prerequisite: EDCI 434 or permission of department. Analysis of approaches to curriculum, current research, theory, and pedagogy of reading and writing to second language students from diverse cultural and linguistic backgrounds. For undergraduate and graduate prospective and current teachers of English to speakers of other languages K-12, adult and university. Required for TESOL certification program.

**EDCI 436 Teaching for Cross-Cultural Communication (3)** The techniques and content for teaching culture in foreign language classes and English as a Second Language (ESL) classes. Research and evaluation of selected aspects of a culture as basis for creating teaching materials.

**EDCI 437 Bilingual-Bicultural Education (3)** Prerequisite: permission of department. Analysis of bilingual-bicultural education in the U.S. and abroad with emphasis on TESOL. Methods of teaching, goals, instructional materials and mainstreaming of bilingual students.

**EDCI 438 Field Experience in TESOL (3)** Prerequisites: EDCI 434 or equivalent; and permission of department. Systematic observations, tutoring and teaching in a TESOL field setting.

**EDCI 440 Student Teaching Seminar in Secondary Education: English, Speech, (1) Theatre** Prerequisites: admission to teacher education program; and 2.5 GPA; and EDCI 340. Corequisite: EDCI 441. An analysis of teaching theories, strategies and techniques in relation to the student teaching experience.

**EDCI 441 Student Teaching in Secondary Schools: English (6-12)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 340. Corequisites: EDCI 440; and EDCI 442; or EDCI 448.

**EDCI 442 Student Teaching in Secondary Schools: Speech (6-12)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 340. Corequisite: EDCI 440.

**EDCI 443 Literature for Children and Youth (3)** For elementary education and pre-elementary education majors only. 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.

**EDCI 444 Language Arts in Early Childhood Education (3)** Teaching of spelling, handwriting, oral and written expression and creative expression. Primarily for in-service teachers, nursery school through grade 3.

**EDCI 445 Language Arts in the Elementary School (3)** Teaching of spelling, handwriting, oral and written expression and creative expression. Primarily for in-service teachers, grades 1-6.

**EDCI 446 Methods of Teaching English, Speech, Theatre in Secondary Schools (3)** Prerequisites: EDHD 300; and EDCI 390; or permission of department. Objectives, selection and organization of subject matter, appropriate methods, lesson plans, textbooks and other instructional materials, measurement and topics pertinent to English, speech, and drama education. For in-service teachers.

**EDCI 447 Field Experience in English, Speech, Theatre Teaching (1)** Prerequisites: admission to teacher education program; and 2.5 GPA; and EDCI 390; and EDHD 300S. Corequisite: EDCI 340. For education majors only. Practical experience as an aide to a regular English, speech or drama teacher; assigned responsibilities and participation in a variety of teaching/learning activities.

**EDCI 448 Student Teaching in Secondary Schools: Theatre (6-12)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 340. Corequisite: EDCI 441. Persons doing student teaching in theatre only should register for 12 credits. Persons in the Theatre and English Education Program should register for 6 credits of EDCI 441 and 6 credits of EDCI 448.

**EDCI 450 Student Teaching Seminar in Secondary Education: Mathematics (3)** Prerequisites: admission to teacher education program; 2.5 GPA; and EDCI 350; and EDCI 457. Corequisite: EDCI 451. An analysis of teaching theories, strategies and techniques in the student teaching experience.

**EDCI 451 Student Teaching in Secondary Schools: Mathematics (12)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 350; and EDCI 457. Corequisite: EDCI 450.

**EDCI 452 Mathematics in Early Childhood Education (3)** Prerequisite: MATH 210 or equivalent. Emphasis on materials and procedures which help pupils sense arithmetic meanings and relationships. Primarily for in-service teachers, nursery school through grade 3.

**EDCI 453 Mathematics in the Elementary School (3)** Prerequisite: MATH 210 or equivalent. Emphasis on materials and procedures which help pupils sense arithmetic meanings and relationships. Primarily for in-service teachers, grades 1-6.

**EDCI 455 Methods of Teaching Mathematics in Secondary Schools (3)** Prerequisites: EDHD 300; and EDCI 390; and 2 semesters of calculus. Objectives, selection and organization of subject matter, appropriate methods, lesson plans, textbooks and other instructional materials, measurement, and topics pertinent to mathematics education.

**EDCI 456 Teaching Mathematics to the Educationally Handicapped (3)** Prerequisites: (EDSP 331; and EDSP 332; and EDSP 333; and EDSP 443; and MATH 210) or permission of department. Development of skills in diagnosing and identifying learning disabilities in mathematics and planning for individualized instruction. Clinic participation required.

**EDCI 457 Teaching Secondary Students with Difficulties in Learning Mathematics (3)** Prerequisites: admission to teacher education program; and a 2.5 GPA; and permission of department required for post-baccalaureate students. Pre- or corequisite: EDHD 300. Corequisite: EDCI 390. For education majors only. Diagnosis, prescription and implementation of instruction for less able secondary school mathematics students. Participation in a clinical experience.

**EDCI 461 Reading in Early Childhood Education (3)** Developmental reading instruction, including emergent literacy, literature-based and basal reader programs. Primarily for inservice teachers, pre-school through grade 3.

**EDCI 462 Reading in the Elementary School (3)** Developmental reading instruction, including emergent literacy, literature-based and basal reader programs. Primarily for inservice teachers, grades 1-8.

**EDCI 463 Reading in the Secondary School (3)** Prerequisites: admission to teacher education program; and 2.5 GPA; or permission of department required for post-baccalaureate students. For education majors only. The fundamentals of content area reading instruction. Emphasis on middle school through high school.

**EDCI 464 Reading Instruction and Diagnosis Across Content Areas (3)** Prerequisite: EDCI 362 or permission of department for graduate students. Fundamentals of diagnosis and diagnostic instruction in reading for preservice elementary teachers. Emphasis on integrated evaluation procedures and instruction strategies.

**EDCI 465 Language, Culture, and Education (3)** Prerequisite: LING 200 or permission of department. Survey of sociolinguistic and psycholinguistic perspectives for the study of language and education; examination of pragmatics, speech act theory, and dimensions of language variation (dialects, codes, and registers); implications for educational research and instructional practice.

**EDCI 466 Literature for Adolescents (3)** Prerequisites: admission to teacher education program; and 2.5 GPA; permission of department required for post-baccalaureate students. For education majors only. 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.

**EDCI 467 Teaching Writing (3)** Prerequisites: admission to teacher education program; and 2.5 GPA; permission of department required for post-baccalaureate students. For education majors only. Sources and procedures for developing curriculum objectives and materials for teaching written composition; prewriting, composing, and revision procedures; contemporary directions in rhetorical theory; survey of research on composition instruction.

**EDCI 470 Student Teaching Seminar in Secondary Education: Science (1)** Prerequisites: admission to teacher education program; and 2.5 GPA; and EDCI 370. Corequisites: EDCI 371; and EDCI 471. Analysis of teaching theories, strategies and techniques in student teaching.

**EDCI 471 Student Teaching in Secondary Schools: Science (12)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 370. Corequisites: EDCI 371; and EDCI 470.

**EDCI 472 Methods of Teaching Science in Secondary Schools (3)** Prerequisites: EDHD 300; and EDCI 390; and permission of department. Methods for classroom and laboratory instruction, determining appropriate teaching methods, selecting instructional materials, evaluating student achievement. Includes lab and field experience. For in-service teachers.

**EDCI 473 Environmental Education (3)** Two hours of lecture and three hours of laboratory per week. An interdisciplinary course covering the literature, techniques and strategies of environmental education.

**EDCI 474 Science in Early Childhood Education (3)** Objectives, methods, materials and activities for teaching science in the elementary school. Primarily for in-service teachers, nursery school through grade 3.

**EDCI 475 Science in the Elementary School (3)** Objectives, methods, materials, and activities for teaching science in the elementary school. Primarily for in-service teachers, grades 1-6.

**EDCI 476 Teaching Ecology and Natural History (3)** An introduction to the teaching of natural history in the classroom and in the field. Ecological principles; resources and instructional materials; curricular materials. Primarily for teachers, park naturalists, and outdoor educators.

**EDCI 477 Applications of Technology to Societal Problems (3)** Junior standing. Credit will be granted for only one of the following: EDCI 477 or EDIT 476. A study of alternative solutions of a technological nature with respect to such areas as housing, transportation, energy, communications, production and waste disposal, water development and pollution control.

**EDCI 480 The Child and the Curriculum: Elementary (3)** Relationship of the school curriculum, grades 1-6, to child growth and development. Recent trends in curriculum organization; the effect of environment on learning; readiness to learn; and adapting curriculum content and methods to maturity levels of children. Primarily for in-service teachers, grades 1-6.

**EDCI 481 Student Teaching: Elementary (12)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 322; and EDCI 342; and EDCI 352; and EDCI 362; and EDCI 372. Corequisite: EDCI 464.

**EDCI 484 Student Teaching in Elementary School: Music (4-6)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and MUED 411; and MUED 420; and MUED 470; and MUED 471; and MUED 472. Corequisite: EDCI 494. Fulfills elementary teaching requirements in K-12 music education programs.

**EDCI 485 Student Teaching in Elementary School: Physical Education (4-8)** For EDCI majors only. Fulfills elementary teaching requirements in K-12 physical education programs.

**EDCI 486 Supervision of Student Teachers (1-3)** Designed for in-service teachers. The development and refinement of skills in observing, evaluating and conducting conferences with student teachers. Clinical supervision and cooperative problem solving. Required by some school systems for supervision of student teachers.

**EDCI 488 Selected Topics in Teacher Education (1-3)** Prerequisite: EDCI major or permission of department. Repeatable to 6 credits if content differs.

**EDCI 489 Field Experiences in Education (1-4)** Prerequisite: permission of department. Corequisite: EDCI 497. Repeatable to 4 credits.

**EDCI 491 Student Teaching in Secondary Schools: Health (12)** For EDCI majors only.

**EDCI 494 Student Teaching in Secondary Schools: Music (2-8)** For EDCI majors only.

**EDCI 495 Student Teaching in Secondary Schools: Physical Education (2-8)** For EDCI majors only.

**EDCI 497 The Study of Teaching (3)** Prerequisite: EDCI 481. Corequisite: EDCI 489. Identification and examination of learner and teacher outcome variables related to teaching systems, methods, and processes. Methods of conducting classroom research.

**EDCI 498 Special Problems in Teacher Education (1-6)** Prerequisite: permission of department. For EDCI majors only. Repeatable to 6 credits. Individual study of approved problems.

**EDCI 499 Workshops, Clinics, and Institutes (1-6)** Repeatable to 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.

## EDCP—Education Counseling and Personnel Services

**EDCP 108 College and Career Advancement: Concepts and Skills (1)** Repeatable to 3 credits if content differs. Knowledge and skills designed to enhance college as a learning experience or preparation for life.

**EDCP 310 Peer Counseling Theory and Skills (3)** The theories and skills of peer helping relationships. Counseling theories and skills at a level appropriate for students seeking basic level training for use in peer counseling settings.

**EDCP 317 Introduction to Leadership (3)** Application of leadership theories, concepts, and skills. Completion of personal and leadership self-assessments, values exploration, and leadership skill practice through course activities.

**EDCP 318 Leadership and Community Service (3)** Three hours of lecture and five hours of laboratory per week. Prerequisite: permission of department. Repeatable to 6 credits if content differs. Course will utilize experiential learning opportunities to develop knowledge and skills in the area of leadership and community service. Provides a foundation for the integration of leadership and community service.

**EDCP 325 Substance Use and Abuse in American Society (3)** Incidence, etiology, effects and management of substance use and abuse from perspective of the individual, the family, and society.

**EDCP 410 Introduction to Counseling and Personnel Services (3)** Overview of counselor functions and skills that lead to effective helping.

**EDCP 411 Principles of Mental Health (3)** Prerequisite: nine semester hours in the behavioral sciences or permission of department. Mechanisms involved with personal adjustment, coping skills, and the behaviors that lead to maladjustment.

**EDCP 413 Behavior Modification (3)** Knowledge and techniques of intervention in a variety of social situations, including contingency contracting and time out will be acquired.

**EDCP 416 Theories of Counseling (3)** An overview and comparison of the major theories of counseling, including an appraisal of their utility and empirical support.

**EDCP 417 Advanced Leadership Seminar (3)** Prerequisite: EDCP 317 or equivalent; permission of department. Students will analyze and synthesize the concept of leadership using cultural, ethical, sociological, historical perspectives. Exploration and reflection of personal values, decision making, indepth analysis on various leadership themes will take place in various course activities.

**EDCP 418 Special Topics in Leadership (3)** Prerequisite: EDCP 317 or equivalent; permission of department. Repeatable to 6 credits if content differs. 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.

**EDCP 420 Education and Racism (3)** Strategy development for counselors and educators to deal with problems of racism.

**EDCP 460 Introduction to Rehabilitation Counseling (3)** Survey of principles and practices involved in the vocational rehabilitation of persons with disabilities.

**EDCP 461 Psycho-Social Aspects of Disability (3)** Theory and research concerning disability, with emphasis on crisis theory, loss and mourning, handicapped as a deviant group, sexuality and functional loss, attitude formation, dying process and coping. Implications for counseling and the rehabilitation process.

**EDCP 462 The Disabled Person in American Society (3)** Critical examination of the history of legislation and analysis of current policies toward severely physically and mentally disabled persons.

**EDCP 470 Introduction to Student Personnel (3)** Prerequisite: permission of department. 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.

**EDCP 489 Field Experiences in Counseling and Personnel Services (1-4)** Prerequisite: permission of department. Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.

**EDCP 498 Special Problems in Counseling and Personnel Services (1-3)** Prerequisite: permission of department. Available only to major students who have formal plans for individual study of approved problems.

**EDCP 499 Workshops, Clinics, Institutes (1-6)** Repeatable to 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.

## EDHD—Education, Human Development

**EDHD 230 Human Development and Societal Institutions (3)** 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.

**EDHD 300 Human Development and Learning (6)** Prerequisite: admission to teacher education program. Major concepts and theories of human development and learning and their implications for the educational process. One half day a week in school to observe student behavior, participate in classroom activities, and attend seminars on school topics.

**EDHD 306 Study of Human Behavior (3)** The scientific principles of human behavior, development, and adjustment. Field work: observation, recording, and analysis of the behavior of an individual. Does not satisfy requirements of professional teacher education program.

**EDHD 312 Professional Development Seminar in Early Childhood Education (3)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI

280. Corequisites: EDCI 313; and EDCI 443A; EDCI 488E; EDHD 419A. For early childhood education majors only. Credit will be granted for only one of the following: EDHD 312 or EDCI 312. Formerly EDCI 312. Affective and integrative functions of teaching young children; planning daily programs; organizing the learning environment; developing the curriculum; clarifying values; guiding behavior; diagnosing and evaluating; and working with parents and other adults.

**EDHD 313 Creative Activities for Young Children (3)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 280. Corequisites: EDCI 443A; and EDCI 312; and EDCI 488E; and EDHD 419A. For early childhood majors only. Credit will be granted for only one of the following: EDHD 313 or EDCI 313. Formerly EDCI 313. Techniques and resources for art, music, play and creative dramatics.

**EDHD 319 Selected Topics in Human Development (3)** Repeatable to 6 credits if content differs. Selected topics in human development in relation to contemporary culture.

**EDHD 320 Human Development through the Lifespan (3)** Central concepts related to parameters of human development, individual and social, which arise throughout the various stages of the lifespan. Continuity and change within the developing individual.

**EDHD 340 Human Development Aspects of the Helping Relationship (3)** Development of skills and theoretical knowledge relevant to the human services. Relating, communicating, and problem-solving with others. In-class training activities and field experiences for acquiring interpersonal competence.

**EDHD 350 Human Development Factors in Personal Development (3)** Personality dynamics including self-study and group experiences which contribute to individual development and insight. Emphasis on factors which enhance optimal personal growth.

**EDHD 400 Introduction to Gerontology (3)** 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.

**EDHD 410 The Child and the Curriculum: Early Childhood (3)** Credit will be granted for only one of the following: EDHD 410 or EDCI 410. Formerly EDCI 410. Relationship of the nursery school curriculum to child growth and development. Recent trends in curriculum organization; the effect of environment on learning; readiness to learn; and adapting curriculum content and methods to maturity levels of children. Primarily for in-service teachers, nursery school through grade 3.

**EDHD 411 Child Growth and Development (3)** Theoretical approaches to and empirical studies of physical, psychological and social development from conception to puberty. Implications for home, school and community.

**EDHD 413 Adolescent Development (3)** Adolescent development, including special problems encountered in contemporary culture. Observational component and individual case study. Does not satisfy requirement for professional teacher education program.

**EDHD 416 Scientific Concepts in Human Development (3)** Guided reading and observation of students through the school year. Impact of family, school, society, and peer group on individual. Analysis of field data in terms of behavioral patterns.

**EDHD 417 Laboratory in Behavior Analysis (3)** Prerequisite: EDHD 416. Continuation of analysis of field observations; emphasis on cognitive processes, motivation, self-concept, attitudes and values.

**EDHD 419 Human Development and Learning in School Settings (3)** Prerequisite: permission of department. Repeatable to 6 credits if content differs. Advanced study of human development and learning in different phases of school program over a period of time.

**EDHD 420 Cognitive Development and Learning (3)** Prerequisite: EDHD 300 or EDHD 320 or EDHD 411 or PSYC 355 or PSYC 341 or permission of department. 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.

**EDHD 421 Student Teaching: Preschool (4)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 314; and EDCI 315; and EDCI 316; and EDCI 317; and EDHD 419B. For early childhood education majors only. Credit will be granted for only one of the following: EDHD 421 or EDCI 411. Formerly EDCI 411.

**EDHD 422 Student Teaching: Kindergarten (4)** Prerequisites: admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 314; and EDCI 315; and EDCI 316; and EDCI 317; and EDHD 419B. Corequisites: EDCI 411; and EDCI 413. For early childhood education majors only. Credit will be granted for only one of the following: EDHD 422 or EDCI

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412. Formerly EDCI 412.

**EDHD 423 Student Teaching: Primary Grades (8)** *Prerequisites:* admission to teacher education program; and 2.5 GPA; and permission of department; and EDCI 314; and EDCI 315; and EDCI 316; and EDCI 317; and EDHD 419B. *Corequisites:* EDCI 411; and EDCI 412. For early childhood education majors only. Credit will be granted for only one of the following: EDHD 423 or EDCI 413. Formerly EDCI 413.

**EDHD 430 Adolescent Violence (3)** *Prerequisite:* PSYC 100 or EDHD 300 or permission of department. Examines the roots of violence among adolescents and the extent to which this constitutes a problem in various settings. Research studies on its origins, prevention and intervention and implications for social policy are examined.

**EDHD 445 Guidance of Young Children (3)** *Prerequisite:* PSYC 100 or EDHD 306 or permission of department. Practical aspects for helping and working with children, drawing on research, clinical studies, and observation. Implications for day care and other public issues.

**EDHD 460 Educational Psychology (3)** *Prerequisite:* PSYC 100 or EDHD 306 or permission of department. Application of psychology to learning processes and theories. Individual differences, measurement, motivation, emotions, intelligence, attitudes, problem solving, thinking and communicating in educational settings. (May not be substituted for EDHD 300 by students in professional teacher education programs.)

**EDHD 489 Field Experiences in Education (1-4)** *Prerequisite:* permission of department. Repeatable to 4 credits. Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.

**EDHD 498 Special Problems in Education (1-3)** *Prerequisite:* permission of department. Available only to students who have definite plans for individual study of approved problems.

**EDHD 499 Workshops, Clinics, and Institutes (1-6)** Repeatable to 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.

### EDMS—Measurement, Statistics, and Evaluation

**EDMS 410 Classroom Assessment (3)** *Junior standing.* 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.

**EDMS 451 Introduction to Educational Statistics (3)** *Junior standing.* 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.

**EDMS 465 Algorithmic Methods in Educational Research (3)** *Prerequisite:* EDMS 451 or equivalent. Use of the computer as a tool in educational research. Instruction in a basic scientific computer source language as well as practical experience in program writing for solving statistical and educational research problems.

**EDMS 489 Field Experiences in Measurement and Statistics (1-4)** *Prerequisite:* permission of department. Repeatable to 4 credits. Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.

**EDMS 498 Special Problems in Measurement and Statistics (1-3)** *Prerequisite:* permission of department. Repeatable to 6 credits. Available only to education majors who have formal plans for individual study of approved problems.

### EDPA—Education Policy, Planning and Administration

**EDPA 201 Education in Contemporary American Society (3)** An examination of the relationship between education and the social environment in contemporary American society. Issues of equality or equal opportunity, individual and cultural differences, education

outside of schools, the control of education, and the future of education.

**EDPA 210 Historical and Philosophical Perspectives on Education (3)** 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.

**EDPA 288 Special Problems in Education (1-6)** *Prerequisite:* permission of department. Available only to freshmen and sophomore students who have definite plans for individual study of approved problems relative to their preparation for teaching.

**EDPA 301 Foundations of Education (3)** *Prerequisite:* junior standing and admission to teacher education; or Bachelor's degree with permission of department. 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.

**EDPA 400 The Future of the Human Community (3)** Examination of the future of our social and cultural institutions for education and child rearing, social and family relationships, health and leisure, information exchange, and the provision of food, clothing, and shelter.

**EDPA 401 Educational Technology, Policy, and Social Change (3)** *Junior standing.* Examines technology as a complex force which influences social change and the educational development of individuals.

**EDPA 440 Educational Media (3)** Survey of classroom uses of instructional media. Techniques for integrating media into instruction. Includes preparation of a unit of instruction utilizing professional and teacher-produced media.

**EDPA 488 Special Topics in Education Policy and Administration (1-3)** *Prerequisite:* permission of department. Repeatable to 6 credits. Special and intensive treatment of current topics and issues in education policy and administration.

**EDPA 489 Field Experiences in Education (1-4)** *Prerequisite:* permission of department. Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.

**EDPA 498 Special Problems in Education (1-3)** *Prerequisite:* permission of department. Available only to students who have definite plans for individual study of approved problems.

**EDPA 499 Workshops, Clinics, and Institutes (1-6)** Repeatable to 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.

### EDSP—Education, Special

**EDSP 210 Introduction to Special Education (3)** Characteristics and needs of children with handicaps. Current issues in special education.

**EDSP 288 Special Topics in Teacher Education (1-3)** *Prerequisite:* major in education or permission of department. Repeatable to 6 credits if content differs.

**EDSP 298 Special Problems in Teacher Education (1-6)** *Prerequisite:* permission of department. 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.

**EDSP 320 Introduction to Assessment in Special Education (3)** *Prerequisite:* EDSP 210. *Pre- or corequisite:* EDSP 321; and EDSP 322. *Recommended:* STAT 100 or SOCY 201. For EDSP majors only. Assessment instruments and procedures and specific criterion-referenced and norm-referenced measures used in special education.

**EDSP 321 Comparative Approaches to Behavior and Classroom Management in (3) Special Education** *Prerequisite:* EDSP 210. *Pre- or corequisites:* EDSP 320; and EDSP 322. The development of behavior and classroom management techniques used in special education.

**EDSP 322 Field Placement in Special Education I (2-3)** *Pre- or corequisites:* EDSP 320; and EDSP 321. For EDSP majors only. Practicum experience in special education setting. The application of assessment and classroom management procedures. Field placement for two or three half-days per week.

**EDSP 330 Families and the Education of Handicapped Children (3)** *Prerequisite:* EDSP 321 or permission of department. *Corequisites:* EDSP 405, EDSP 424, EDSP 445 or EDSP 463 or permission of department. For EDSP majors only. Emphasis on the impact of handicapped children on families and strategies for communicating and working with families.

**EDSP 331 Introduction to Curriculum and Instructional Methods in Special (3) Education** *Prerequisites:* EDSP 320; and EDSP 321. *Pre- or corequisites:* EDSP 332; and EDSP 333; and EDSP 443. For EDSP majors only. Instructional principles and programs in special education.

**EDSP 332 Interdisciplinary Communication in Special Education (3)** *Prerequisites:* EDSP 320; and EDSP 321. *Pre- or corequisites:* EDSP 331; and EDSP 333; and EDSP 443. For EDSP majors only. Terminology, procedures and professional roles specific to persons providing services to handicapped children.

**EDSP 333 Field Placement in Special Education II (2-3)** *Prerequisite:* EDSP 322. *Pre- or corequisites:* EDSP 331; and EDSP 332; and EDSP 443. For EDSP majors only. Practicum experience in special education setting. Opportunities to apply curriculum methods and materials. Two or three half-days per week.

**EDSP 349 Student Teaching of Exceptional Children (8)** For EDSP majors only. Student teaching full-time for eight weeks with exceptional children.

**EDSP 376 Fundamentals of Sign Language (3)** 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.

**EDSP 400 Assessment, Curriculum and Instructional Methods For Students (3) with Severe Disabilities** *Corequisites:* EDSP 402 or EDSP 431 or permission of department. Examination of functional assessment procedures, curriculum development and analysis, and instructional techniques for students with severe disabilities.

**EDSP 401 Environmental Adaptations for Severely Handicapped Students (3)** *Pre- or corequisites:* EDSP 411; and EDSP 412 or EDSP 430; and EDSP 431. Management problems of and alternatives for severely disabled individuals.

**EDSP 402 Field Placement: Severe Disabilities I (2-5)** *Pre- or corequisites:* EDSP 400; and EDSP 404 or permission of department. Practicum experience in settings serving severely disabled individuals. Enrollment limited to those admitted to severely handicapped specialty area. Field placement for two to five half-days per week.

**EDSP 403 Adaptations for Students with Physical Disabilities (3)** *Prerequisite:* EDSP 400 or permission of department. Characteristics, mobility, positioning, feeding, communication, and inclusion of individuals with physical disabilities.

**EDSP 404 Education of Students with Autism (3)** *Pre- or corequisites:* EDSP 400 and EDSP 402 or permission of department. Characteristics, needs, assessment, and educational methods for students diagnosed as autistic.

**EDSP 405 Field Placement: Severe Disabilities II (2-5)** *Prerequisite:* EDSP 402 or permission of department. *Pre- or corequisites:* EDSP 330; and EDSP 403; and EDSP 410 or permission of department. Practicum experience in settings serving severely disabled individuals. Field placement for two to five half-days per week.

**EDSP 410 Community Functioning Skills for Students with Severe Disabilities (3)** *Prerequisites:* EDSP 400; and EDSP 404 or permission of department. *Corequisites:* EDSP 330; and EDSP 403; and EDSP 405. Assessment, instructional techniques, and curriculum development related to community functioning skills for students with severe disabilities.

**EDSP 411 Field Placement: Severe Disabilities III (2-5)** *Prerequisite:* EDSP 405. *Pre- or corequisites:* EDSP 412; and EDSP 420 or EDSP 460 or permission of department. Practicum experience in settings serving severely disabled individuals. Field placement for two to five half-days per week.

**EDSP 412 Vocational and Transitional Instruction for Students with Severe (3) Disabilities** *Corequisites:* EDSP 411 or EDSP 465 or permission of department. Assessment and instructional strategies for developing the vocational and transitional skills of students with severe disabilities.

**EDSP 417 Student Teaching: Severe Disabilities (4-11)** Student teaching, full-time for twelve weeks, with severely handicapped individuals. Limited to special education majors admitted to severely handicapped specialty area.

**EDSP 418 Seminar: Issues and Research Related to the Instruction of Students with Severe Disabilities (1-3)** For EDSP majors only. Repeatable to 6 credits if content differs. Examines the current research related to the instruction of severely disabled individuals.

**EDSP 420 Developmental and Behavioral Characteristics of Nonhandicapped (3) and Handicapped Infants and Young Children** *Corequisites:* [EDSP 421 or EDSP 411] or permission of department. Study of the developmental, behavioral, and learning characteristics of nonhandicapped and handicapped infants and young preschool children.

**EDSP 421 Field Placement: Early Childhood Special Education I (2-3)** *Pre- or corequisite:* EDSP 420; and EDCI 410. Practicum experience in settings serving preschool handicapped children. Opportunities for studying the patterns of development and learning among nonhandicapped and handicapped infants and older preschoolers. Enrollment limited to students admitted to early childhood specialty. Field placement for two or three half-days per week.

**EDSP 422 Curriculum and Instruction in Early Childhood Special Education (3) (Moderate to Mild: 3-8 Years)** *Prerequisites:* (EDCI 410; and EDSP 420) or permission of department. *Corequisites:* EDSP 330; and EDSP 424. Characteristics, methods and materials for the instruction of young children (ages 3-8) traditionally labeled mild to moderately handicapped.

**EDSP 423 Assessment of Preschool Handicapped Children and Infants (3)** *Prerequisites:* EDSP 330; and EDSP 422. *Corequisites:* EDSP 430; and EDSP 431; and EDSP 400 or EDSP 441. Current psychoeducational assessment and evaluation procedures used with profoundly to moderately handicapped infants and young preschool children. Psychometric, criterion-referenced, developmental checklists, and automated and ecological assessment procedures. Administration of selected assessment instruments.

**EDSP 424 Field Placement: Early Childhood Special Education II (Moderate (2-4) to Mild)** *Prerequisite:* EDSP 421 or permission of department. *Pre- or corequisites:* EDSP 330; and EDSP 422. Practicum experience in settings serving young (ages 3 to 8) mild to moderately handicapped children in self-contained and integrated early childhood programs. Opportunities to apply educational methods and materials. Field placement for two to four half-days per week.

**EDSP 430 Intervention Techniques and Strategies For Preschool Handicapped (3) Children and Infants (Severe to Moderate, Birth-6 Years)** *Prerequisites:* EDSP 330; and EDSP 422. *Corequisites:* EDSP 423; and EDSP 431; and (EDSP 400 or EDSP 441). Current approaches to the treatment of preschool severely to moderately handicapped children.

**EDSP 431 Field Placement: Early Childhood Special Education III (Severe (2-4) to Moderate)** *Prerequisite:* EDSP 424 or permission of department. *Pre- or corequisites:* EDSP 430; and EDSP 423; and (EDSP 400 or EDSP 441). Opportunities to apply techniques, strategies, methods and materials for educating severely to moderately handicapped infants and young children. Field placement for two to four half-days per week.

**EDSP 437 Student Teaching: Early Childhood Special Education (4-11)** Student teaching, full-time for twelve weeks, with handicapped infants and preschool children. Limited to special education majors in early childhood special education specialty area.

**EDSP 438 Seminar: Special Issues in Early Childhood Special Education (1-3)** *Prerequisite:* permission of department. *For EDSP majors only. Repeatable to 6 credits if content differs.* Study of current issues and research concerning education of preschool handicapped children.

**EDSP 440 Assessment and Instructional Design for the Educationally Handicapped: Cognitive and Psychosocial Development (3)** *Prerequisites:* (EDSP 441; and EDCI 456) or permission of department. *Pre- or corequisites:* EDSP 330; and EDSP 445. Learning style, cognitive, and problem-solving strategies, and psychosocial behavior of educationally handicapped individuals at elementary to secondary levels. Characteristics, assessment and instruction. Enrollment limited to Special Education majors accepted into educationally handicapped area of specialization.

**EDSP 441 Assessment and Instructional Design for the Educationally Handicapped: Oral Language and Communication Disorders (3)** *Corequisites:* (EDSP 442 or EDSP 431) or permission of department. Characteristics of individuals with oral language and communication disorders, assessment of such disorders and instructional strategies, curricula and materials.

**EDSP 442 Field Placement: Educationally Handicapped I (2-3)** *Pre- or corequisite:* (EDSP 441 and EDCI 456) or permission of department. Practicum experience in settings serving educationally handicapped individuals. Demonstration of the content of EDSP 441. Enrollment limited to students admitted to educationally handicapped specialty. Field placement for two or three half-days per week.

**EDSP 443 Assessment and Instructional Design for the Handicapped: Reading (3) and Written Communication Disorders** *Prerequisites:* (EDSP 320; and EDSP 321) or permission of department. *Pre- or corequisites:* EDSP 331; and EDSP 332; and EDSP 333. Characteristics and assessments of individuals with

reading and written communication disorders at elementary to secondary levels, and methods of teaching reading and written language skills to such individuals. Adaptation of regular instructional methods and curricula.

**EDSP 445 Field Placement: Educationally Handicapped II (2-4)** *Prerequisite:* EDSP 442 or permission of department. *Pre- or corequisites:* (EDSP 330; and EDSP 440; and EDSP 443). Practicum experience in settings serving educationally handicapped. The application of instructional design and assessment in cognitive development. Field placement for 2-4 half-days per week.

**EDSP 446 Instructional Design for the Educationally Handicapped: Functional (3) Living Skills** *Pre- or corequisites:* (EDSP 447 or EDSP 465) or permission of department. Instructional methods, curricula and materials designed to teach functional living skills to educationally handicapped individuals at elementary to secondary levels. Curricula and teaching strategies in science and social studies used in general education and adaptations for educationally handicapped individuals.

**EDSP 447 Field Placement: Educationally Handicapped III (2-4)** *Prerequisite:* EDSP 445 or permission of department. *Pre- or corequisites:* EDSP 446; and EDSP 450; and EDSP 460. Practicum experience in settings serving educationally handicapped individuals. The application of the content of EDSP 446, EDSP 450 and EDSP 460. Field placement for two to four half-days per week.

**EDSP 450 Inclusive Practices in the Schools (3)** *Corequisite:* EDSP 411 or EDSP 431 or EDSP 447 or EDSP 465. Educational practices regarding inclusive education in the schools for students with and without disabilities.

**EDSP 457 Student Teaching: Educationally Handicapped (4-11)** *For EDSP majors only.* Student teaching, full-time for twelve weeks, with educationally handicapped individuals.

**EDSP 458 Seminar: Special Issues and Research Related to the Educationally (1-3) Handicapped** *Repeatable to 6 credits if content differs.* Current issues and research concerning the education of educationally handicapped individuals.

**EDSP 460 Introduction to Secondary/Transition Special Education (3)** *Corequisites:* (EDSP 461 or EDSP 411 or EDSP 447) or permission of department. *For EDSP majors only.* Historical and current issues, legislation, and service delivery options for youth with disabilities.

**EDSP 461 Field Placement: Secondary/Transition I (2-4)** *Pre- or corequisite:* EDSP 460. *For EDSP majors only.* Practicum experience in secondary/transition programs for individuals with disabilities. Field placement for two half-days per week.

**EDSP 462 Vocational Assessment and Instruction in Special Education (3)** *Prerequisite:* EDSP 460 or permission of department. Current vocational assessment strategies, interpretation of assessment results, and planning, delivery and evaluation of instruction in vocational education for secondary students with disabilities.

**EDSP 463 Field Placement: Secondary/Transition II (2-4)** *Prerequisite:* EDSP 461 or permission of department. *Pre- or corequisite:* EDSP 462. *For EDSP majors only.* Practicum experience in secondary/transition programs for individuals with disabilities. Field placement for three half-days per week.

**EDSP 464 Secondary and Transition Methods in Special Education (3)** *Prerequisite:* EDSP 462 or permission of department. Current secondary vocational/special education issues and transition methods including work-study programming, job development, and job coaching.

**EDSP 465 Field Placement: Secondary/Transition III (2-4)** *Prerequisite:* EDSP 463. *Pre- or corequisite:* EDSP 464. *For EDSP majors only.* Practicum experience in secondary/transition programs for individuals with disabilities. Field placement for three half days per week.

**EDSP 467 Student Teaching: Secondary/Transition (4-11)** *For EDSP majors only.* A full-time twelve week field assignment in a setting providing secondary/transition services to individuals with disabilities. Enrollment is limited to special education majors who have successfully completed coursework in the secondary/transition area of specialization.

**EDSP 468 Special Topics Seminar in Secondary/Transition Special Education (1-3)** *Prerequisite:* permission of department. *For EDSP majors only. Repeatable to 6 credits if content differs.* Current issues and research relating to secondary/transition services for individuals with disabilities.

**EDSP 470 Introduction to Special Education (3)** Designed to give an understanding of the needs of all types of exceptional children.

**EDSP 471 Characteristics of Exceptional Children: Mentally Retarded (3)** *Prerequisite:* EDSP 470 or equivalent. Studies the diagnosis, etiology, physical, social and emotional characteristics of exceptional children.

**EDSP 472 Education of Exceptional Children: Mentally Retarded (3)** *Prerequisite:* EDSP 471 or equivalent. Offers practical and specific methods of teaching exceptional children. Selected observation of actual teaching may be arranged.

**EDSP 473 Curriculum For Exceptional Children: Mentally Retarded (3)** *Prerequisite:* EDSP 471 or equivalent. Examines the principles and objectives guiding curriculum for exceptional children; gives experience in developing curriculum; studies various curricula currently in use.

**EDSP 475 Education of the Slow Learner (3)** Studies the characteristics of the slow learner and those educational practices which are appropriate for the child who is functioning as a slow learner.

**EDSP 476 Communicating with Sign Language (3)** *Prerequisite:* EDSP 376 or permission of department. Intermediate level receptive/expressive skills in American Sign Language. Aspects of the culture, history, and research perspectives of the deaf community.

**EDSP 480 Microcomputers in Special Education (3)** *Credit will be granted for only one of the following:* EDCI 385, EDCI 487, EDCI 406, EDIT 477, or EDSP 480. Microcomputers for the education of handicapped individuals.

**EDSP 481 Characteristics of Exceptional Children: Gifted and Talented (3)** *Prerequisite:* EDSP 470 or equivalent. Studies the diagnosis, etiology, physical, social, and emotional characteristics of gifted and talented children.

**EDSP 482 Education of Exceptional Children: Gifted and Talented (3)** *Prerequisite:* EDSP 481 or equivalent. Offers practical and specific methods of teaching gifted and talented children. Selected observation of actual teaching may be arranged.

**EDSP 483 Curriculum For Exceptional Children: Gifted and Talented (3)** *Prerequisite:* EDSP 481 or equivalent. Examines the principles and objectives guiding current curriculum for gifted and talented children; gives experience in developing curriculum; studies various curricula currently in use.

**EDSP 488 Selected Topics in Teacher Education (1-3)** *Prerequisite:* major in education or permission of department. *Repeatable to 6 credits if content differs.*

**EDSP 489 Field Experiences in Special Education (1-4)** *Prerequisite:* permission of department. Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.

**EDSP 491 Characteristics of Learning Disabled Students (3)** *Prerequisite:* EDSP 470 or permission of department. Diagnosis, etiology, physical, social, and emotional characteristics of learning disabled students.

**EDSP 492 Education of Learning Disabled Students (3)** *Prerequisite:* EDSP 491 or permission of department. Methods of teaching learning disabled children.

**EDSP 493 Curriculum For Exceptional Children: Learning Disabilities (3)** *Prerequisite:* EDSP 492 or equivalent. Principles and objectives guiding curriculum for children with learning disabilities; gives experience in developing curriculum; studies various curricula currently in use.

**EDSP 498 Special Problems in Special Education (1-6)** *Prerequisite:* permission of department. Available only to education majors who have definite plans for individual study of approved problems. Credit according to extent of work.

**EDSP 499 Workshops, Clinics, and Institutes in Special Education (1-6)** *Repeatable to 6 credits if content differs.* 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.

## EDUC—Education

**EDUC 388 Special Topics in Education (1-3)** *Prerequisite:* permission of department. *Repeatable to 6 credits if content differs.*

**EDUC 499 Honors Thesis (1-6)** *Prerequisites:* admission to College Honors Program and permission of college. Individual thesis work under supervision of faculty advisors; includes periodic seminar meetings with other honors students engaged in thesis work.

## 166 Approved Courses

### ENAE—Engineering, Aerospace

**ENAE 100 The Aerospace Engineering Profession (1)** *Recommended: ENES 100 and MATH 140.* 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.

**ENAE 261 Aerospace Analysis and Computation (3)** *Prerequisites: CHEM 103, ENES 100, ENES 102, and PHYS 161. Corequisite: MATH 241.* ENAE majors only or permission of department. Linear algebra, vector spaces, matrices, programs and subprograms, linear mappings, determinants, eigenvalues and eigenvectors, do loops, arrays, subscripted variables, functions and subroutines, finite differences, numerical differentiation and integration, differential and difference equations, boundary value problems, random variables and probability distributions, sampling theory, estimation theory, applications to aerospace engineering problems.

**ENAE 281 Fundamentals of Aeronautical Systems (3)** *Prerequisites: ENES 100; and ENES 102. Corequisites: ENAE 261 and PHYS 262.* ENAE majors only or permission of department. Introduction to the airplane as an aeronautical system. Fundamental disciplines that describe this system. Elements of aerodynamics, airfoils, and wings. Airplane performance, stability and control. Synthesis of airplane design concepts. Notes on the history of aeronautics and airplane design.

**ENAE 282 Fundamentals of Astronautical Systems (3)** *Prerequisites: ENES 100; and ENES 102; and ENES 103. Corequisites: ENAE 261 and PHYS 262.* ENAE majors only or permission of department. Space vehicles as a system. Rocket performance, fundamentals of orbital motion, vehicle preliminary design. Introduction to underlying disciplines, including structures, propulsion, human factors. Historical perspectives on spacecraft design and development.

**ENAE 301 Dynamics of Aerospace Systems (3)** *Prerequisites: ENAE 281; and ENAE 282; and ENES 221; and MATH 246; and PHYS 263. Corequisite: ENAE 321.* ENAE majors only or permission of department. Kinematics and dynamics of three dimension motion of point masses and rigid bodies with introduction to more general systems. Primary emphasis on Newtonian methods with introduction to Lagrange's equations and Hamilton's principle. Practice in numerical solutions of equations of motion using MATLAB or similar high level computer mathematics systems.

**ENAE 311 Aerodynamics I (3)** *Prerequisites: ENAE 281; and ENES 221; and MATH 246. Corequisite: ENME 223.* ENAE majors only or permission of department. 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.

**ENAE 321 Aerospace Structures I (3)** *Prerequisites: ENAE 281; and ENAE 282; and MATH 246.* ENAE majors only or permission of department. Loads on aircraft, spacecraft and launch vehicles, mechanical behavior of aerospace materials, uniaxial extension, torsion and bending, analysis of stress and strain.

**ENAE 322 Aerospace Structures II (3)** *Prerequisite: ENAE 321.* ENAE majors only or permission of department. Continuation of ENAE 321. Finite element modeling, torsion and bending of thin-walled multi-cell structures under combined loadings, buckling.

**ENAE 362 Aerospace Instrumentation and Experimentation (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisites: grades of C or better in PHYS 263, ENAE 261, ENAE 281, ENAE 282, ENES 221, and MATH 246. Corequisites: ENME 232, ENAE 301, ENAE 311, and ENAE 321.* Junior standing. For ENAE majors only. Measurement philosophy, statistical handling of experimental data. Sensing devices, associated signal conditioning and signal processing used to carry out experiments in aerospace engineering. Includes metrology, machine tool measurements, bridge circuits, optical devices, computer based data acquisition. Topics chosen to support measurements in aerodynamics, flight structures, and flight control.

**ENAE 398 Honors Research Project (1-3)**

**ENAE 403 Aircraft Flight Dynamics (3)** *Prerequisites: ENAE 432; and ENAE 414.* ENAE majors only or permission of department. 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.

**ENAE 404 Space Flight Dynamics (3)** *Prerequisite: ENAE 301.* ENAE majors only or permission of department. Three-dimensional motion under central fields. Solutions to orbital motion, orbital

elements, time elements. Kepler's laws. Orbital maneuvering, rendezvous and station-keeping. Hill's equations. Rigid-body attitude dynamics, spacecraft attitude dynamics and controls.

**ENAE 414 Aerodynamics II (3)** *Prerequisite: ENAE 311.* ENAE majors only or permission of department. Junior standing. Aeronautically related aerodynamics. Basics of incompressible flow. Airfoil and wing theory for both incompressible and compressible flow.

**ENAE 416 Viscous Flow and Aerodynamic Heating (3)** *Prerequisite: ENAE 311. Recommended: ENAE 414.* ENAE majors only or permission of department. Derivation of the conservation equations and applications to viscous flows while the energy equation is simplified for conduction in solids. Exact and approximate solutions for steady and unsteady conduction. Exact solutions for channel flow, Couette flow, pipe flow and stagnation point flows. Boundary layer simplifications and exact solutions of the boundary layer equations for flat plates and self similar flows. Approximate and integral solutions of the boundary layer equations. Emphasis on aerodynamic heating and thermal control.

**ENAE 423 Aerostructures III (3)** *Prerequisite: ENAE 322.* ENAE majors only or permission of department. Continuation of ENAE 322, dynamic response of single and multiple degrees of freedom systems, finite element modeling, Wing divergence, aileron reversal, wing and panel flutter.

**ENAE 424 Design and Manufacture of Composite Prototypes (3)** *Two hours of lecture and three hours of laboratory per week. Corequisite: ENAE 322 or equivalent.* Manufacturing practices involving composites. Developing a manufacturing process for a composite component integrating the many aspects including cost, schedule, performance. Student teams provide oral and written reports of the design and manufacture of a composite prototype.

**ENAE 426 Computer-Aided Structural Analysis and Design (3)** *Prerequisite: ENAE 423.* ENAE majors only or permission of department. Provides an understanding of the application of the finite element method (FEM) through the use of a general purpose FEM computer software to perform Static and Normal Modes Analysis.

**ENAE 432 Control of Aerospace Systems (3)** *Prerequisite: grade of C or better in ENAE 281 and ENAE 282 and ENES 221 and MATH 246 and ENAE 301.* Junior standing. Formerly ENAE 332. Introduction to the feedback control of dynamic systems, Laplace Transforms and transfer function representation of dynamic systems. Analysis of stability in the frequency domain. Introduction to state space design methods and to digital control.

**ENAE 441 Space Navigation and Guidance (3)** *Prerequisites: ENAE 432 and ENAE 404.* ENAE majors only or permission of department. Principles of navigation. Celestial, radio, and inertial navigation schemes. Navigational and guidance requirements for orbital, planetary, and atmospheric entry missions. Fundamentals of communications and information theory. Link budgets, antennas and telemetry systems.

**ENAE 455 Aircraft Propulsion and Power (3)** *Prerequisite: ENAE 414.* ENAE majors only or permission of department. Thermodynamic cycle analysis, aerothermochemistry of fuels and propellants, operating principles of piston, turbojet, fanjet, and other variations of airbreathing aircraft power units.

**ENAE 457 Space Propulsion and Power (3)** *Prerequisites: ENAE 311 and PHYS 263.* ENAE majors only or permission of department. Senior standing. Thermodynamic cycle analysis, aerothermochemistry of fuels and propellants, operating principles of rocket, ion, and other exoatmospheric power units.

**ENAE 464 Aerospace Engineering Laboratory (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisites: ENAE 311; and ENAE 322; and ENAE 432; and ENAE 362.* ENAE majors only or permission of department. 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.

**ENAE 481 Principles of Aircraft Design (3)** *Prerequisites: ENAE 322; and ENAE 432; and ENAE 362; and ENAE 414.* ENAE majors only or permission of department. 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.

**ENAE 482 Aeronautical Systems Design (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisites: ENAE 403; and ENAE 423; and ENAE 455; and ENAE 481.* Senior standing. For ENAE majors only. 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.

**ENAE 483 Principles of Space Systems Design (3)** *Prerequisites: ENAE 322; and ENAE 432; and ENAE 362; and ENAE 404.* ENAE majors only or permission of department. 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.

**ENAE 484 Space Systems Design (3)** *Three hours of lecture and six hours of discussion/recitation per week. Prerequisites: ENAE 423; and ENAE 441; and ENAE 457; and ENAE 483.* For ENAE majors only. 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.

**ENAE 488 Topics in Aerospace Engineering (1-4)** 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.

**ENAE 499 Elective Research (1-3)** *Prerequisites: senior standing in ENAE major and permission of department, instructor, and student's advisor. Repeatable to 6 credits.* Original research projects terminating in a written report.

### ENBE—Biological Resources

#### Engineering

**ENBE 100 Basic Biological Resources Engineering Technology (3)** *For non-engineering majors. Formerly ENAG 100.* An introduction to the applications of engineering concepts to biology, agriculture, and environment. Topics include quantification measurements, mechanical, thermal, fluid, and electrical principles.

**ENBE 110 Introduction to Biological Resources Engineering (1)** *One hour of lecture and one hour of laboratory per week.* Biological engineering applications, including aquaculture, bioinstrumentation, biomedicine, biotechnology, environment, food, and plant growth. Simple laboratory experiments will illustrate important techniques used by biological engineers.

**ENBE 200 Fundamentals of Agricultural Mechanics (3)** *Two hours of lecture and four hours of laboratory per week. Formerly ENAG 200.* Study of hand tools and power shop equipment as they relate to mechanized agriculture, in tool fitting, plumbing, wood and metal working, welding, brazing, soldering, hot and cold sheet metal, electricity, construction and building materials, sketching, drawing and using plans for construction. Emphasis is upon the development of orderly and safe shop procedures.

**ENBE 232 Water, A Renewable Resource (3)** *For non-engineering students. Formerly ENAG 232.* Occurrence and distribution of water. Review of both natural and man-made water resource systems. Basics of water quality and waste water treatment.

**ENBE 234 Principles of Erosion and Water Control (1)** *Formerly ENAG 234.* Introduction to principles of estimating runoff and erosion. Engineering principles necessary to control erosion and runoff from agricultural areas. For non-engineering students.

**ENBE 236 Design of Drainage Systems (1)** *Formerly ENAG 236.* Effect of drainage on crop production and quality. Design of agricultural drainage systems. For non-engineering students.

**ENBE 237 Design of Irrigation Systems (1)** *Formerly ENAG 237.* Principles and practices of agricultural irrigation, including types of irrigation systems, soil water concepts, computing evapotranspiration, irrigation scheduling and design of a sprinkler irrigation system. For non-engineering students.

**ENBE 241 Computer Use in Bioresource Engineering (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: permission of department.* Application of computer technology to biological and natural resource systems considering engineering aspects. Designed to help students in the use of computer technology for problem solving. The course will cover 4-5 software packages important for later use by the student.

**ENBE 305 Farm Mechanics (2)** *For agricultural education majors only. Senior standing. Formerly ENAG 305.* Two laboratory periods a week this course consists of laboratory exercises in practical farm shop and farm equipment maintenance, repair, and construction projects, and a study of the principles of shop organization and administration.

**ENBE 315 Energy: Its Effects on Agriculture and Food (3)** *Formerly ENAG 315.* Introduction to the current energy problems in agricultural production and food supply. Energy issues, alternate

sources of energy, energy conservation practices, possible solutions and limitations.

**ENBE 414 Mechanics of Food Processing (4)** *Prerequisite: PHYS 121. Formerly ENAG 414.* Three lectures and one laboratory per week. 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.

**ENBE 422 Water Resources Engineering (3)** *Prerequisite: ENME 342 or ENCE 330. Formerly ENAG 422.* Applications of engineering and soil sciences in erosion control, drainage, irrigation and watershed management. Principles of agricultural hydrology and design of water control and conveyance systems.

**ENBE 435 Aquacultural Engineering (3)** *Prerequisite: permission of department. Formerly ENAG 435.* A study of the engineering aspects of development, utilization and conservation of aquatic systems. Emphasis will be on harvesting and processing aquatic animals or plants as related to other facets of water resources management.

**ENBE 451 Water Quality: Field and Lab Analysis Methods (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisites: CHEM 103 and (CHEM 104 or CHEM 113). Also offered as NRMT 451. Credit will be granted for only one of the following: ENBE 451 or NRMT 451.* A broad range of water quality issues including water supply, wastewater treatment, water problems in developing countries, water borne diseases, point and nonpoint sources of pollution, stream monitoring, ground water, and nutrient cycling.

**ENBE 453 Introduction to Biological Materials (3)** *Prerequisite: ENES 220 or equivalent.* Basic engineering properties of biological materials, including animal tissues and agricultural products, and of traditional engineering materials such as metals, ceramics, alloys, and polymers. Course includes limited laboratory experiences.

**ENBE 454 Biological Process Engineering (4)** *Prerequisites: MATH 246 and ENME 342 or equivalent, and one semester of life sciences, or permission of department. Formerly ENAG 454.* Design of systems to pump, heat, cool, dry and control biological materials as part of food, environmental, and biological engineering. Effect of physical parameters on biological material response to these processes.

**ENBE 456 Biomedical Instrumentation (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: (ENEE 300 and ENEE 301 and one course in human physiology) or permission of department.* Study of biomedical instrumentation and biomedical equipment technology. How biomedical equipment is used to measure information from the human body. Hands-on experience with representative biomedical equipment.

**ENBE 462 Nonpoint Source Pollution Assessment Techniques (3)** *Prerequisite: one course in hydrology or permission of department.* Various techniques to identify and measure nonpoint source pollution. Primary focus is on agriculture and water.

**ENBE 471 Biological Systems Control (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: ENEE 300 and MATH 246, and one course in biological sciences or permission of department.* Principles of control systems designed by biological engineers and analysis of control mechanisms found in biological organisms. Apparent control strategies used by biological systems will be covered.

**ENBE 481 Creative Design with CAD/CAM (3)** *Two hours of lecture and two hours of laboratory per week. Formerly ENAG 481.* Computer aided design (CAD) techniques applicable to a wide range of engineering applications.

**ENBE 482 Dynamics of Biological Systems (1)** *Prerequisite: ENBE 454 or equivalent.* Force-acceleration, work energy, and impulse-momentum relationships important for biological systems and whole-body organisms.

**ENBE 484 Biosystems Responses to Environmental Stimuli (3)** *Two hours of lecture and one hour of laboratory per week. Prerequisite: ENBE 454 or permission of department.* Descriptions of responses of biological systems to external stimuli, including temperature, water, atmosphere, light, chemicals, social interactions, and others. Mathematical models and engineering concepts applied to living systems. Useful to be able to analyze biological systems and design products and processes dealing with or intended for biological systems or organisms.

**ENBE 485 Capstone Design I (1)** *One hour of lecture per week. Prerequisite: permission of department. Senior standing. For ENBE majors only.* To complete the curriculum of an undergraduate engineer, design procedures and professional concerns will be presented. Students will begin planning and designing their capstone projects. CORE capstone credit for ENBE 485 and ENBE 486 will not be awarded until satisfactory completion of ENBE 486.

**ENBE 486 Capstone Design II (2)** *Two hours of lecture per week. Prerequisite: ENBE 485 taken in the immediately preceding*

*semester. Senior standing. For ENBE majors only.* To complete the curriculum of an undergraduate engineer, design procedures and professional concerns will be presented. A complete, comprehensive, and professional design project will be realized by the student. CORE Capstone credit for ENBE 485 and ENBE 486 will not be awarded until satisfactory completion of ENBE 486.

**ENBE 488 Special Topics in Biological Resources Engineering (1-4)** *Prerequisite: permission of department.* Lecture and conference courses designed to extend the student's understanding of biological resources engineering. Current topics are emphasized.

**ENBE 489 Special Problems in Biological Resources Engineering (1-3)** *Prerequisite: permission of department.* Student will select an engineering problem and prepare a technical report. The problem may include design, experimentation, and/or data analysis.

**ENBE 499 Special Problems in Agricultural Engineering Technology (1-3)** *Prerequisite: permission of department. Formerly ENAG 499.* Not acceptable for majors in agricultural engineering. Problems assigned in proportion to credit.

## ENCE—Engineering, Civil

**ENCE 202 Computation Methods in Civil Engineering I (3)** *Prerequisites: MATH 141 and ENES 102 and ENES 100. For ENCE majors only. Formerly ENCE 201.* Introduction to basic computational tools for the solution of engineering problems. Spreadsheet and computational/symbolic processing packages are introduced in the context of engineering economic analysis and project evaluation. Introduction to event-driven structured programming.

**ENCE 203 Computation Methods in Civil Engineering II (3)** *Prerequisites: MATH 241 and ENES 220. Corequisite: MATH 246. For ENCE majors only. Formerly ENCE 301.* Elementary numerical analysis: roots of equations, systems of linear algebraic equations, curve fitting, integration, and solution of ordinary differential equations. Numerical techniques are presented in the context of engineering applications, and example problems are solved using a variety of computer-based tools (structure programming, spreadsheet, and computational/symbolic processing software packages).

**ENCE 300 Fundamentals of Engineering Materials (3)** *Two hours of lecture and one hour of laboratory per week. Pre- or corequisite: ENES 220.* Properties and constitution of the principal materials used in civil engineering. Laboratory tests for these properties, interpretation of test results and of specifications.

**ENCE 302 Probability and Statistics for Civil Engineers (3)** *Prerequisites: ENCE 203 and MATH 246. For ENCE majors only.* Introductory probability and statistics course, probability theory, distributions, random variables, statistical analysis, confidence intervals, and hypothesis testing.

**ENCE 315 Introduction to Environmental Engineering (3)** *Prerequisites: CHEM 103 or CHEM 133; and PHYS 161. Not open to ENGR students who have completed ENCE 221. Formerly ENCE 221.* Physical, chemical, and biological systems relating to the quality of land, water, and air environments. Current environmental pollution problems will be examined and methods of pollution abatement discussed.

**ENCE 320 Construction Engineering and Management (3)** *Prerequisite: permission of department.* Overview of the construction management process in relation to each phase of a project from the inception of the need by the client to the completion of the work in the field.

**ENCE 330 Basic Fluid Mechanics (3)** *Prerequisites: ENES 220; and ENES 221; and PHYS 262.* The study of fluids at rest and in motion. Principles of viscous and turbulent flow. Impulse and momentum concepts. Pumps, turbines and meters. Dimensional analysis and laws of similitude.

**ENCE 340 Fundamentals of Soil Mechanics (3)** *Prerequisite: ENES 220. For ENCE majors only.* 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.

**ENCE 353 Introduction to Structural Analysis (3)** *Prerequisite: ENES 220. Corequisite: ENCE 203. For ENCE majors (09080) only. Credit will be granted for only one of the following: ENCE 255 or ENCE 353. Formerly ENCE 255.* Methods of analysis of statically determinate and indeterminate structures for fixed and moving loads. Equations of equilibrium and compatibility. Influence lines, shear and moment envelopes. Analysis of forces and deflections in structures by methods of moment distribution, consistent deformation, and virtual work.

**ENCE 355 Introduction to Structural Design (3)** *Prerequisite: ENCE 300. For ENCE majors only.* Structural design of members for buildings and bridges subjected to tensions, compression,

shear and bending. Materials: structural steel and reinforced concrete. Design of welded and bolted connections. Placement of reinforcing bars in concrete members.

**ENCE 370 Fundamentals of Transportation Engineering (3)** *Prerequisites: MATH 141 and PHYS 262.* Engineering problems of transportation by highways, airways, pipelines, railways, and waterways. Elementary dynamics of traffic and functional consideration of routes and terminals.

**ENCE 398 Honors Research Project (1-3)**

**ENCE 410 Advanced Strength of Materials (3)** *Prerequisites: ENCE 353; and MATH 246. For ENCE majors only.* Behavior of structural members under load. Straight and curved beam analysis, unsymmetrical bending, shear center, beams on elastic foundation. Torsion of solid and thin walled members. Applied elasticity and stress-strain relations. Advanced topics in mechanics.

**ENCE 420 Construction Equipment and Methods (3)** *Prerequisite: ENCE 320. Senior standing. For ENCE majors only.* Evaluation and selection of equipment and methods for construction of projects, including earthmoving, paving, steel and concrete construction, formwork, trenching, cofferdams, rock excavation, tunneling, site preparation and organization. Design of formwork, trench supports, and cofferdams.

**ENCE 423 Project Estimating, Planning and Control (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: ENCE 320. For ENCE majors only.* Application of planning and scheduling techniques for construction work; introduction to resource leveling and time-cost tradeoffs; cost estimating, cost indices, parametric estimates, unit price estimates.

**ENCE 425 Decision Support Systems for Construction (3)** *Prerequisite: ENCE 320. For ENCE majors only.* Computer hardware and software tools in civil engineering practice and research. Topics include computer hardware; the operating systems for the hardware; the software available on those systems, (e.g., text editors, word processors, spread sheets, interpreters, compilers, communication packages, etc.); the use and development of computer tools for civil engineering applications.

**ENCE 430 Flow in Open Channels and Conveyance Structures (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: ENCE 330. For ENCE majors only.* Application of theoretical, experimental and computer simulation techniques in the design of open channels and conveyance structures including transitions, spillways, culverts, weirs, and bridge openings. Uniform and non-uniform flows under subcritical or supercritical conditions. Analysis of unsteady, spatially varied overland and channel flows. Laboratories will emphasize techniques to improve understanding of complex flow phenomena and to provide design information.

**ENCE 431 Surface Water Hydrology (3)** *Prerequisite: ENCE 330.* Study of the physical processes of the hydrologic cycle. Hydrometeorology, concepts of weather modification, evaporation and transpiration infiltration studies, runoff computations, flood routing, reservoir requirements, emphasis on process simulation as a tool in the water resource development.

**ENCE 432 Ground Water Hydrology (3)** *Prerequisite: ENCE 330.* Concepts related to the development of the ground water resource, hydrogeology, hydrodynamics of flow through porous media, hydraulics of wells, artificial recharge, sea water intrusion, basin-wide ground water development.

**ENCE 433 Environmental Engineering Analysis (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: CHEM 133 and ENES 221 and CHEM 233.* The theory and analytical techniques used in evaluating man's environment. Emphasis on quantitative, physical, electroanalytical and organic chemistry as applied to chemical analysis of water.

**ENCE 435 Sanitary Engineering Analysis and Design (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: ENES 221 and ENCE 330 and CHEM 233.* The application of sanitary analysis and fundamental principles to the design and operation of water and waste water treatment plants and the control of stream pollution.

**ENCE 436 Drinking Water Treatment (3)** *Prerequisites: ENCE 315 and CHEM 233.* Basic theory and practical design considerations for unit processes involved in drinking water treatment. The physicochemical operations considered include coagulation/flocculation, sedimentation, filtration, adsorption, ion exchange, aeration, and disinfection.

**ENCE 440 Engineering Soil Tests (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: ENCE 340. For ENCE majors only.* Review of major soil tests and their interpretation for engineering purposes. Engineering classification tests (Atterberg limits, grain-size distribution, specific gravity), permeability and seepage properties, in-situ and lab density-moisture tests, soil strength (penetrometers, vane shear, CBR, unconfined compression, direct shear and triaxial) and

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compressibility characteristics.

**ENCE 441 Soil-Foundation Systems (3)** *Prerequisite:* ENCE 340. Review of classical lateral earth pressure theories, analysis of braced excavation systems, cantilever and anchored sheet piling design, bearing capacity of shallow foundations (footings and mats) design of deep pile foundations to include pile capacity and pile group action.

**ENCE 442 Highway and Airfield Pavement Design (3)** *Prerequisite:* ENCE 340. Principles relative to the design, construction and rehabilitation of highway and airfield pavement systems. Introduction to multi-layered elastic and slab theories, properties of pavement materials and methods of characterization, stochastic treatment of design variables, economic principles of design alternatives and the effect of environment upon pavement performance. Review of existing rigid and flexible design methods as well as major fundamentals relative to the rehabilitation of existing pavement systems.

**ENCE 453 Computer-Aided Structural Analysis (3)** *Two hours of lecture and one hour of laboratory per week. Prerequisite:* ENCE 353. For ENCE majors only. 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.

**ENCE 454 Design of Concrete Structures (3)** *Prerequisites:* ENCE 353; and ENCE 355. For ENCE majors only. Formerly ENCE 451. 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.

**ENCE 455 Design of Steel Structures (3)** *Prerequisites:* ENCE 353; and ENCE 355. For ENCE majors only. 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.

**ENCE 463 Engineering Economics and Systems Analysis (3)** *Prerequisites:* ENCE 202 and ENCE 203. For ENCE majors only. Development and application of engineering economic principles to engineering problems. Evaluations of design alternatives. Deterministic modeling and optimization with emphasis in civil engineering applications simulation modeling.

**ENCE 465 Geographic Information Systems for Planning and Design Models (3)** *Prerequisites:* ENCE 202 and ENCE 203. Senior standing. For ENCE majors only. Application of computer-centered techniques to develop, manage, and interpret multi-dimensional data bases required for large scale projects in transportation, water resources, and environmental engineering. Translation of digital format data from remote sensing or conventional sources to quantitative information. Required for spatially distributed simulation models. Use of instructional geographic information systems and image processing software on personal computers.

**ENCE 466 Design of Civil Engineering Systems (3)** *One hour of lecture, two hours of laboratory, and one hour of discussion/recitation per week. Prerequisites:* ENCE 353 or ENCE 355, ENCE 315, ENCE 320, ENCE 330, ENCE 340, ENCE 370 or permission of department. Senior standing. For ENCE majors only. A major civil engineering design experience that emphasizes development of student creativity, development and use of design methodologies, evaluation of alternate solutions, feasibility considerations, and detailed system descriptions. Realistic design constraints including economic factors, safety, aesthetics, and reliability will be imposed.

**ENCE 470 Highway and Traffic Engineering (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite:* ENCE 370. For ENCE majors only. Highway location, design, construction and maintenance. Concepts of traffic engineering, traffic flow theory and traffic operations and management.

**ENCE 471 Urban Transportation Planning (3)** *Prerequisite:* ENCE 370. For ENCE majors only. Introduction to urban transportation modeling systems. Transportation demand analysis. Trip generation, distributions, mode split, and traffic assignment. Transportation alternative evaluations.

**ENCE 472 Transportation Engineering (3)** *Prerequisite:* ENCE 370. For ENCE majors only. Transportation engineering concepts including transportation systems analysis, airport systems, airline and airport operations, water transportation, and mass transportation operations.

**ENCE 488 Senior Thesis (3)** *Senior standing. For ENCE majors only.* Advanced study in civil engineering problems with special emphasis on mathematical modeling and experimental methods.

**ENCE 489 Special Problems in Civil Engineering (1-4)** *Senior standing. For ENCE majors only.* A course arranged to meet the needs of exceptionally well prepared students for study in a particular field of civil engineering.

## ENCH—Engineering, Chemical

**ENCH 215 Chemical Engineering Analysis (3)** *Prerequisite:* CHEM 104. Pre- or corequisite: MATH 141. 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.

**ENCH 250 Computer Methods in Chemical Engineering (3)** *Prerequisites:* ENES 101; and ENCH 215. 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.

**ENCH 300 Chemical Process Thermodynamics (3)** *Prerequisites:* CHEM 203; and ENCH 215; and MATH 241. 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.

**ENCH 333 Chemical Engineering Seminar (1)** *Senior standing.* Oral and written reports on recent developments in chemical engineering and the process industries.

**ENCH 422 Transport Processes I (3)** *Prerequisites:* MATH 241 and MATH 246 and ENES 102. Macroscopic approach to analysis of heat, mass and momentum transfer. Integral balances, mechanical energy equation, Bernoulli's equation. Interphase transport. Application to design of process equipment. Radiant heat transfer.

**ENCH 424 Transport Processes II (3)** *Prerequisites:* ENCH 300 and ENCH 422. Microscopic approach to analysis of heat, mass and momentum transfer Analogies, laws for conduction and convection. Design applications via differential balances and general balance equations. Boundary layer analysis and turbulent flow.

**ENCH 426 Transport Processes III (3)** *Prerequisites:* ENCH 300 and ENCH 422. Corequisite: ENCH 424. Separation by staged operations. Rate dependent separation processes. Design applications in distillation, gas absorption, liquid extraction, drying, adsorption and ion exchange.

**ENCH 437 Chemical Engineering Laboratory (3)** *Prerequisites:* ENCH 426; and ENCH 440; and ENCH 442. Application of chemical engineering process and unit operation principles 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 in report form.

**ENCH 440 Chemical Engineering Kinetics (3)** *Prerequisites:* ENCH 300; and ENCH 422; and CHEM 481. 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.

**ENCH 442 Chemical Engineering Systems Analysis (3)** *Prerequisites:* ENCH 300; and ENCH 422. 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.

**ENCH 444 Process Engineering Economics and Design I (3)** *Prerequisites:* ENCH 426; and ENCH 440; and ENCH 442. Principles of chemical engineering economics and process design. Emphasis on equipment types, equipment design principles, capital cost estimation, operating costs, and profitability.

**ENCH 446 Process Engineering Economics and Design II (3)** *Prerequisite:* ENCH 444. Application of chemical engineering principles for the design of chemical processing equipment. Typical problems in the design of chemical plants.

**ENCH 450 Chemical Process Development (3)** *Prerequisite:* ENCH 426. Chemical process industries from the standpoint of technology, raw materials, products and processing equipment. Operations of major chemical processes and industries combined with quantitative analysis of process requirements and yields.

**ENCH 452 Advanced Chemical Engineering Analysis (3)** *Prerequisite:* ENCH 426. Application of digital and analog computers to chemical engineering problems. Numerical methods, programming, differential equations, curve fitting, amplifiers and analog circuits.

**ENCH 453 Applied Mathematics in Chemical Engineering (3)** *Prerequisite:* ENCH 426. Mathematical techniques applied to the

analysis and solution of chemical engineering problems. Use of differentiation, integration, differential equations, partial differential equations and integral transforms. Application of infinite series, numerical and statistical methods.

**ENCH 454 Chemical Process Analysis and Optimization (3)** *Prerequisites:* ENCH 426; and ENCH 440. Applications 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. Emphasis on evaluation of process alternatives.

**ENCH 468 Research (1-3)** *Prerequisite:* permission of both department and instructor. Repeatable to 6 credits. Investigation of a research project under the direction of a faculty member. Comprehensive reports are required.

**ENCH 482 Biochemical Engineering (3)** *Prerequisite:* senior standing in engineering or permission of both department and instructor. Introduction to biochemical and microbiological applications to commercial and engineering processes, including industrial fermentation, enzymology, ultrafiltration, food and pharmaceutical processing and resulting waste treatment. Enzyme kinetics, cell growth, energetics and mass transfer.

**ENCH 485 Biochemical Engineering Laboratory (3)** *Six hours of laboratory per week. Pre- or corequisite:* ENCH 482. 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.

**ENCH 490 Introduction to Polymer Science (3)** *Prerequisite:* ENCH 422. The elements of the chemistry, physics, processing methods, and engineering applications of polymers.

**ENCH 494 Polymer Technology Laboratory (3)** *One hour of lecture and four hours of laboratory per week. Prerequisite:* ENCH 490. Polymer processing and characterization of polymer products. Extrusion, injection molding, blown film production with mechanical, thermal and rheological characterization.

**ENCH 496 Processing of Polymer Materials (3)** *Prerequisite:* ENCH 490 or ENCH 492. Credit will be granted for only one of the following: ENCH 496 or ENMA 496. A comprehensive analysis of the operations carried out on polymeric materials to increase their utility. Conversion operations such as molding, extrusion, blending, film forming, and calendaring. Development of engineering skills required to practice in the high polymer industry.

## ENCO—Engineering, Cooperative Education

**ENCO 098 Summer Co-Op Work Experience (0)** *Prerequisite:* successful completion of freshman and sophomore engineering requirements. Through alternate semesters of full-time work and full-time study, Co-op provides students with a year of practical work experience related to their major. Students should register for ENCO 098 if they are working during a summer semester.

**ENCO 099 Co-Op Work Experience (0)** *Prerequisite:* successful completion of freshman and sophomore engineering requirements. Through alternating semesters of full-time and full-time study, Co-op provides students with a year of practical work experience related to their major. Students must register for ENCO 099 if they are working fall or spring semesters.

## ENEE—Engineering, Electrical

**ENEE 114 Programming Concepts for Engineering (4)** *Three hours of lecture and two hours of discussion/recitation per week. For ENEE majors (09090) only. Restricted to students with 60 or less cumulative semester hours.* Principles of software development, high level languages, compiling and linking, pseudo-code, input/output, data types and variables, operators and expressions, conditionals and loops, functions, arrays, pointers, structure data types, memory allocation, introduction to algorithms, software projects, debugging, documentation. Programs will use the C language.

**ENEE 188 Special Introductory Topics in Electrical Engineering (1-4)** *For ENEE majors only. Repeatable to 8 credits if content differs.* Introductory topics in electrical engineering.

**ENEE 204 Basic Circuit Theory (3)** *Three hours of lecture and one hour of discussion/recitation per week. Prerequisite:* MATH 246. Basic circuit elements: resistors, capacitors, inductors, sources, mutual inductance and transformers; their I-V relationships. Kirchoff's Laws. DC and AC steady state analysis. Phasors, node and mesh analysis, superposition, theorems of Thevenin and Norton. Transient analysis for first- and second-order circuits.

**ENEE 206 Fundamental Electric and Digital Circuit Laboratory (2)** *One hour of lecture and three hours of laboratory per week. Prerequisite:* ENEE 244. Corequisite: ENEE 204. For ENEE majors 09090 only. Credit will be granted for only one of the following:

**ENEE 206 or ENEE 305. Formerly ENEE 305.** Introduction to basic measurement techniques and electrical laboratory equipment (power supplies, oscilloscopes, voltmeters, etc.) Design, construction, and characterization of circuits containing passive elements, operational amplifiers, and digital integrated circuits. Transient and steady-state response. This course is a prerequisite to all upper level ENEE laboratories.

**ENEE 244 Digital Logic Design (3)** Three hours of lecture and one hour of discussion/recitation per week. Prerequisite: ENES 240. Gates, flip-flops, registers and counters. Karnaugh map simplification of gate networks. Switching algebra. Synchronous sequential systems. PLA's. Elements of binary arithmetic units.

**ENEE 300 Principles of Electrical Engineering (3)** Prerequisites: MATH 241, PHYS 263. Corequisite: ENEE 301. Required of aerospace, mechanical and chemical engineers. Not applicable in the electrical engineering major program. Acceptable as prerequisite for some advanced ENEE courses. Analysis of linear systems, introduction to Laplace transforms, steady-state A-C transforms, introduction to the concepts of electromagnetic fields and electric machines.

**ENEE 301 Electrical Engineering Laboratory (1)** Two hours of laboratory per week. Corequisite: ENEE 300. Experiments on the transient and steady-state response of linear circuits, electric machines, electron tubes and semi conductor devices. \20S I3 All lower-division CHEM, MATH, PHYS and Engineering courses that are required courses for the BS degree in Electrical Engineering must be completed before enrolling in any 300- or 400- ENEE course (except ENEE 300 and ENEE 301). Transfer students will be allowed one term to complete all such courses after starting to take upper-level ENEE courses.14 \20E

**ENEE 302 Analog Electronic Circuits (3)** Prerequisite: ENEE 204 and completion of all lower-division courses in the EE curriculum. See above note. Basic electronics elements (diodes, bipolar transistors, MOSFETs) their characteristics and principles of operation. Small signal analysis. Circuit models with controlled sources. Diode circuits. Low-frequency amplifiers and feedback. Frequency response of amplifiers. Operational amplifiers and their applications. Wave-shaping and waveform generators. Elements of power electronics.

**ENEE 305 Fundamental Laboratory (2)** One hour of lecture and three hours of laboratory per week. Prerequisite: ENEE 204 and completion of all lower-division technical courses in the EE curriculum. See above note. This course is prerequisite to all ENEE 400-level laboratory courses. Concepts and techniques of physical measurements using standard electrical measuring devices: generators, oscilloscopes, voltmeters, etc. Measurements of linear and non-linear circuits: steady state and step response; integrated circuits. Handling and use of data.

**ENEE 306 Electronic Circuits Design Laboratory (2)** One hour of lecture and three hours of laboratory per week. Prerequisite: ENEE 302. For ENEE majors 09090 only. Not open to students who have completed ENEE 413. Formerly ENEE 413. Students will design, construct and test analog and digital circuits at the transistor level. Bipolar and field effect transistors will be covered. Circuits designed will include common emitter and differential amplifiers, active filter, TTL and CMOS logic gates. Students should gain much of the background required for the design of modern microelectronic circuits.

**ENEE 312 Digital Electronic Circuits (3)** Prerequisite: ENEE 302 and completion of all lower-division technical courses in the EE curriculum. See above note. Review of basic semiconductor devices and technology. Inverters, gates and logic families. Analysis and design of combinational circuits (adder, comparator, encoder/decoder). Memories. Analysis and design of sequential circuits (flip-flops, registers, counters). Large scale integrated systems (dynamic MOS registers, EPROMs, PLA, CCDs). Analog-to-digital converters. Elements of CAD, including use of the SPICE computer package.

**ENEE 322 Signal and System Theory (3)** Prerequisites: ENEE 204 and MATH 246 and completion of all lower-division technical courses in the curriculum. See above note. Concept of linear systems, state space equations for continuous and discrete systems, time domain analysis of linear systems. Fourier, Laplace and Z transforms. Application of theory to problems in electrical engineering.

**ENEE 324 Engineering Probability (3)** Prerequisite: ENEE 322 and completion of all lower-division technical courses in the EE curriculum. See above note. 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.

**ENEE 350 Computer Organization (3)** Prerequisite: ENEE 244 and completion of all lower-division technical courses in the EE curriculum. See above note. Not open to students who have completed ENEE 250. Formerly ENEE 250. 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.

**ENEE 380 Electromagnetic Theory (3)** Prerequisites: MATH 241 and PHYS 263 and completion of all lower-division technical courses in the EE curriculum. See above note. 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.

**ENEE 381 Electromagnetic Wave Propagation (3)** Prerequisite: ENEE 380 and completion of all lower-division technical courses in the EE curriculum. See above note. Review of Maxwell's equations; the wave equation, potentials, Poynting's theorem. Transmission, lossy medium, skin effect. Parallel-plate and rectangular wave-guides. Radiation, retarded potentials, radiation from dipole.

**ENEE 407 Microwave-Circuits Laboratory (2)** One hour of lecture and three hours of laboratory per week. Prerequisites: ENEE 305 and 381 and completion of all lower-division technical courses in the EE curriculum. See above note. Experiments concerned with circuits constructed from microwave components providing practical experience in the design, construction and testing of such circuits. Projects include microwave filters and S-parameter design with applications of current technology.

**ENEE 413 Electronics Laboratory (2)** One hour of lecture and three hours of laboratory per week. Prerequisite: ENEE 302 and ENEE 305 and completion of all lower-division technical courses in the EE curriculum. See above note. The specification, design and testing of basic electronic circuits and practical interconnections. Emphasis on design with discrete solid state and integrated circuit components for both analog and digital circuits.

**ENEE 417 Microelectronics Design Laboratory (2)** One hour of lecture and three hours of laboratory per week. Prerequisites: ENEE 305 and ENEE 312 and completion of all lower-division technical courses in the EE curriculum. See above note. For ENEE majors only. EE capstone design project. Experiments are designed to provide student with different aspects of modern microelectronics. Students will design and build circuits to meet certain specifications. The topics include solid state physics, semiconductor characteristics, computer simulation, CAD circuit design, Neural Network hardware/software implementation, etc.

**ENEE 418 Projects in Electrical Engineering (1-3)** Hours to be arranged. Prerequisites: permission of instructor and department and completion of all lower-division technical courses in the EE curriculum. See above note. Theoretical and experimental projects.

**ENEE 420 Communication Systems (3)** Prerequisite: ENEE 324 and completion of all lower-division technical courses in the EE curriculum. See above note. 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.

**ENEE 425 Digital Signal Processing (3)** Prerequisite: ENEE 322 and completion of all lower-division technical courses in the EE curriculum. See above note. 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.

**ENEE 426 Communication Networks (3)** Prerequisite: permission of department and completion of all lower-division technical courses in the EE curriculum. See above note. The main design issues associated with ordinary, single-user, point-to-point communication systems and their juxtaposition to those involved in multi-user systems such as computer networks, satellite systems, radio nets, and general communication networks. Application of analytical tools of queueing theory to design problems in such networks. Review of proposed architectures and protocols.

**ENEE 428 Communications Design Laboratory (2)** One hour of lecture and three hours of laboratory per week. Prerequisite: ENEE 324 and completion of all lower-division technical courses in the EE curriculum. See above note. Corequisite: ENEE 420 or ENEE 425. For ENEE majors only. EE capstone design course. Exploring the signal processing and communication systems theoretical concepts presented in ENEE 420 Communication Systems and ENEE 425 Digital Signal Processing by implementing them on actual DSP based hardware in real time.

**ENEE 434 Introduction to Neural Networks and Signals (3)** Prerequisite: ENEE 204 or ENEE 300 and completion of all lower-division technical courses in the EE curriculum. See above note. Introduction to the generation and processing of bioelectric signals

including structure and function of the neuron, membrane theory, generation and propagation of nerve impulses, synaptic mechanisms, transduction and neural coding of sensory events, central nervous system processing of sensory information and correlated electrical signals, control of effector organs, muscle contraction and mechanics, and models of neurons and neural networks.

**ENEE 435 Electrodes and Electrical Processes in Biology and Medicine (3)** Prerequisite: ENEE 204 or ENEE 300 and completion of all lower-division technical courses in the EE curriculum. See above note. Techniques for recording biological signals such as brain, muscle and cardiac electrical potentials; membrane theory; half-cell potentials, liquid junction potentials, polarization of electrodes; biological and medical instrumentation; and applications in the design of cardiac pacemakers, or a similar case study.

**ENEE 438 Topics in Biomedical Engineering (1-3)** Prerequisite: permission of department and completion of all lower-division technical courses in the EE curriculum. See above note. Repeatable to 9 credits. The content may vary from semester to semester. Selected topics of current interest from such areas as bioelectric systems, modeling instrumentation, automated diagnostic, health-care delivery, etc.

**ENEE 440 Microprocessors (3)** Prerequisite: ENEE 350 and completion of all lower-division technical courses in the EE curriculum. See above note. Microprocessor architectures, instruction sets, and applications. Bus structures, memory, I/O interfacing, Programming, and the embedding of microprocessors in other systems.

**ENEE 444 Logic Design of Digital Systems (3)** Prerequisite: ENEE 250 and completion of all lower-division technical courses in the EE curriculum. See above note. Not open to students who have completed ENEE 244. Review of switching algebra: gates and logic modules; map simplification techniques; multiple-output systems; memory elements and sequential systems; large switching systems; iterative networks; sample designs, computer oriented simplification algorithms; state assignment; partition techniques; sequential system decompositions.

**ENEE 445 Computer Laboratory (2)** One hour of lecture and three hours of laboratory per week. Prerequisite: ENEE 305 and ENEE 440 or ENEE 444 and completion of all lower-division technical course in the EE curriculum. See above note. Hardware oriented experiments providing practical experience in the design, construction, and checkout of components and interfaces for digital computers and data transmission systems. Projects include classical design techniques and applications of current technology.

**ENEE 446 Digital Computer Design (3)** Prerequisite: ENEE 350 and completion of all lower-division technical courses in the EE curriculum. See above note. 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.

**ENEE 448 Microprocessor Systems Design (3)** Prerequisite: ENEE 440 and completion of all lower-division technical courses in the EE curriculum. See above note. For ENEE majors only. EE capstone design project. Design and implementation of a microprocessor-based system to solve a real-world problem, using client problems provided through Maryland's "TAP" (Technical Assistance) Program.

**ENEE 450 Discrete Structures (3)** Prerequisite: ENEE 350 and completion of all lower-division technical courses in the EE curriculum. See above note. Modern algebra with applications to computer and communications hardware. Relations, mappings, groups, rings and fields. Boolean algebras and lattice theory. Applications to digital logic design, computer arithmetic and error-correcting codes.

**ENEE 460 Control Systems (3)** Prerequisite: ENEE 322 and completion of all lower-division technical courses in the EE curriculum. See above note. 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. Introduction to computer aided design of control systems.

**ENEE 461 Control Systems Laboratory (2)** One hour of lecture and three hours of laboratory per week. Prerequisites: ENEE 305 and ENEE 460 and completion of all lower-division technical courses in the EE curriculum. See above note. Projects to enhance the student's understanding of feedback control systems and to familiarize him with the characteristics and limitations of real control devices. Students will design, build, and test servomechanisms, and will conduct analog and hybrid computer simulations of control systems.

**ENEE 462 Systems, Control and Computation (3)** Prerequisite: ENEE 322 and completion of all lower-division technical courses in the EE curriculum. See above note. Matrix algebra, state space

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analysis of discrete systems, state space analysis of continuous systems, computer algorithms for circuit analysis, optimization and system simulation.

**ENEE 468 Design and Control of a Walking Robot (3)** *One hour of lecture and two hours of discussion/recitation per week. Prerequisite: ENEE 322. Junior standing. For ENEE, ENME, and CMSC majors only. Repeatable to 6 credits if content differs. Also offered as ENME 489.* EE capstone design course. Design by students of a fully functional walking robot. Components in control systems, multi-body dynamics, digital and logic design, and software development.

**ENEE 472 Electric Power System Components (3)** *Prerequisite: ENEE 322; and ENEE 380; and completion of all lower-division technical courses in the EE curriculum. See above note.* Linear and nonlinear magnetic circuits, hysteresis and eddy current losses, transformers, induction motors, synchronous generators.

**ENEE 473 Electrical Machines Laboratory (2)** *One hour of lecture and three hours of laboratory per week. Prerequisite: ENEE 305 and completion of all lower-division technical courses in the EE curriculum. See above note.* Experiments involving single and three phase transformers, induction machines, synchronous machines and D.C. machines.

**ENEE 474 Power Systems (3)** *Prerequisite: ENEE 322 and completion of all lower-division technical in the EE curriculum. See above note.* 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.

**ENEE 475 Power Electronics (3)** *Prerequisite: ENEE 302 and completion of all lower-division technical courses in the EE curriculum. See above note.* Analytical methods, canonical circuit topologies, fundamentals of power semiconductors, snubbing circuits, drive circuits, fundamentals of control methods.

**ENEE 476 Power System Stability (3)** *Prerequisite: ENEE 322 and completion of all lower-division technical courses in the EE curriculum. See above note.* Power system modeling, the swing equation. Lyapunov stability analysis. Construction of Lyapunov, or energy, function. The equal-area criterion. Critical clearing time. Potential energy boundary surface method. Emergency control. Recent developments.

**ENEE 480 Fundamentals of Solid State Electronics (3)** *Prerequisite: ENEE 302 and completion of all lower-division technical courses in the EE curriculum. See above note.* Crystal structure and materials preparation; carrier transport; elementary quantum mechanics applied to solids; band structure of metals, insulators, and semiconductors; field effect transistors; pn junctions; bipolar transistors; fabrication of devices.

**ENEE 481 Antennas (3)** *Prerequisite: ENEE 381 and completion of all lower-division technical courses in the EE curriculum. See above note.* Introduction to the concepts of radiation, generalized far field formulas; antenna theorems and fundamentals; antenna arrays, linear and planar arrays; aperture antennas; terminal impedance; propagation.

**ENEE 482 Design of Active and Passive Microwave Devices (3)** *Prerequisite: ENEE 381 and completion of all lower-division technical courses in the EE curriculum. See above note.* Design and operation of passive and active microwave devices. The passive components include waveguides, resonators, and antennas. The active devices include klystrons, magnetrons, gyrotrons, and free electron lasers.

**ENEE 483 Electromagnetic Measurements Laboratory (2)** *One hour of lecture and three hours of laboratory per week. Prerequisites: ENEE 305 and ENEE 380 and completion of all lower-division technical courses in the EE curriculum. See above note.* Experiments designed to provide familiarity with a large class of micro-wave and optical components, techniques for interconnecting them into useful systems, and techniques of high frequency and optical measurements.

**ENEE 484 Design of Charged Particle Devices (3)** *Prerequisite: ENEE 381 or permission of department and completion of all lower-division technical courses in the EE curriculum. See above note. Senior standing. For ENEE majors only.* EE capstone design course. Underlying physical principles and design concepts of a variety of charged particle devices such as electron and ion sources, electric and magnetic lenses, high power microwave tubes, lithography systems, and particle accelerators.

**ENEE 485 Loudspeaker Design (3)** *One hour of lecture and three hours of laboratory per week. Prerequisites: ENEE 204 and ENEE 305. Senior standing. For ENEE majors only.* EE capstone design course. Loudspeaker design and construction. Fundamental principles of loudspeaker and enclosure loading. Laboratory measurements of driver parameters and loudspeaker characterization. Analogy between acoustical and electrical circuits. Enclosure making. Room interaction. Students set goals, design, and construct a system, test and compare results with predictions.

**ENEE 486 Optoelectronics Lab (2)** *One hour of lecture and three hours of laboratory per week. Prerequisites: ENEE 305 and PHYS 263 and completion of all lower-division technical courses in the EE curriculum.* 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.

**ENEE 488 Topics in Electrical Engineering (3)** *Prerequisite: permission of department and completion of all lower-division technical courses in the EE curriculum. See above note.* Selected topics of current importance in electrical engineering.

**ENEE 493 Introduction to VLSI Design (3)** *Prerequisite: ENEE 312 and completion of all lower-division technical courses in the EE curriculum. See above note.* For ENEE majors only. EE capstone design project. Design of Very Large Scale Integrated circuits, including layout, circuit analysis and component selection.

**ENEE 494 Solid State Devices (3)** *Prerequisite: ENEE 302 and completion of all lower-division technical courses in the EE curriculum. See above note.* Introduction to semiconductor materials; p-n junctions; metal-semiconductor contacts; bipolar transistors, insulated gate field effect transistors; and related selected topics.

**ENEE 496 Lasers and Electro-optic Devices (3)** *Pre- or corequisite: ENEE 381. Completion of all lower-division technical courses in the EE curriculum. See above note.* Optical resonators, Fabry-perot etalon. Theory of laser oscillation, rate equations. Gaseous, solid state, semiconductor and dye laser systems. Electro-optic effects and parametric oscillators. Holography.

**ENEE 497 Optical System Design (3)** *Corequisite: ENEE 381. Completion of all lower-division technical courses in the EE curriculum. See above note.* EE capstone design course. Methods of optical system design including overall system layout, analysis, and component selection.

## ENES—Engineering Science

**ENES 100 Introduction to Engineering Design (3)** *One hour of lecture and two hours of laboratory per week.* Students work as teams to design and build a product using computer software for wordprocessing, spreadsheet, CAD, and communication skills.

**ENES 101 Introductory Engineering Science (3)** *Two hours of lecture and two hours of discussion/recitation per week. For engineering majors only.* Basic languages of the engineer. Elements of graphic communication and analysis. Orthographic projection, conventions, graphs and curve-fitting. Introduction to structured computer programming. Engineering orientation.

**ENES 102 Statics (2)** *One hour of lecture and two hours of discussion/recitation per week. Prerequisite: MATH 140. For engineering majors only. Formerly ENES 110.* 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, and friction. Vector and scalar methods are used to solve problems.

**ENES 103 FORTRAN for Engineers (1)** *For engineering majors only.* Fundamentals of FORTRAN as applied to engineering problems.

**ENES 105 How Things Work: Basic Technological Literacy (3)** *Prerequisite: MATH 001 or high school equivalent.* An introduction to technology for non-technical majors. Structure of matter, electronic materials, electricity and electric circuits, electronic components including diodes and transistors, digital circuits and devices, computers, communication systems, radar and other modern technological devices.

**ENES 121 The World of Engineering (3)** Introduction to engineering and its influence on the way we live. Study of the conception, design, and operation of engineering systems from the past to the present and a look into the future.

**ENES 131 Introduction to Flight (3)** An elementary course in aeronautics appropriate for both science and non-science students. The elements of flight as exemplified by the flight of birds and the historical development of the airplane. Navigation and control of the aircraft, weather as it affects aviation, flight instruments, and the operation of the U.S. Civil Aviation System.

**ENES 190 Introduction to Design and Quality (3)** *Prerequisite: permission of College. Also offered as BMGT 190.* Expose engineering and business students to the principles of total quality, using experiential team learning and technology aided approaches. The first of four courses in total quality.

**ENES 220 Mechanics of Materials (3)** *Prerequisites: ENES 102; and MATH 141; and PHYS 161. For engineering majors only (not including ENEE majors).* 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.

**ENES 221 Dynamics (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: ENES 102 or ENES 110; and MATH 141; and PHYS 161.* 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.

**ENES 230 Introduction to Materials and their Applications (3)** *Prerequisite: ENES 100 or permission of department.* Structure of materials, chemical composition, phase transformations, corrosion and mechanical properties of metals, ceramics, polymers and related materials. Material selection in engineering applications.

**ENES 240 Engineering Computation (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: MATH 141.* Introduction to the design and implementation of algorithms to solve engineering problems using digital computers. Analysis of problems fundamental to engineering design, construction and diagrammatic description of effective procedures for solving them and implementing and testing of these solutions in a common high-level engineering oriented language such as FORTRAN. Techniques for data input and storage, selection of relevant numerical and non-numerical methods for problem solutions, and the efficient ordering of data for meaningful output presentation.

**ENES 380 Methods for Measuring Quality (3)** *Prerequisite: BMGT 190 or ENES 190. Also offered as BMGT 290.* Provides engineering and business students an understanding of the need and use of measurement techniques that lead to continuous improvement. The second course of four courses in total quality.

**ENES 388 Engineering Honors Seminar (1)**

**ENES 389 Selected Topics (3)** *Repeatable to 6 credits if content differs.*

**ENES 390 Competing on Quality in a Global Economy (3)** *Prerequisite: BMGT 290 or ENES 380. Also offered as BMGT 390.* Examines strategic quality management in a globalized setting. Global marketing, international finance, and cross cultural concepts will be emphasized. The third of four courses in total quality.

**ENES 405 Power and the Environment (3)** Intended for seniors not majoring in engineering. Not applicable as a technical elective for engineering majors. An introduction to the power needs of society. The interrelationship between man's use of energy and the effect on the eco-system. Introduction to the techniques of power production with special emphasis on nuclear-fueled power plants.

**ENES 489 Special Topics in Engineering (3-6)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs.* Special topics in engineering.

**ENES 490 The Total Quality Practicum (3)** *Prerequisite: BMGT 390 or ENES 390. Also offered as BMGT 490.* Capstone course for the four course total quality program. Based on a major project undertaken by student teams in an industry environment emphasizing integrative aspects of total quality, each project will be supervised by a joint faculty/industry team with differing areas of expertise.

**ENES 508 Engineering Professional Development for Teachers (1-6)** *Two hours of lecture and three hours of laboratory per week. Prerequisite: permission of department. For non-engineering majors only. Repeatable to 6 credits if content differs.* An introduction to the fundamental concepts that underlie engineering and the process that engineers use in solving technological problems and in design work. Problems in experimental analysis are demonstrated through laboratory experiments. The laboratory work provides the basis for introductory design.

## ENFP—Engineering, Fire Protection

**ENFP 251 Introduction to Fire Protection Engineering (3)** The social, economic, environmental and legal dimensions of the fire problem. The theoretical and engineering principles of basic fire phenomena. Technological assessment of urban fire protection utilizing operations research and systems engineering procedures.

**ENFP 255 Fire Alarm and Special Hazards Design (3)** *Formerly ENFP 315.* Study of gaseous and particulate fire suppression systems. Examination and evaluation of code criteria, performance specifications and research. Application of fluid theory to the design process and the calculation procedures for gaseous particulate fire suppression systems. An integrated fire protection systems design project. Functional analysis and design of detection systems.

**ENFP 300 Fire Protection Fluid Mechanics (3)** *Prerequisites: MATH 246 and PHYS 262 and ENES 221. Formerly ENFP 290.* Basic principles of fluid flow. Properties of a fluid, velocity field, flow patterns. Pressure distribution in a fluid. Hydrostatic and hydrodynamic problems. Integral relations for control volumes. Differential relations, dimensional analysis and similarity. Internal

and external flow problems associated with fire protection systems and fire scenarios.

**ENFP 310 Water Based Fire Protection Systems Design (3)** *Prerequisite:* ENFP 290. Study of aqueous suppression system agents and their application to selected fire protection problems. Examination of specifications, code criteria, published criteria and research utilized in the engineering design of aqueous agent suppression systems. Application of hydraulic theory to a range of design considerations. Problem calculations based upon student prepared design layouts.

**ENFP 312 Heat and Mass Transfer (3)** *Prerequisites:* (ENCH 300 or ENME 320 or ENME 217) and (ENCE 330 or ENME 342). Fundamentals of heat and mass transfer. Conduction, convection, radiation modes of heat transfer. Diffusion concepts and evaporation phenomena. Problem solving techniques with application to fire problems.

**ENFP 320 Fire Assessment Methods and Laboratory (4)** *Three hours of lecture and two hours of laboratory per week. For ENFP majors only.* Experimental evaluation of ignition, flame spread, rate of heat release and smoke production of furnishings and interior finish materials.

**ENFP 405 Structural Fire Protection (3)** *Prerequisite:* ENES 220. *For ENFP majors only.* 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.

**ENFP 411 Fire Risk Assessment (3)** *Prerequisites:* ENFP 251; and ENFP 315. 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.

**ENFP 415 Fire Dynamics (3)** *Prerequisites:* ENCH 300 or ENME 320; and ENCE 330 or ENME 342; and ENFP 312 or permission of department. Introduction to premixed and diffusion flames; ignition, flame spread and rate of burning; fire plumes; flame radiation.

**ENFP 416 Problem Synthesis and Design (3)** *Senior standing.* Techniques and procedures of problem orientation and solution design utilizing logical and numerical procedures. Student development of research projects in selected areas.

**ENFP 421 Functional and Life Safety Analysis (3)** *Prerequisite:* ENFP 320. *For ENFP majors only.* Egress analysis. Characteristics of people movement in corridors and stairways. Human response to fire. Tenability analysis.

**ENFP 425 Fire Modeling (3)** *Prerequisite:* permission of department. *Senior standing. For ENFP majors only.* Introduction to current fire modeling techniques for building fire safety assessment. Application of various computer-based fire models to representative problems.

**ENFP 429 Independent Studies (1-3)** *Prerequisite:* permission of department. *For ENFP majors only. Repeatable to 6 credits if content differs.* For students who have definite plans for individual study of approved problems, or study of an advanced topic selected in conjunction with the faculty.

**ENFP 431 Building Safety and the Law (3)** *Junior standing.* Key topics include, biotechnology, safety regulation, federal preemption, product liability, professional negligence, antitrust, privacy and information technology, risk modelling, environmental protection, patent, copyright, trade secrets, reverse engineering, scientific and technological evidence, international trade, engineering ethics. Examples include plane crashes, computer chip protection, human machine interfaces, nuclear power plants, internet censorship, flood control, earthquakes and biomedical technology.

**ENFP 435 Law and Technology (3)** *Junior standing.* Responding to natural and manufactured building hazards requires a complex legal environment, including regulation and liability. Key topics include the use of model codes, administrative regulation, retrospective codes, federal preemption, arson, performance based codes, risk based regulation, engineering malpractice, product liability and disaster investigation.

**ENFP 450 Professional Development Seminar (1)** *Prerequisite:* permission of department. *Senior standing.* An integrative, senior level professional seminar covering various topics such as engineering ethics, professional licensing, codes and standards development, career selection, and contemporary issues in fire protection engineering.

**ENFP 455 Fabrics and Furnishings Flammability (3)** *Two hours of lecture, one hour of laboratory, and one hour of discussion/recitation per week. Junior standing. For ENFP majors only.* Characterization and analysis of the flammability and flame resistance of textile materials, including fabrics and interior furnishings. Mechanisms of ignition, burning and extinguishment include flaming or smoldering ignition, flame spread, heat output,

smoke and toxic gas production, and extinguishability, material properties and respective fire test methods.

**ENFP 489 Special Topics (3)** *Prerequisite:* permission of department. *Repeatable to 6 credits.* Selected topics of current importance to fire protection.

## ENGL—English

**ENGL 101 Introduction to Writing (3)** An introductory course in expository writing.

**ENGL 201 Western World Literature: Homer to the Renaissance (3)** Readings in major genres of the Western literary tradition. Works and authors may include selections from Bible, medieval epic and romance, Renaissance drama, Homer, Aeschylus, Virgil, Dante.

**ENGL 202 Western World Literature: Renaissance to the Present (3)** Readings in major texts from the Western literary tradition. Authors such as Moliere, Goethe, Cervantes, Dostoevsky, Woolf, Camus.

**ENGL 205 Introduction to Shakespeare (3)** *Recommended for non-majors.* Reading of representative works. Genre, action, character, theme, language, and staging. Shakespeare's relation to Renaissance culture.

**ENGL 211 English Literature: Beginnings to 1800 (3)** Surveys medieval and early modern literary works written in England. Readings may include Beowulf, Chaucer, Spenser, Mary Wroth, Milton; eighteenth-century satire, drama, novels.

**ENGL 212 English Literature: 1800 to the Present (3)** Surveys the major literary movements of the period, from Romantic to Victorian to Modern. Such authors as Wordsworth, Keats, Bronte, Tennyson, Browning, Yeats, Joyce, Woolf.

**ENGL 221 American Literature: Beginning to 1865 (3)** Surveys American writing from the founding of the colonies through the Civil War. Authors such as Taylor, Cooper, Poe, Dickinson.

**ENGL 222 American Literature: 1865 to Present (3)** Surveys American writing from the Civil War through the Cold War. Authors such as Clemens, Frost, Hurston, Bellow.

**ENGL 234 Introduction to African-American Literature (3)** A survey of African-American literature from the late eighteenth century to the present.

**ENGL 235 Introduction to the Literatures of the African Diaspora (3)** *Not open to students who have completed CMLT 235. Credit will be granted for only one of the following: CMLT 235 or ENGL 235.* Authors, periods, and genres that reflect the diversity of African and African Diaspora cultures.

**ENGL 240 Introduction to Fiction, Poetry, and Drama (3)** *Not open to students who have completed ENGL 102.* Readings in the novel, short story, poetry and drama.

**ENGL 241 Introduction to the Novel (3)** Historical, formal, social questions about the genre. Readings drawn from a range of cultures and communities.

**ENGL 242 Introduction to Non-Fiction Prose (3)** Contemporary and historical works in some of the major genres of non-fiction: biography, ecology, science writing, editorial, cultural commentary. The purposes of non-fiction (information, persuasion, analysis, and commentary); the research and writing methods of non-fiction writers; and the impact and value of non-fiction works in society.

**ENGL 243 Introduction to Poetry (3)** How poetry works. Focus on style, subject, rhythm, voice, technique and structure. Readings from a range of cultures and communities.

**ENGL 244 Introduction to Drama (3)** A survey of the basic literature of drama from the classical Greeks to modern times.

**ENGL 245 Film and the Narrative Tradition (3)** Primary attention is on the film as a narrative medium, but other literary models will be examined.

**ENGL 246 The Short Story (3)** Achievements of the short story form. Focus on subject, voice, narrative structure. Authors such as Poe, Chekov, Gogol, O'Connor, Hemingway, Welty.

**ENGL 247 Literature of Fantasy (3)** Reading and analysis of various works of non-realistic literature broadly termed "fantasy".

**ENGL 250 Introduction to Literature by Women (3)** *Also offered as WMST 255. Credit will be granted for only one of the following: ENGL 250 or WMST 255.* Images of women in literature by and about women.

**ENGL 260 Introduction to Folklore (3)** Surveys a wide range of folklore genres; history and theory of folklore.

**ENGL 277 Mythologies: An Introduction (3)** Introduction to the myths of Europe, Asia, Oceania, the Middle East, Africa and North

and South America.

**ENGL 278 Special Topics in Literature (3)** *Repeatable to 9 credits if content differs.*

**ENGL 280 Introduction to the English Language (3)** Facts and phenomena of the English language; basic concepts and instruments useful for the analysis of literary and rhetorical uses of English. Potential topics include the history of English, its metrics, lexical patterns, common rhetorical devices, literary genres and its role as an international language.

**ENGL 281 Standard English Grammar, Usage, and Diction (3)** The basic structure of written English, including parts of speech, sentence patterns, standard punctuation, diction, and usage.

**ENGL 282 Introduction to Rhetorical Theory (3)** Basic elements of rhetorical theory. Classical and contemporary perspectives on the nature, functions, and scope of rhetoric. Potential texts for analysis include non-fiction prose, novels, short fiction, philosophical treatises, autobiographies, biographies, and speeches.

**ENGL 291 Intermediate Writing (3)** Writing essays, the revision process, and editing techniques.

**ENGL 294 Introduction to Creative Writing (3)** Writing of fiction and poetry, with special attention to elements of style and craft. Selected readings, frequent writing exercises, workshop format.

**ENGL 296 Beginning Fiction Workshop (3)** Writing of fiction, with special attention to the elements of style and craft. Selected readings, frequent writing exercises, workshop format.

**ENGL 297 Beginning Poetry Workshop (3)** Writing of poetry, with special attention to the elements of style and craft. Selected readings, frequent writing exercises, workshop format. \20S \3ENGL 300 and 400 level course prerequisites: \4any two freshman or sophomore English courses. \20E

**ENGL 301 Critical Methods in the Study of Literature (3)** *For English and English education majors only.* An introduction to the techniques of literary analysis and a brief survey of the most common approaches to literature.

**ENGL 302 Medieval Literature in Translation (3)** *Prerequisite:* two lower-level English courses, at least one in literature; or permission of department. 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.

**ENGL 304 The Major Works of Shakespeare (3)** *Prerequisite:* two lower-level English courses, at least one in literature; or permission of department. *Not open to students who have completed ENGL 403 and ENGL 404.* Representative early, middle, and later works, including comedies, tragedies, histories, and romances. Historical and cultural contexts.

**ENGL 305 Shakespeare and His Contemporaries: An Introduction (3)** *Prerequisite:* two lower-level English courses, at least one in literature; or permission of department. Readings in Shakespeare and contemporaries such as Marlowe, Dekker, Middleton, Jonson, Webster, Chapman, Marston. Elizabethan and Jacobean theatrical and social contexts.

**ENGL 310 Medieval and Renaissance British Literature (3)** *Prerequisite:* two lower-level English courses, at least one in literature; or permission of department. Detailed study of selected major medieval and Renaissance works written in England. Cultural attitudes and historical contexts. May include Beowulf, Anglo-Saxon lyric, drama, sonnets; works of women writers, Chaucer, Spenser, Sidney. Some readings in Middle English.

**ENGL 311 Baroque and Augustan British Literature (3)** *Prerequisite:* two lower-level English courses, at least one in literature; or permission of department. The culture of seventeenth and eighteenth-century Britain seen through detailed study of selected major texts. Drama, poetry, political writings, and early novels by men and women. Authors may include Donne, Milton, Jonson, Behn, Swift, Pope, Montagu, and Wollstonecraft.

**ENGL 312 Romantic to Modern British Literature (3)** Detailed study of selected major texts from the 19th and 20th centuries. Transitions from Romanticism to Victorian age to Modernism. Historical, social, literary contexts. Issues such as rise of democracy; industrial revolution; the "woman question"; revolutions in literary form. Authors might include Wordsworth, Austen, Dickens, Arnold, T.S. Eliot, Woolf.

**ENGL 313 American Literature (3)** *Prerequisite:* two lower-level English courses, at least one in literature; or permission of department. A detailed study of selected major texts of American literature from the seventeenth century to the twentieth century. Issues such as race, gender, and regionalism. Authors such as Franklin, Hawthorne, Dickinson, Hemingway, and Morrison.

**ENGL 320 English Romantic Literature (3)** *Prerequisite:* two lower-level English courses, at least one in literature; or permission of department. *Not open to students who have*

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completed ENGL 420 or ENGL 421. Survey fiction, poetry, and criticism c.1790 to c.1830. Shifts of thought from eighteenth-century rationalism to Romanticism. Writers such as Wordsworth, Coleridge, Keats, Mary Shelley, Byron, Hazlitt.

**ENGL 345 Twentieth Century Poetry (3)** *Prerequisite: two lower-level English courses, at least one in literature; or permission of department. Not open to students who have completed ENGL 445 or ENGL 446.* Major British and American poets of the twentieth century.

**ENGL 348 Literary Works by Women (3)** *Prerequisite: two lower-level English courses, at least one in literature; or permission of department. Repeatable to 6 credits if content differs. Also offered as WMST 348. Credit will be granted for only one of the following: ENGL 348 or WMST 348.* The context, form, style and meaning of literary works by women.

**ENGL 360 African, Indian and Caribbean Writers (3)** *Prerequisite: two lower-level English courses, at least one in literature; or permission of department.* 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.

**ENGL 362 Caribbean Literature in English (3)** *Prerequisite: two lower-level English courses, at least one in literature; or permission of department.* Political and literary traditions that intersect in the fiction, poetry, and drama written in English by Caribbean writers, primarily during the 20th century.

**ENGL 368 Special Topics in the Literature of Africa and the African Diaspora (3)** *Prerequisite: two lower-level courses, at least one in literature; or permission of department. Repeatable to 9 credits if content differs.* Comparisons among the literary traditions in Africa, the Caribbean, and North and South America.

**ENGL 369 Honors Seminar: Major Traditions (4-5)** *Prerequisite: permission of department.* Intensive study of major English and American literary classics in their generic context of narrative and lyric poetry, drama, prose, fiction and non-fiction from the beginnings to the present.

**ENGL 370 Junior Honors Conference (1)** *Prerequisite: candidacy for honors in English.* Preparation for writing the senior honors project.

**ENGL 373 Senior Honors Project (3)** *Prerequisite: ENGL 370. For ENGL majors only.* Research and writing of senior honors project. Strongly recommended for students planning graduate work.

**ENGL 377 Medieval Myth and Modern Narrative (3)** *Prerequisite: two lower-level English courses, at least one in literature; or permission of department. Not open to students who have completed ENGL 361. Formerly ENGL 361.* 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".

**ENGL 378 Independent Research in English (1-6)** *Prerequisite: permission of department. Repeatable to 6 credits.* Designed to provide qualified majors in English an opportunity to pursue specific English readings under the supervision of a member of the department.

**ENGL 379 Special Topics in Literature (3)** *Prerequisite: two lower-level English courses, at least one in literature; or permission of department. Repeatable to 9 credits if content differs.*

**ENGL 380 Internship (3-6)** *Prerequisite: permission of department.* The English Department's internship program. Preprofessional experience in writing and editing in a variety of fields.

**ENGL 381 MGA Legislative Seminar (3)** *Prerequisite: permission of department.* Classroom analysis component of the Maryland General Assembly internship program.

**ENGL 383 The Uses of Language (3)** Exploration of the social and political aspects of language use, including conversational behavior, persuasive uses of language, social dialects, and language and gender; analytical methods of pragmatics/ discourse analysis.

**ENGL 384 Concepts of Grammar (3)** Introduction to the basic units of grammatical description; motivation for and nature of constituent structure and syntactic categories; fundamental grammatical concepts employed in the teaching and learning of languages.

**ENGL 385 English Semantics (3)** An introductory study of meaning in language and paralinguage. General semantics, kinesics, linguistic relativity and recent developments in linguistic semantics.

**ENGL 391 Advanced Composition (3)** *Prerequisite: 56 hours of college credit which must include ENGL 101 or equivalent.* An advanced composition course which emphasizes constructing

written arguments accommodated to real audiences.

**ENGL 392 Advanced Composition: Pre-Law (3)** *Prerequisite: 56 hours of college credit which must include ENGL 101 or equivalent.* Techniques of argumentation and persuasion. Intensive practice to help writers achieve stylistic flexibility and correctness.

**ENGL 393 Technical Writing (3)** *Prerequisite: 56 hours of college credit which must include ENGL 101 or equivalent.* The writing of technical papers and reports.

**ENGL 394 Business Writing (3)** *Prerequisite: 56 hours of college credit which must include ENGL 101 or equivalent.* Intensive practice in the forms of written communication common in the business world—letters, memos, short reports, and proposals. Principles of rhetoric and effective style.

**ENGL 395 Writing for Health Professions (3)** *Prerequisite: 56 hours of college credit which must include ENGL 101 or equivalent.* Focus on accommodating technical material and empirical studies to lay audiences, and helping writers to achieve stylistic flexibility and correctness.

**ENGL 396 Intermediate Fiction Workshop (3)** *Prerequisite: permission of department.* Practice in the craft of writing fiction, with special attention to the revision process. Selected readings, frequent writing exercises, workshop format.

**ENGL 397 Intermediate Poetry Workshop (3)** *Prerequisite: permission of department.* Practice in the craft of writing poetry, with special attention to the revision process. Selected readings, frequent writing exercises, workshop format.

**ENGL 399 Senior Seminar (3)** Limited to graduating English majors, to be taken in the last year and preferably the last semester of the undergraduate program, normally following completion of the core courses. Topics will vary each semester; most will be interdisciplinary or will cross historical periods. The course will provide a seminar experience in material or methodologies not otherwise available to the major.

**ENGL 402 Chaucer (3)** *Prerequisite: two English courses in literature or permission of department.* Works read in Middle English. Readings may include Canterbury Tales, Troilus and Criseyde, dream visions, lyrics.

**ENGL 403 Shakespeare: The Early Works (3)** *Prerequisite: two English courses in literature or permission of department.* 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.

**ENGL 404 Shakespeare: The Later Works (3)** *Prerequisite: two English courses in literature or permission of department.* 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.

**ENGL 407 Non-dramatic Literature of the Sixteenth Century (3)** *Prerequisite: two English courses in literature or permission of department.* Poetic and prose genres—utopia, epic, narrative, lyric, sonnet, oration, epistle, sermon, apologia—in context of the literary and intellectual life of the sixteenth century. Writers such as More, Wyatt, Surrey, Sidney, and Spenser.

**ENGL 408 Literature by Women Before 1800 (3)** *Prerequisite: two English courses in literature or permission of department. Repeatable to 9 credits if content differs. Also offered as WMST 408. Credit will be granted for only one of the following: ENGL 408 or WMST 408.* Selected writings by women in the medieval and early modern era.

**ENGL 410 Edmund Spenser (3)** *Prerequisite: two English courses in literature or permission of department.* Selected works of Edmund Spenser in their literary, social, and historical contexts. Special attention to The Faerie Queene; also sonnets and lyric poetry.

**ENGL 412 Literature of the Seventeenth Century, 1600-1660 (3)** *Prerequisite: two English courses in literature or permission of department.* Works from early Stuart through Interregnum period. Major literary genres in historical contexts. Writers such as Donne, Jonson, Mary Worth, Bacon, Browne, and Marvell.

**ENGL 414 Milton (3)** *Prerequisite: two English courses in literature or permission of department.* Poetry and major prose in their social, political, and literary-historical contexts. Special attention to Paradise Lost. Other works may include Samson Agonistes and shorter poems.

**ENGL 415 Literature of the Seventeenth Century, 1660-1700 (3)** *Prerequisite: two English courses in literature or permission of department.* English poetry, drama, fiction, and non-fiction written from the Restoration of Charles II to 1700. Attention to increasing literacy and publication and greater involvement by women in literary production. Authors include Milton, Dryden, Congreve, and Behn.

**ENGL 416 Literature of the Eighteenth Century, 1700-1750 (3)** *Prerequisite: two English courses in literature or permission of department.* British literary traditions, including the poetry of Pope, the prose of Swift, the correspondence of Montagu, the drama of Gay, and early novels by Defoe, Richardson, and Fielding.

**ENGL 417 Literature of the Eighteenth Century, 1750-1800 (3)** *Prerequisite: two English courses in literature or permission of department.* British poetry, drama, fiction, and non-fiction, emphasizing innovative forms and attitudes in genres such as the gothic novel and political writings, as well as more traditional works. Authors include Johnson, Burney, Sterne, Burke, and Wollstonecraft.

**ENGL 418 Major British Writers before 1800 (3)** *Prerequisite: two English courses in literature or permission of department. Repeatable to 9 credits if content differs.* Two writers studied intensively each semester.

**ENGL 419 Major British Writers after 1800 (3)** *Prerequisite: two English courses in literature or permission of department. Repeatable to 9 credits if content differs.* Two writers studied intensively each semester.

**ENGL 420 Literature of the Romantic Period I (3)** *Prerequisite: two English courses in literature or permission of department.* First generation of writers of the early nineteenth century, including Wordsworth, Coleridge, Blake.

**ENGL 421 Literature of the Romantic Period II (3)** *Prerequisite: two English courses in literature or permission of department.* Second generation of writers of the Romantic period, including Keats, Percy and Mary Shelley, Byron, Lamb, Hazlitt.

**ENGL 422 Literature of the Victorian Period I (3)** *Prerequisite: two English courses in literature or permission of department.* Major writers between 1835 and 1865, such as Dickens, Thackeray, the Brontes, Tennyson, Browning, Carlyle, Mill.

**ENGL 423 Literature of the Victorian Period II (3)** *Prerequisite: two English courses in literature or permission of department.* Major writers between 1850 and 1890, such as Arnold, D.G. and Christina Rossetti, George Eliot, Hardy, Hopkins, Pater.

**ENGL 424 Late Victorian and Edwardian Literature (3)** *Prerequisite: two English courses in literature or permission of department.* Transition from Victorian to modern, 1885 to 1910. Literary movements and techniques; changes in thought and feeling. Writers such as Wilde, Kipling, Stevenson, Wells, Butler.

**ENGL 425 Modern British Literature (3)** *Prerequisite: two English courses in literature or permission of department.* Major Modernist writers in English prose and poetry since 1900. Such writers as Eliot, Larkin, Forster, Burgess, Durrell, Henry Green, Golding, Auden, Malcolm Lowry, Joyce, and Yeats.

**ENGL 429 Independent Research in English (1-6)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs.* Designed to provide qualified majors in English an opportunity to pursue specific English readings under the supervision of a member of the department.

**ENGL 430 American Literature, Beginning to 1810, the Colonial and Federal (3) Periods** *Prerequisite: two English courses in literature or permission of department.* Puritanism, the Enlightenment, early Romanticism. Writers such as Bradstreet, Franklin, Brown.

**ENGL 431 American Literature: 1810 to 1865, the American Renaissance (3)** *Prerequisite: two English courses in literature or permission of department.* Nationalism, Sentimentalism, Transcendentalism. Writers such as Douglass, Stowe, Melville.

**ENGL 432 American Literature: 1865 to 1914, Realism and Naturalism (3)** *Prerequisite: two English courses in literature or permission of department.* Reconstruction, Realism, Naturalism. Representative writers such as Dickinson, James, Dreiser.

**ENGL 433 American Literature: 1914 to the Present, the Modern Period (3)** *Prerequisite: two English courses in literature or permission of department.* Modernism, Postmodernism. Writers such as Stevens, Stein, Ellison.

**ENGL 434 American Drama (3)** *Prerequisite: two English courses in literature or permission of department.* American drama from late eighteenth-century to the present; emphasis on theater of the twentieth century. Authors such as Tyler, O'Neill, Hellman, Hansberry, and Albee.

**ENGL 435 American Poetry: Beginning to the Present (3)** *Prerequisite: two English courses in literature or permission of department.* Selections of American poetry, from Bradstreet to contemporary free verse. Authors such as Whitman, Dickinson, Bishop, Hughes, Rich, and Frost.

**ENGL 437 Contemporary American Literature (3)** *Prerequisite: two English courses in literature or permission of department.* Prose, poetry, drama of living American writers. Current cultural and social issues.

**ENGL 438 Major American Writers before 1865 (3)** *Prerequisite:* two English courses in literature or permission of department. Repeatable to 9 credits if content differs. Two writers studied intensively each semester.

**ENGL 439 Major American Writers after 1865 (3)** *Prerequisite:* two English courses in literature or permission of department. Repeatable to 9 credits if content differs. Two writers studied intensively each semester.

**ENGL 440 The Novel in America to 1914 (3)** *Prerequisite:* two English courses in literature or permission of department. 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.

**ENGL 441 The Novel in America Since 1914 (3)** *Prerequisite:* two English courses in literature or permission of department. Survey of the American novel since World War I. Cultural and philosophical contexts, technical developments in the genre. Authors such as Hemingway, Cather, Faulkner, Anne Tyler, Morrison.

**ENGL 442 Literature of the South (3)** *Prerequisite:* two English courses in literature or permission of department. Survey of fiction and poetry, especially the period 1900 to the present. Authors such as Faulkner, Welty, Glasgow, Wolfe, and Hurston.

**ENGL 443 Afro-American Literature (3)** *Prerequisite:* two English courses in literature or permission of department. An examination of the literary expression of the black American in the United States, from its beginning to the present.

**ENGL 444 Feminist Critical Theory (3)** *Prerequisite:* ENGL 250 or WMST 200 or WMST 250. Also offered as WMST 444. Credit will be granted for only one of the following: ENGL 444 or WMST 444. Issues in contemporary feminist thought that have particular relevance to textual studies, such as theories of language, literature, culture, interpretation, and identity.

**ENGL 445 Modern British and American Poetry (3)** *Prerequisite:* two English courses in literature or permission of department. The formation of Modernism in British and American poetry before 1930. Such poets as Yeats, Pound, H.D., Eliot, Langston Hughes, Moore, Stevens, and Williams.

**ENGL 446 Post-Modern British and American Poetry (3)** *Prerequisite:* two English courses in literature or permission of department. British and American poets from the 1930's to the present. Such poets as Auden, Williams, Plath, Brooks, Lowell, Wolcott, Ted Hughes, Bishop, Larkin, Jarrell, and Berryman.

**ENGL 447 Satire (3)** *Prerequisite:* two English courses in literature or permission of department. An introduction to English and American satire from Chaucer to the present.

**ENGL 448 Literature by Women of Color (3)** *Prerequisite:* two English courses in literature or permission of department. Repeatable to 9 credits if content differs. Also offered as WMST 448. Credit will be granted for only one of the following: ENGL 448 or WMST 448. Literature by women of color in the United States, Britain, and in colonial and post-colonial countries.

**ENGL 449 Playwriting (3)** Practice in writing one-act plays. Script development, production choices.

**ENGL 450 Early Tudor and Elizabethan Drama (3)** *Prerequisite:* two English courses in literature or permission of department. Drama of the sixteenth century, from Sir Thomas More's circle through Lyly, Greene, Marlowe, and their successors. Interludes, school drama, comedy and tragedy, professional theater. Influences of humanism, Protestantism, politics, and cultural change.

**ENGL 451 Jacobean and Caroline Drama (3)** *Prerequisite:* two English courses in literature or permission of department. Drama in early decades of the seventeenth century. Playwrights include Jonson, Middleton, Marston, Webster, Beaumont and Fletcher. Tragedy, city comedy, tragicomedy, satire, masque. Pre-Civil War theatrical, political, and religious contexts.

**ENGL 452 English Drama From 1660 to 1800 (3)** *Prerequisite:* two English courses in literature or permission of department. Restoration and eighteenth-century drama, with special attention to theater history, cultural influences, concepts of tragedy, comedy, farce, parody, and burlesque, as well as dramatic and verbal wit.

**ENGL 453 Literary Criticism (3)** *Prerequisite:* two literature courses.

**ENGL 454 Modern Drama (3)** *Prerequisite:* two English courses in literature or permission of department. The roots of European Modernism and its manifestation in the drama of the twentieth century. Such playwrights as Beckett, Churchill, Stoppard, Wilde, Chekov, Ibsen, Brecht, O'Neill, Sartre, Anouilh, Williams, and Shaw.

**ENGL 455 The Eighteenth-Century English Novel (3)** *Prerequisite:* two English courses in literature or permission of department. The origins and development of the British novel, from the late

seventeenth century until the beginning of the nineteenth. Questions about what novels were, who wrote them, and who read them. Authors such as Behn, Defoe, Richardson, Fielding, Sterne, Smollett, Burney, Radcliffe, and Austen.

**ENGL 456 The Nineteenth-Century English Novel (3)** *Prerequisite:* two English courses in literature or permission of department. Surveys major novels of the period. Attention to narrative form and realism; representations of gender and class; social contexts for reading, writing and publishing. Authors such as Austen, Bronte, Dickens, George Eliot, Trollope.

**ENGL 457 The Modern Novel (3)** *Prerequisite:* two English courses in literature or permission of department. Modernism in the novel of the twentieth century. Such writers as Joyce, Lawrence, Murdoch, James, Forster, Faulkner, Hemingway, Fitzgerald, Ellison, Welty, Nabokov and Malamud.

**ENGL 458 Literature by Women after 1800 (3)** *Prerequisite:* two English courses in literature or permission of department. Repeatable to 9 credits if content differs. Also offered as WMST 458. Credit will be granted for only one of the following: ENGL 458 or WMST 458. Selected writings by women after 1800.

**ENGL 461 Folk Narrative (3)** Personal history narrative; studies in legend, tale and myth.

**ENGL 462 Folksong and Ballad (3)** A cross-section of American folk and popular songs in their cultural contexts; artists from Bill Monroe to Robert Johnson.

**ENGL 463 American Folklore (3)** An examination of American folklore in terms of history and regional folk cultures. Exploration of collections of folklore from various areas to reveal the difference in regional and ethnic groups as witnessed in their oral and literary traditions.

**ENGL 464 African-American Folklore and Culture (3)** The culture of African Americans in terms of United States history (antebellum to the present) and social changes (rural to urban). Exploration of aspects of African American culture and history via oral and literary traditions and life histories.

**ENGL 466 Arthurian Legend (3)** *Prerequisite:* two English courses in literature or permission of department. Development of Arthurian legend in English and continental literature from Middle Ages to twentieth century. All readings in modern English.

**ENGL 468 American Film Directors (3-9)** *Prerequisite:* one college-level film course. Repeatable to 9 credits if content differs. A study of two or more American filmmakers in an analytic cultural context.

**ENGL 469 Honors Seminar: Alternative Traditions (4-5)** *Prerequisite:* permission of Director of English Honors. Repeatable to 9 credits if content differs. Year-long seminar focusing on a selected literary, cultural, or social topic that features texts and/or critical perspectives outside the traditional canon.

**ENGL 470 African-American Literature: The Beginning to 1910 (3)** *Prerequisite:* two English courses in literature or permission of department. Beginnings of African-American literature including origins of literary expression in folk tales, songs, and spirituals; slave narratives; pamphlets, essays and oratory; and the emergence of poetry and fiction. Emphasis is on interaction between literary forms and the salient political issues of the day.

**ENGL 471 African-American Literature: 1910-1945 (3)** *Prerequisite:* two English courses in literature or permission of department. 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.

**ENGL 472 African-American Literature: 1945 to Present (3)** *Prerequisite:* two English courses in literature or permission of department. 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.

**ENGL 476 Modern Fantasy and Science Fiction (3)** *Prerequisite:* two English courses in literature or permission of department. Major works of fantasy and science fiction since the mid-eighteenth century, emphasizing their continuity and their relationships to philosophical speculation, scientific discovery, literary history and cultural change.

**ENGL 477 Studies in Mythmaking (3)** *Prerequisite:* two literature courses. Major themes, figures, and configurations of northern European mythology, examining the value of the mythic mode of thought in a scientific era.

**ENGL 478 Selected Topics in English and American Literature before 1800 (1-3)** *Prerequisite:* two English courses in literature or permission of department. Repeatable if content differs.

**ENGL 479 Selected Topics in English and American Literature after 1800 (3)** *Prerequisite:* two English courses in literature or permission of department. Repeatable if content differs.

**ENGL 482 History of the English Language (3)** *Prerequisite:* ENGL 280 or LING 200 or permission of department. Origin and development of the English language.

**ENGL 483 American English (3)** *Prerequisite:* ENGL 280 or LING 200 or permission of department. Origins and development of the various dialects of English spoken in the United States.

**ENGL 484 Advanced English Grammar (3)** Credit will be granted for only one of the following: ENGL 484 or LING 402. Advanced study of grammatical description.

**ENGL 486 Introduction to Old English (3)** *Prerequisite:* two English courses in literature or permission of department. Grammar, syntax, and phonology of Old English. Works read in the original language. Poetry may include "Battle of Maldon," "Dream of the Rood," "Wanderer," "Seafarer," riddles; prose of Bede, Wulfstan, Aelfric, and other writers of Anglo-Saxon period in England.

**ENGL 487 Foundations of Rhetoric (3)** Credit will be granted for only one of the following: ENGL 487 or SPCH 401. Principles and approaches to the theory, criticism, and historical understanding of rhetorical discourse.

**ENGL 488 Topics in Advanced Writing (3)** Repeatable to 9 credits if content differs. 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.

**ENGL 489 Special Topics in English Language (3)** Repeatable to 9 credits if content differs. Current topics in language, such as linguistics, history of rhetoric, and composition studies.

**ENGL 493 Advanced Expository Writing (3)** *Prerequisite:* satisfactory completion of professional writing requirement. Writing processes and documents most necessary for professional writers.

**ENGL 494 Editing and Document Design (3)** *Prerequisite:* ENGL 391, ENGL 393 or equivalent. For ENGL majors only. 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.

**ENGL 495 Independent Study in Honors (2)** *Prerequisites:* candidacy for honors in English and ENGL 370 and ENGL 373. For ENGL majors only. Completion and presentation of the senior honors project.

**ENGL 498 Advanced Fiction Workshop (3)** *Prerequisite:* ENGL 396 or permission of department. Repeatable to 9 credits if content differs. Formerly ENGL 496. Practice in the craft of writing fiction, with emphasis on the revision process. Students encouraged to experiment with a variety of subjects, voices, and forms. Selected readings, frequent writing exercises, workshop format.

**ENGL 499 Advanced Poetry Workshop (3)** *Prerequisite:* ENGL 397 or permission of department. Repeatable to 9 credits if content differs. Formerly ENGL 497. Practice in the craft of writing poetry, with emphasis on the revision process. Students encouraged to experiment with a variety of subjects, forms, and literary conventions. Selected readings, frequent writing exercises, workshop format.

## ENMA—Engineering, Materials

**ENMA 300 Materials Science and Engineering (3)** *Prerequisite:* ENES 220. Credit will be granted for only one of the following: ENMA 300 or ENME 300. Basic principles, nature and properties of engineering materials. Processes and methods to manufacture and usefully apply engineering materials. Fabrication techniques for metals, polymers, and refractories.

**ENMA 301 Materials Engineering Laboratory (1)** Two hours of laboratory per week. Pre- or corequisite: ENMA 300. Credit will be granted for only one of the following: ENMA 301 or ENME 301. Fatigue, tensile and impact testing, heat treatment and hardenability, structure and properties of steels, case studies.

**ENMA 310 Materials Laboratory I: Structural Characterization (3)** One hour of lecture and six hours of laboratory per week. *Prerequisite:* ENES 230. *Corequisite:* ENMA 460. Junior standing. Characterization of the structure of materials including both single crystal and polycrystalline materials. Laboratories will include x-ray and electron diffraction and microscopy.

**ENMA 311 Materials Laboratory II: Electromagnetic Properties (3)** One hour of lecture and six hours of laboratory per week. *Prerequisites:* ENMA 310 and ENMA 460. Junior standing.

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Characterization of the electromagnetic properties of materials. Laboratories will include measurements of electrical and transport properties, index of refraction, and magnetic properties.

**ENMA 362 Mechanical Properties (3)** *Prerequisite: ENES 230. Junior standing or permission of department.* Fundamentals of mechanical behavior in materials. Elastic behavior, dislocations, strengthening, high temperature deformation, deformation of noncrystalline materials, tensile fracture and fatigue.

**ENMA 363 Microprocessing of Materials (3)** *Prerequisite: ENES 230.* Micro and nanoscale processing of materials. Emphasis on thin film processing for advanced technologies.

**ENMA 420 Intermediate Ceramics (3)** *Prerequisites: ENES 230, ENMA 470, and ENMA 471 or permission of department.* To introduce basic concepts such as crystal chemistry, defect chemistry and ternary phase equilibria which can also be used to illustrate the various types of advanced ceramics (superconductors; superionic conductors; dielectrics including ferroelectrics; optical materials; high temperature structural materials; etc.) and allow an understanding of their behaviors.

**ENMA 460 Physics of Solid Materials (3)** *Prerequisites: MATH 241 and PHYS 263. Junior standing.* 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.

**ENMA 461 Thermodynamics of Materials (3)** 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.

**ENMA 462 Deformation of Engineering Materials (3)** *Prerequisite: ENES 230 or permission of both department and instructor.* Relationship of structure to the mechanical properties of materials. Elastic and plastic deformation, microscopic yield criteria, state of stress and ductility. Elements of dislocation theory, work hardening, alloy strengthening, creep, and fracture in terms of dislocation theory.

**ENMA 463 Macroprocessing of Materials (3)** *Prerequisite: ENES 230. Junior standing.* Processing of modern, bulk engineering materials. Raw materials, forming, firing, finishing and joining. More emphasis on metals and ceramics than polymers.

**ENMA 464 Environmental Effects on Engineering Materials (3)** *Prerequisite: ENES 230 or permission of both department and instructor.* 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.

**ENMA 470 Structure and Properties of Engineering Materials (3)** A comprehensive survey of the atomic and electronic structure of solids with emphasis on the relationship of structure to the physical and mechanical properties.

**ENMA 471 Kinetics, Diffusion and Phase Transformations (3)** *Pre- or corequisite: ENMA 461. Junior standing or permission of department.* Fundamentals of diffusion, the kinetics of reactions including nucleation and growth and phase transformations in material.

**ENMA 472 Technology and Design of Engineering Materials (3)** *Prerequisite: ENES 230.* Relationship between properties of solids and their engineering applications. Criteria for the choice of materials for electronic, mechanical and chemical properties. Particular emphasis on the relationships between the structure of solids and their potential engineering applications.

**ENMA 473 Processing of Engineering Materials (3)** The effect of processing on the structure of engineering materials. Processes considered include refining, melting and solidification, purification by zone refining, vapor phase processing, mechanical working and heat treatments.

**ENMA 481 Introduction to Electronic and Optical Materials (3)** *Prerequisite: ENES 230 or equivalent.* 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.

**ENMA 489 Selected Topics in Engineering Materials (3)** *Prerequisite: permission of department. Repeatable to 12 credits if content differs.* To introduce basic concepts such as crystal chemistry, defect chemistry and ternary phase equilibria which can also be used to illustrate the various types of advanced ceramics (superconductors; superionic conductors; dielectrics including ferroelectrics; optical materials; high temperature structural materials; etc.) and allow an understanding of their behaviors.

**ENMA 490 Materials Design (3)** *One hour of lecture and six hours of laboratory per week. Senior standing.* Capstone design course. Students work in teams on projects evaluating a society or industry based materials problem and then designs and evaluates a strategy to minimize or eliminate the problem; includes written and oral presentations.

**ENMA 495 Polymeric Engineering Materials I (3)** *Prerequisite: ENES 230.* Study of polymeric engineering materials and the relationship to structural type. Elasticity, viscoelasticity, anelasticity and plasticity of single and multiphase materials. Emphasis is on polymeric materials.

**ENMA 496 Processing and Engineering of Polymers (3)** *Prerequisite: ENMA 495.* Processing and engineering techniques for the conversion of polymeric materials into products are discussed. Processes considered include forming, bonding and modification operations. The effect of processing on the structure and properties of polymeric materials is emphasized.

**ENMA 499 Senior Laboratory Project (1-3)** *Senior standing.* 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.

### ENME—Engineering, Mechanical

**ENME 201 Mechanical Engineering Project (1)** The disassembly and assembly of a mechanical device. A written report describing the method of operation of the device with sketches and drawings illustrating the components. Grading will be satisfactory/fail.

**ENME 205 Numerical Methods in Mechanical Engineering (3)** *Prerequisites: MATH 246 and ENES 103. For engineering majors only.* Introduction to numerical techniques and error analysis. Application to matrices, curve fitting, interpolation, differentiation and integration. Solution of algebraic equations, differential equations and eigenvalue problems as applied in mechanical engineering.

**ENME 217 Thermodynamics (3)** *Prerequisites: PHYS 262; and MATH 141.* Properties, characteristics and fundamental equations of gases and vapors. Work transfer and heat transfer, first and second laws of thermodynamics, entropy, irreversibility, availability, and the thermodynamics of mixtures.

**ENME 232 Thermodynamics (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: PHYS 262.* Introduction to thermodynamics. Thermodynamic properties of matter. First and second law of thermodynamics, cycles, reactions, and mixtures.

**ENME 252 Electronics and Instrumentation I (3)** *Two hours of lecture and two hours of laboratory per week. Corequisite: PHYS 263.* 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.

**ENME 310 Mechanics of Deformable Solids (3)** *Prerequisites: ENES 220 and ENME 205. For engineering majors only.* Introduction to the mechanics of engineering materials in three dimensions. Concepts of stress, strain, generalized Hooke's law, and equilibrium of solids. Modes of failure including plasticity, stability, fatigue, and fracture will be treated. Applications of the finite element method.

**ENME 311 Mechanics of Deformable Solids Laboratory (1)** *Corequisite: ENME 310.* A laboratory course in the mechanics of engineering materials. Concepts of stress, strain, generalized Hooke's law, and equilibrium of solids. Modes of failure including plasticity, stability, fatigue, and fracture will be treated.

**ENME 315 Intermediate Thermodynamics (3)** *Prerequisite: ENME 217.* Application of the first and second laws of thermodynamics in the analysis of basic heat engines, air compression and vapor cycles. Heat sources in fossil fuels and nuclear fuels. The thermodynamics of fluid flow.

**ENME 320 Thermodynamics (3)** *Prerequisites: MATH 141; and PHYS 262.* The properties, characteristics and fundamental equations of gases and vapors. Application of the first and second laws of thermodynamics in the analysis of basic heat engines, air compression vapor cycles. Flow and non-flow processes for gases and vapors.

**ENME 321 Transfer Processes (3)** *Prerequisites: ENME 205 and ENME 342.* Conduction by steady state and transient heat flow, laminar and turbulent flow, free and forced convection, radiation, evaporation and condensation vapors. Transfer of mass, heat and momentum.

**ENME 331 Fluid Mechanics (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: ENME 232 and ENES 221.* 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.

**ENME 332 Transfer Processes (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: ENME 331.* The principles of heat transfer. Conduction in solids. Convection. Radiation. Modern measurement techniques. Computer analysis.

**ENME 342 Fluid Mechanics I (3)** *Prerequisite: ENME 217.* Fluid flow concepts and basic equations, effects of viscosity and compressibility. Dimensional analysis and laws of similarity. Flow through pipes and over immersed bodies. Principles of flow measurement.

**ENME 343 Fluid Mechanics Laboratory (1)** *Two hours of laboratory per week. Corequisite: ENME 342.* Measurement of fluid properties, determination of pressure drops in pipes and fittings, observation of fluid phenomena. Experiment and demonstration of flow measurement techniques.

**ENME 351 Electronics and Instrumentation II (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: ENME 252 and PHYS 263.* Continuation of ENME 252. 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.

**ENME 360 Mechanical Vibrations (3)** *Prerequisites: ENES 220 and ENES 221 and ENME 205.* Dynamic characteristics of machinery with emphasis on systems with single and multiple degrees of freedom.

**ENME 361 Vibration, Controls and Optimization I (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: ENES 221 and ENES 220 and MATH 246.* 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.

**ENME 362 Vibrations, Controls and Optimization II (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: ENME 351 and ENME 361.* Continuation of ENME 361. 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.

**ENME 371 Product Engineering and Manufacturing (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: ENES 221.* Business aspects of engineering product development. Relationship of design and manufacturing. Product specification. Statistical process control. Design team development. The development process.

**ENME 381 Measurements Laboratory (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisites: ENME 360; and ENEE 300.* Required of juniors in mechanical engineering. Measurements and measurement systems, application of selected instruments with emphasis on interpretation of results.

**ENME 382 Engineering Materials and Manufacturing Processes (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: ENES 220.* Basic material structures and properties. Mechanical behavior of materials. Manufacturing processes theory. Materials processing. Quality assurance. Laboratory experiments.

**ENME 392 Statistical Methods for Product and Processes Development (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: MATH 241.* 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.

**ENME 398 Honors Research Project (1-3)**

**ENME 400 Machine Design (3)** *Prerequisites: ENME 310; and ENME 360.* Working stresses, stress concentration, stress analysis and repeated loadings. Design of machine elements. Kinematics of mechanisms.

**ENME 401 The Structure and Properties of Engineering Materials (3)** *Corequisite: ENME 310.* The nature and properties of engineering materials as related to their use in all phases of mechanical engineering will be studied. Materials covered include metals, ceramics and glasses, polymer and composites.

**ENME 403 Automatic Controls (3)** *Prerequisites: ENEE 300; and ENME 360.* Senior standing. Hydraulic, electrical, mechanical and pneumatic automatic control systems. Open and closed loops. Steady state and transient operation, stability criteria, linear and non-linear systems. Laplace transforms.

**ENME 404 Mechanical Engineering Systems Design (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: senior standing in mechanical engineering.* Design of components that form a complete working system. Engineering economics, performance-cost studies, optimization. Engineering design practice through case studies. Legal and ethical responsibility of the designer.

**ENME 405 Energy Conversion Design (3)** *Prerequisite:* senior standing in mechanical engineering. Application of the thermodynamics, fluid mechanics and heat transfer to energy conversion processes. Design of engines, compressors, heat exchangers. Energy storage and fuel handling equipment.

**ENME 408 Selected Topics in Engineering Design (3)** *Prerequisite:* senior standing in mechanical engineering or permission of department. Repeatable to 6 credits if content differs. 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.

**ENME 412 Mechanical Design For Manufacturing and Production (3)** *Prerequisite:* senior standing in engineering. The physical properties of materials. Review of key fundamental principles used in product design. Characterization of various classes of engineering materials. The types of manufacturing processes which can be applied to production of the design.

**ENME 414 Computer-Aided Design (3)** *Prerequisites:* ENME 205; and MATH 241 or equivalent. Introduction to computer graphics. Plotting and drawing with computer software. Principles of writing interactive software. The applications of computer graphics in computer-aided design. Computer-aided design project.

**ENME 415 Engineering Applications of Solar Energy (3)** *Prerequisites:* ENME 315; and ENME 321. Collection, storage, and utilization of solar thermal energy. Conversion to electricity. Component and system modeling equations. Performance analysis. Systems design.

**ENME 422 Energy Conversion II (3)** *Prerequisite:* ENME 315. Advanced topics in energy conversion. Direct conversion processes of fuel cells, solar cells, thermionics, thermoelectrics and magnetohydrodynamics.

**ENME 423 Environmental Engineering (3)** *Prerequisites:* ENME 321 and senior standing in mechanical engineering. Heating and cooling load computations. Thermodynamics of refrigeration. Low temperature refrigeration. Problems involving extremes of temperature, pressure, acceleration and radiation.

**ENME 442 Fluid Mechanics II (3)** *Prerequisites:* ENME 342 and senior standing. Hydrodynamics with engineering applications. Stream function and velocity potential, conformal transformations, pressure distributions, circulation, numerical methods and analogies.

**ENME 450 Mechanical Engineering Analysis For the Oceanic Environment (3)** Characteristics of the marine environment which affect the design, operation and maintenance of mechanical equipment, effects of waves, currents, pressure, temperature, corrosion, and fouling. Study of design parameters for existing and proposed mechanical systems used in marine construction, on shipboard, in search and salvage operations.

**ENME 465 Introductory Fracture Mechanics (3)** *Senior standing in engineering.* An examination of the concepts of fracture in members with pre-existing flaws. Emphasis is primarily on the mechanics aspects with the development of the Griffith theory and the introduction of the stress intensity factor,  $K$ , associated with different types of cracks. Fracture phenomena are introduced together with critical values of the fracture toughness of materials. Testing procedures for characterizing materials together with applications of fracture mechanics to design.

**ENME 466 Introduction to Experimental Stress Analysis (3)** *Prerequisites:* ENME 310, ENME 381 or equivalent. Principles and applications of common methods of experimental stress analysis with the special emphasis on those techniques which have gained wide acceptance in industry. Topics covered include electrical resistance strain gages and their associated instrumentation, the elementary optical methods of photoelasticity and moiré, and brittle and photoelastic coatings.

**ENME 470 Finite Element Analysis (3)** *Prerequisites:* ENME 310; and ENME 321. Basic concepts of the theory of the finite element method. Applications in solid mechanics and heat transfer.

**ENME 471 Integrated Product and Process Development I (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite:* ENME 371. Integration of product development with the development process. Organizational structures. The nature of design. Product specification. Bench marking. Design concepts. Evaluation of alternatives.

**ENME 472 Integrated Product and Process Development II (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite:* ENME 471. Continuation of ENME 471. Integration of product development with the development process. Design strategies. Product architecture. Design for manufacturing. Selection of materials. Design for assembly.

**ENME 473 Mechanical Design of Electronic Systems (3)** *Prerequisites:* ENME 310; and ENME 360; and ENME 321. Design considerations in the packaging of electronic systems. Production of circuit boards and design of electronic assemblies. Vibration, shock, fatigue and thermal considerations.

**ENME 475 Robotics (3)** *Prerequisites:* ENME 360; and ENEE 300. Basic engineering principles in the design and analysis of robots. Industrial applications of robots.

**ENME 480 Engineering Experimentation (3)** *One hour of lecture and five hours of laboratory per week. Senior standing in mechanical engineering.* Theory of experimentation. Applications of the principles of measurement and instrumentation systems to laboratory experimentation. Experiments in fluid mechanics, solid mechanics and energy conversion. Selected experiments or assigned projects to emphasize planned procedure, analysis and communication of results, analogous systems and leadership.

**ENME 488 Special Problems (3)** *Prerequisite:* permission of department. Advanced problems in mechanical engineering with special emphasis on mathematical and experimental methods.

**ENME 489 Special Topics in Mechanical Engineering (3)** *Prerequisite:* permission of department. Repeatable to 6 credits with permission of advisor. Selected topics of current importance in mechanical engineering.

## ENNU—Engineering, Nuclear

**ENNU 215 Introduction to Nuclear Technology (3)** *Prerequisites:* MATH 141; and PHYS 161. Engineering problems of the nuclear energy complex, including basic theory, use of computers, nuclear reactor design and isotopic and chemical separations.

**ENNU 310 Environmental Aspects of Nuclear Engineering (3)** *Prerequisites:* [MATH 241 or MATH 246; and PHYS 263] or permission of both department and instructor. Evaluation of environmental and safety aspects of nuclear power reactors. Calculations of radioactive decay, activation, and shielding, radiation monitoring. Biological effects of radiation, waste handling, siting, plant design and operations, as related to environment safety and licensing regulations.

**ENNU 320 Nuclear Reactor Operation (3)** *Two hours of lecture and two hours of laboratory per week.* Introduction to nuclear reactor operations. Outline of reactor theory. Nature and monitoring techniques of ionizing radiation, radiation safety. Reactor instrument response. Operation of the University of Maryland nuclear reactor.

**ENNU 398 Honors Research Project (1-3)**

**ENNU 430 Radioisotope Power Sources (3)** *Prerequisite:* ENNU 215 or permission of both department and instructor. Principles and theory of radioisotope power sources. Design and use of nuclear batteries and small energy conversion devices.

**ENNU 435 Activation Analysis (3)** *Prerequisite:* ENNU 215 or permission of both department and instructor. Principles and techniques of activation analysis involving neutrons, photons and charged particles. Emphasis placed upon application of this analytical technique to solving environmental and engineering problems.

**ENNU 440 Nuclear Technology Laboratory (3)** *One hour of lecture and four hours of laboratory per week. Prerequisites:* MATH 240; and PHYS 263. Techniques of detecting and making measurements of nuclear or high energy radiation. Radiation safety experiments. Both a sub-critical reactor and the swimming pool critical reactor are sources of radiation.

**ENNU 441 Nuclear Engineering Laboratory I (1)** *One hour of lecture and two hours of laboratory per week. Corequisite:* ENNU 450. Methods of radiation detection. Principles and uses of radiation detectors and electronics. Geiger counting and statistical analysis. Fundamentals of gamma spectroscopy.

**ENNU 442 Nuclear Engineering Laboratory II (1)** *One hour of lecture and two hours of laboratory per week. Prerequisite:* ENNU 441. *Corequisite:* ENNU 455. Principles of radiation detectors and electronics. Use of Maryland University Training Reactor for criticality experiments and activation analysis. Fundamental heat transfer experiments. Data acquisition and analysis.

**ENNU 443 Nuclear Engineering Laboratory III (1)** *One hour of lecture and two hours of laboratory per week. Prerequisites:* ENNU 441 and ENNU 442. Heat transfer, fluid flow, boiling experiments. Applications to reactor systems and components. Observation of thermalhydraulic phenomena. Gamma shielding analysis.

**ENNU 450 Nuclear Reactor Engineering I (3)** *Prerequisites:* [MATH 246; and PHYS 263] or permission of both department and instructor. Elementary nuclear physics, reactor theory, and reactor energy transfer. Steady-state and time-dependent neutron distributions in space and energy. Conduction and convective heat transfer in nuclear reactor systems.

**ENNU 455 Nuclear Reactor Engineering II (3)** *Prerequisite:* ENNU 450. General plant design considerations including radiation hazards and health physics, shielding design, nuclear power economics, radiation effects on reactor materials, and various types of nuclear reactor systems.

**ENNU 460 Nuclear Heat Transport (3)** *Prerequisite:* ENNU 450. Heat generation in nuclear reactor cores, conduction and transfer to coolants. Neutron flux distributions, fission and heat release. Steady and unsteady state conduction in fuel elements. Heat transfer to nonmetallic and metallic coolants. Heat transfer with phase change. Thermal design of reactor cores.

**ENNU 461 Chemical Separation in the Nuclear Cycle Reactor Fuel (3)** *Prerequisite:* ENNU 450 or permission of both department and instructor. An introduction to chemical and physical separation of the nuclear reactor fuel. Basic separation processes, reactor fuel fabrication, reactor chemistry problems and the handling and treatment of radioactive waste. Calculations of plant design and operation. Related safety issues.

**ENNU 465 Nuclear Reactor Systems Analysis (3)** *Prerequisites:* [MATH 246; and PHYS 263; and ENNU 455] or permission of both department and instructor. Power reactor (BWR,PWR,HTGR) system design and analysis. System specifications and modes of operation. Plant documentation (PSAR,FSAR, etc.). Piping and instrumentation drawings. Theory and application of pump and piping calculations. Steam power plant cycles and calculations. Steam plant equipment (turbines, heaters, condensers, etc.) analysis.

**ENNU 468 Research (2-3)** *Prerequisite:* permission of both department and instructor. Repeatable to 6 credits. Investigation of a research project under the direction of one of the staff members. Comprehensive reports are required.

**ENNU 470 Introduction to Controlled Fusion (3)** *Prerequisite:* senior standing in engineering or permission of both department and instructor. The principles and the current status of research to achieve controlled thermonuclear power production. Properties of ionized gases relating to confinement and heating. Concepts of practical fusion devices.

**ENNU 480 Reactor Core Design (3)** *Prerequisite:* ENNU 450 or permission of both department and instructor. Design of nuclear reactor cores based on a sequence of standard computer codes. Thermal and epithermal cross sections, multigroup diffusion theory in one and two dimensions and fine structure flux calculations using transport theory.

**ENNU 485 Nuclear Reactor Thermalhydraulics (3)** *Prerequisites:* ENNU 465, ENME 321 and ENME 342 or equivalent. Thermalhydraulic response of nuclear power plant systems. Accident analysis and impact of emergency systems. Boiling phenomena, nucleate boiling, critical heat flux, condensation. Containment thermalhydraulic analysis. Overview of principal thermalhydraulic computer codes.

**ENNU 489 Special Topics in Nuclear Engineering (3)** *Prerequisite:* permission of department. Repeatable to 6 credits if content differs. Selected topics of current importance in nuclear engineering.

**ENNU 490 Nuclear Fuel and Power Management (3)** *Prerequisites:* [ENNU 460; and ENNU 480] or permission of both department and instructor. Physics and economics of the nuclear fuel cycle utilizing existing design codes. Mining, conversion, enrichment, fabrication, reprocessing processes. Effects of plutonium recycle, in-core shuffling, fuel mechanical design and power peaking on fuel cycle costs.

**ENNU 495 Nuclear Engineering Systems Design (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisites:* ENNU 455 and ENNU 480 and Senior standing in nuclear engineering. Senior capstone design course. Major design experience that emphasizes putting student's engineering knowledge into practice. Design topic is one of current interest in nuclear engineering. Design methodology, creativity, feasibility, reliability, and economic analyses of the overall design required. Students work in teams, and present oral and written design reports.

## ENRE—Reliability Engineering

**ENRE 400 Principles of Quality and Reliability in Engineering (3)** *Not open to reliability engineering graduate students.* Introduction to the basic principles of reliability and quality. Quality topics include: quality loss function, causes of variation and variance reduction techniques, and quality control activities and process control charts. Reliability topics include: basic probability and statistics, component and system reliability models, reliability analysis tools and physics of failure in product development.

**ENRE 462 Basic Reliability Engineering (3)** *Corequisite:* ENRE 470. *Senior standing.* Organization, management and communication concepts in reliability engineering. Mechanisms and physics of failure, methods for failure-rate determination, methods of design for reliability, maintainability concepts, life cycle costing, equipment sparing policies, and measuring reliability for improvement.

**ENRE 467 System Safety Engineering (3)** *Prerequisites:* MATH 246 and PHYS 263 or permission of department. Role of system safety, the language of system safety, and programs for achieving

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safety such as the problem solving process, safety criteria, safety descriptors, checklist-timeliness elements, safety training, hazard analysis, and uncertainty in safety measurements. Time-phased indicators, hazard nomenclature, hazard mode and effect analysis, hazard classification, hazard probability, survival rate, distributions applied to human performance.

**ENRE 470 Basic Reliability Analysis (3)** *Prerequisite: MATH 246 and PHYS 263 or permission of department. Corequisite: ENRE 462. Senior standing.* Principal methods of reliability analysis, including fault tree and reliability block diagrams, method of failure mode and effect analysis (FMEA); event tree construction and evaluation; reliability data collection and analysis; methods of modeling systems for reliability analysis. Focus on systems of concern to all engineers, such as, problems related to process industries, fossil-fueled power plant availability, and other subjects. Methods of quality control and assurance.

**ENRE 489 Special Topics in Reliability Engineering (3)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs.* Selected topics of current importance in reliability engineering.

### ENTM—Entomology

**ENTM 100 Insects (3)** A survey of the major groups of insects, their natural history, and their relationships with humans and their environment.

**ENTM 111 Beekeeping (2)** First semester. A study of the life history, behavior and seasonal activities of the honeybee, its place in pollination of flowers with emphasis on plants of economic importance and bee lore in literature.

**ENTM 205 Principles of Entomology (4)** *Three hours of lecture and two hours of laboratory per week.* An introductory overview to the biology and diversity of insects. Basic physiological, ecological and behavioral processes that result in the dominance of insects in the animal kingdom. The management of pest insect populations and the consequences of the strategies used to regulate insect pests. A collection is required.

**ENTM 303 International Pesticide Problems and Solutions (3)** *Prerequisites: (BIOL 101 and BIOL 102) or (PBIO 100 and PBIO 101) or BIOL 105.* An assessment of the global pesticide problems and environmental, social, economic and political consequences. Case studies examine how human perceptions, international aid, corporations, laws, and other factors affect use of pesticides and the solutions to them. Emphasis on problems and solutions in both developed and developing countries.

**ENTM 313 Biodiversity Issues in Conservation Management (3)** *Prerequisite: PBIO 200 or ENTM 205 or ZOO 210 or permission of department.* How biological diversity affects the stability and economic viability of agriculture, urban landscapes, and other managed resources and what actions can be taken to reduce losses.

**ENTM 398 General Colloquium in Entomology (1)** *Prerequisite: ENTM 205 or permission of department.* Presentation of original research by invited guest speakers, faculty, and graduate students. No more than 1 credit hour of ENTM 398 may be applied to the 120 credit hours needed for the Bachelor's degree.

**ENTM 399 Special Problems (1-2)** *Prerequisite: ENTM 205 and permission of department.* Credit to be determined by the department. Should be taken during the junior year. Investigations of assigned entomological problems. No more than 4 credit hours of ENTM 399 may be applied to the 120 credit hours needed for the Bachelor's degree.

**ENTM 423 Insect Form and Function (4)** *Three hours of lecture and three hours of laboratory per week. Prerequisite: ENTM 205 or permission of department.* Evolutionary morphology, physiology, and biomechanics of insects and other arthropods; anatomy of representative insects; methods of functional and morphological analysis.

**ENTM 424 Insect Diversity and Classification (4)** *One hour of lecture and six hours of laboratory per week. Prerequisite: ENTM 205 or permission of department.* The techniques of collecting insects in the field and their classification into the latest hierarchical scheme. Field trips will visit habitats throughout the state. An insect collection is required.

**ENTM 428 Ecology of Aquatic Insects (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisite: ENTM 205 or permission of instructor.* Biology, ecology, and identification of insects in lotic and lentic aquatic habitats, their adaptation to aquatic life, their function in aquatic ecosystems, and their relationship to environmental deterioration. Field trips and independent project required.

**ENTM 451 Insect Pests of Agricultural Crops (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisite: ENTM 205.* The recognition, biology and control of insects injurious to fruit and vegetable crops, field crops and stored products.

**ENTM 453 Insect Pests of Ornamentals and Turf (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisite: ENTM 205 or permission of department.* The recognition, biology and control of insects and mites injurious to ornamental shrubs, trees, greenhouse crops, and turf. Emphasis on pests of woody ornamental plants.

**ENTM 454 Principles of Plant Protection (2)** *One hour of lecture and two hours of laboratory per week. Prerequisite: ENTM 205 or permission of department.* Systematic assessment of the principles of plant protection and pest population management.

**ENTM 472 Medical and Veterinary Entomology (4)** *Three hours of lecture and two hours of laboratory per week. Prerequisite: ENTM 205 or permission of department.* A study of the morphology, taxonomy, biology and control of the arthropod parasites and disease vectors of man and animals. The ecology and behavior of vectors in relation to disease transmission will be emphasized.

**ENTM 499 Selected Topics in Entomology (2-4)**

### FMST—Family Studies

**FMST 105 Individuals in Families (3)** *Formerly FMCD 105.* Personal growth and development within the family context. Exploration of self-awareness, sex-role image, life transitions, and interpersonal and family relations.

**FMST 201 Families in Communities (3)** *Formerly FMCD 201.* Theory and practice regarding the impact of communities on the quality of family life.

**FMST 260 Couple Relationships (3)** *Formerly FMCD 260.* Couple relationships and their alternatives in contemporary dating, courtship and marriage.

**FMST 290 Family Economics (3)** 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.

**FMST 298 Special Topics in Family Studies (1-3)** *Repeatable to 12 credits if content differs.* Topics of special interest under the general guidance of the Department of Family Studies.

**FMST 302 Research Methods in Family Studies (3)** *Prerequisite: introductory statistics course. For FMST majors only. Formerly FMCD 302.* 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.

**FMST 330 Family Theories and Patterns (3)** *Junior standing. Formerly FMCD 330.* Theory and research on the family, including a cross-cultural analysis of family patterns.

**FMST 332 Children in Families (3)** *Prerequisite: FMST 105 or PSYC 100. Formerly FMCD 332.* 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.

**FMST 341 Personal and Family Finance (3)** *Credit will be granted for only one of the following: FMCD 441, FMST 341, FMCD 341 or CNEC 410. Formerly FMCD 341.* 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.

**FMST 343 Consumer Issues for Families (3)** *Prerequisite: ECON 201 or ECON 205, or permission of department. Formerly FMCD 343.* Families as consumers of products, goods, and services. Special emphasis on the investigation of current issues.

**FMST 370 Interpersonal Communication Processes (3)** *Formerly FMCD 370.* Training in interpersonal communication skills. Relevant concepts, principles, and models.

**FMST 381 Poverty, Affluence, and Families (3)** *Prerequisite: SOCY 100 or SOCY 105. Formerly FMCD 381.* Social, political, cultural and economic factors influencing income and wealth in American families.

**FMST 383 Delivery of Human Services to Families (3)** *Prerequisite: FMST 330. Formerly FMCD 383.* Processes of service delivery with special emphasis upon relationships among managers, service providers and clients. The impact of human service systems on families.

**FMST 399 Independent Study (1-6)** *Prerequisite: permission of department. Repeatable to 12 credits. Formerly FMCD 399.*

**FMST 430 Gender Issues in Families (3)** *Prerequisite: SOCY 100 or SOCY 105 or PSYC 100. Also offered as WMST 430. Credit will be granted for only one of the following: FMST 430 or WMST 430. Formerly FMCD 430.* The development of historical, cultural,

developmental, and psychosocial aspects of masculinity and femininity within the context of contemporary families and the implications for interpersonal relations.

**FMST 431 Family Crises and Intervention (3)** *Prerequisite: PSYC 100. Formerly FMCD 431.* Family crises such as divorce, disability, substance abuse, financial problems, intrafamilial abuse, and death. Theories and techniques for intervention and enhancement of family coping strategies.

**FMST 432 Intergenerational Aspects of Family Living (3)** *Prerequisites: PSYC 100; and SOCY 100; and FMST 332 (or other human development course). Formerly FMCD 432.* The historical, cultural, developmental, and psychosocial experiences of contemporary American generations. Interactions across generations within the family and the consequences for individual development. Cross-national comparisons.

**FMST 444 Family Services and Human Service Organizations (3)** *Prerequisite: FMST 383 or equivalent. Formerly FMCD 444.* Review and analysis of well-functioning human service organizations, including issues of management, decision-making, workplace culture, budgeting, and evaluation of the workforce.

**FMST 445 Family Resource Management (3)** *Formerly FMCD 445.* Interrelationship of resources (time, money, energy, space, materials and human resources) in operation of the household and in meeting demands of multiple roles of family members. Management as intervention strategy.

**FMST 447 Persons with Disabilities in Families (3)** *Prerequisite: PSYC 100 or SOCY 100. Formerly FMCD 447.* Family and community issues for persons with disabilities and their families.

**FMST 452 Family Policy Analysis (3)** *Prerequisite: permission of department. Formerly FMCD 452.* Examination of public, private, and non-profit sector policies and their impact on the quality of family life. Emphasis on policy formation, implementation, and evaluation.

**FMST 460 Violence in Families (3)** *Prerequisite: PSYC 100 or SOCY 100 or SOCY 105. Formerly FMCD 460.* 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.

**FMST 477 Internship and Analysis in Family Studies (3)** *Prerequisites: FMST 383, plus an additional six FMST credits and permission of department. For FMST majors only. Credit will be granted for only one of the following: FMST 477 or FMST 347. Formerly FMST 347.* A supervised internship and a seminar requiring analysis. Opportunities to integrate theory and practice including 120 hours of contracted field experience. Summer/fall internship contracts due May 1; Spring contracts due December 1. See department for application procedures.

**FMST 480 Work and Family Issues and Programs (3)** *Formerly FMCD 480.* The purpose, nature, organization and administration of worksite, or employer-based, family support resources, including child and elder care referral and subsidies, parenting education, health and wellness programs, parental and sick child leaves, and flexible work scheduling.

**FMST 485 Introduction to Family Therapy (3)** *Prerequisites: FMST 330 or FMST 370; or one psychology course at 300 or above level. Formerly FMCD 485.* The fundamental theoretical concepts and clinical procedures of marital and family therapy including pre-marital and divorce therapy issues.

**FMST 487 Legal Aspects of Family Problems (3)** *Formerly FMCD 487.* Laws and legal procedures, with emphasis on adoption, marriage, divorce, annulment, and property rights, and how they affect family life.

**FMST 497 The Child and the Law (3)** *Formerly FMCD 497.* Legislation and case law regarding children's legal rights with emphasis on the rights of children in the juvenile justice system, and rights to medical, educational, and other social services.

**FMST 498 Special Topics (1-3)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs. Formerly FMCD 498.* Special course topics in family studies.

### FOLA—Foreign Language

**FOLA 108 Elementary Foreign Languages I (3)** *Repeatable if content differs.* The first semester of conversational study of a language not otherwise offered. The arts and humanities language requirement may be fulfilled by successful completion of FOLA 108, FOLA 109, FOLA 118 and FOLA 119 in a single language.

**FOLA 109 Elementary Foreign Languages II (3)** *Prerequisite: FOLA 108 in the subject language or permission of department. Repeatable if content differs.* The second semester of conversational study of a language not otherwise offered. The arts and humanities language requirement may be fulfilled by successful completion of FOLA 108, FOLA 109, FOLA 118 and FOLA 119 in a single language.

**FOLA 118 Intermediate Foreign Languages I (3)** *Prerequisite:* FOLA 109 in the subject language or permission of department. Repeatable if content differs. The third semester of conversational study of a language not otherwise offered. The arts and humanities language requirement may be fulfilled by successful completion of FOLA 108, FOLA 109, FOLA 118 and FOLA 119 in a single language.

**FOLA 119 Intermediate Foreign Language II (3)** *Prerequisite:* FOLA 118 in the subject language or permission of department. Repeatable if content differs. Developing intermediate language skills, in both grammar and vocabulary; enhancement of oral and writing abilities.

**FOLA 128 Introductory Middle Eastern Languages I (3)** *Prerequisite:* permission of department. Repeatable to 9 credits if content differs. An introduction to the three principal languages of the Islamic Middle East: Arabic, Persian, and Turkish. Only standard written form of the three languages is taught. May not be used to satisfy arts and humanities language requirement.

**FOLA 129 Introductory Middle Eastern Languages II (3)** *Prerequisite:* FOLA 128 and permission of department. Repeatable to 9 credits if content differs. Continuation of FOLA 128. May not be used to satisfy arts and humanities language requirement.

**FOLA 138 Directed Study of a Foreign Language I (3)** *Open only by permission of department to students of high motivation and proven language learning aptitude.* Directed study of a modern foreign language with use of a self-instructional approach.

**FOLA 139 Directed Study of a Foreign Language II (3)** *Prerequisite:* FOLA 138 in the same language or permission of department. A continuation of FOLA 138.

**FOLA 148 Directed Study of a Foreign Language III (3)** *Prerequisite:* FOLA 139 in the same language or permission of department. A continuation of FOLA 139.

**FOLA 149 Directed Study of a Foreign Language IV (3)** *Prerequisite:* FOLA 148 in the same language or permission of department. A continuation of FOLA 148.

**FOLA 158 Directed Study of a Foreign Language (Intensive) I (6)** *Open only by permission of department to students of very high motivation and proven language learning aptitude.* Intensive directed study of a modern foreign language with use of a self-instructional approach. Equivalent to FOLA 138 plus FOLA 139.

**FOLA 159 Directed Study of a Foreign Language (Intensive) II (6)** *Prerequisite:* FOLA 158 in the same language or permission of department. A continuation of FOLA 158. Equivalent to FOLA 148 plus FOLA 149.

**FOLA 228 Intermediate Middle Eastern Languages I (3)** *Prerequisite:* FOLA 129 and permission of department. Repeatable to 9 credits if content differs. Continuation of FOLA 129. May not be used to satisfy arts and humanities language requirement.

**FOLA 329 Advanced Middle Eastern Languages II (3)** *Prerequisite:* FOLA 328 or permission of department. Repeatable to 9 credits if content differs. Continuation of FOLA 328. May not be used to satisfy arts and humanities language requirement.

**FOLA 389 Foreign Civilization (3)** Repeatable to 6 credits if content differs. A survey of the cultural history, arts and letters, folklore and life-style of the speakers of a language not otherwise offered. All readings and instruction in English.

**FOLA 408 Foreign Language I (3)** Intensive study of a foreign language or related topic not available under one of the current foreign language departments or programs. May not be used to fulfill the arts and humanities language requirement.

**FOLA 409 Foreign Language II (3)** *Prerequisite:* FOLA 408 in the same language or topic. A continuation of FOLA 408. May not be used to fulfill arts and humanities language requirement.

**FOLA 459 Foreign Literature in Translation (3)** Repeatable to 6 credits if content differs. Reading and discussion of selected authors, periods or genres of a foreign literature not otherwise offered. All readings and instruction in English.

## FREN—French

**FREN 101 Elementary French (4)** Four classroom meetings per week plus one laboratory hour. Not open to students with 2 or more years of high-school level French. Introduction to basic structures and pronunciation with emphasis on the four skills: listening, speaking, reading and writing.

**FREN 102 Elementary French (4)** Four classroom meetings plus one laboratory hour per week. *Prerequisite:* FREN 101 at UMCP or permission of department. Further work on basic structures and pronunciation with emphasis on the four skills: listening, speaking, reading and writing.

**FREN 103 Review of Elementary French (4)** Limited to students who have had at least two years of high-school French or

equivalent or who do not qualify for FREN 203. Credit will be granted for only one of the following: FREN 101/ FREN 102 or FREN 103.

**FREN 121 Accelerated French I (3)** *Prerequisite:* good background in at least one other foreign language (successful completion of level 4 in high school or equivalent at the university level; or linguistic competence acquired by residence abroad; or demonstration of equivalent proficiency). An intensive beginning course in French language skills to enable the student to move more quickly to advanced courses. With FREN 122, may be used to satisfy language requirements.

**FREN 200 French For Reading (3)** Course not open to students who have completed two years of high school French or two semesters college French within the last five years nor to students for whom French is the native language. Intensive course designed to bring students to a basic reading and translating competence of ordinary literary and scientific French, with the aid of a dictionary, in one semester. Study of essential grammar, but no spoken or written French involved. No prerequisites. May not be used to satisfy the language requirement of the College of Arts and Humanities.

**FREN 202 Honors Intermediate French (4)** Four hours of lecture per week. Credit will be granted for only one of the following: FREN 202 or FREN 203. Introductory readings in French literature and culture for students wishing an intensive, accelerated version of FREN 203. Designed primarily for highly motivated students. Fulfills the Arts and Humanities language requirement.

**FREN 203 Intermediate French (4)** Completion of the study of basic grammatical structures, with readings, conversation, and composition. Fulfills the Arts and Humanities language requirement.

**FREN 204 Review Grammar and Composition (3)** *Prerequisite:* FREN 203 or permission of department. An intensive review of major aspects of contemporary grammatical usage; training in comprehension and guided composition.

**FREN 211 Intermediate Conversation (3)** Not open to native speakers. *Prerequisite:* FREN 203 or permission of department. Practice in spoken French with emphasis on contemporary French topics.

**FREN 240 Masterworks of French Literature in Translation (3)** Major works of French literature from pre-revolutionary France to the present. Emphasis on the individual in a social context. In English.

**FREN 241 Women Writers of French Expression in Translation (3)** Also offered as WMST 241. Credit will be granted for only one of the following: FREN 241 or WMST 241. Works and ideas of 20th century women writers of French in Canada, Africa, the Caribbean and France. Taught in English.

**FREN 242 Black Writers of French Expression in Translation (3)** An analysis of the works and ideas of 20th century black writers of French in Africa, the Caribbean and France. Taught in English.

**FREN 250 Readings in French (3)** *Prerequisite:* FREN 203 or equivalent. Not open to native speakers. Selected readings from various genres in French literature. Discussion and brief written reports in French.

**FREN 301 Composition and Style (3)** *Prerequisite:* FREN 204 or permission of department. Grammatical analysis, translation, free and guided composition.

**FREN 302 Practicum in Translation I (3)** *Prerequisite:* FREN 301 or permission of department. Problems and strategies of translation into both English and French. Journalistic and literary styles.

**FREN 303 Practicum in Translation II (3)** *Prerequisite:* FREN 301 or permission of department. Problems and strategies of translation into both English and French. Commercial, political and diplomatic styles.

**FREN 306 Commercial French I (3)** *Prerequisite:* FREN 301 or permission of department. Introduction to commercial French including correspondence and business terminology. Emphasis on cross-cultural concepts needed for successful interaction within business settings. In French.

**FREN 311 French Conversation (3)** *Prerequisite:* any 200-level course in French above FREN 203 or permission of department. Not open to native speakers. Development of aural comprehension and oral expression through use of radio and television broadcasts.

**FREN 312 Introduction to French Culture: The French Press (3)** *Prerequisite:* any 200-level course in French above FREN 203 or permission of department. Not open to native speakers. Analysis and discussion of articles from French and Francophone printed media, reflecting a variety of sources and styles.

**FREN 351 French Literature From the Revolution to the Present (3)** *Prerequisite:* FREN 204 or FREN 250 or permission of department. A survey of the chief authors and major movements of

French literature from Pre-Romanticism to the present.

**FREN 352 French Literature From the Middle Ages to the Revolution (3)** *Prerequisite:* FREN 204 or FREN 250 or permission of department. A survey of the chief authors and major movements of French literature from the Middle Ages to the end of the 18th century.

**FREN 370 Aspects of French Civilization (3)** Credit may not be counted toward a French major. Political, social, intellectual, and literary forces shaping contemporary France, from the French Revolution to the present. Taught in English.

**FREN 398 Practicum in Spoken French (1)** *Prerequisite:* FREN 312 or permission of department. Credit may not be counted toward a French major. Repeatable to 3 credits. Practice in French conversation at the advanced level. Satisfactory/Fail only.

**FREN 399 Directed Study in French (1-3)** *Prerequisite:* permission of department. Repeatable to 3 credits. Intended for advanced undergraduates who wish to work on an individual basis with a professor of their choice. Open as elective to all students, but may not be counted toward French major. May be taken for one, two or three credits, according to nature and scope of work envisaged. Grading method: Satisfactory/Fail only.

**FREN 400 Applied Linguistics (3)** The nature of applied linguistics and its contribution to the effective teaching of foreign languages. Comparative study of English and French, with emphasis upon points of divergence. Analysis, evaluation and construction of related drills.

**FREN 401 Advanced Composition and Style (3)** *Prerequisite:* FREN 301 or permission of department. Comparative stylistic analysis; translation.

**FREN 402 Advanced Grammar and Phonetics (3)** *Prerequisite:* FREN 301 or permission of department. Theory and practice of grammatical structures and rules of phonetics.

**FREN 404 Issues in the French-Speaking World Today (3)** *Prerequisite:* FREN 311 or FREN 312 or permission of department. A socio-cultural and historical approach to relevant issues affecting contemporary French civilization. Press articles and television programs will be the basis for classroom cultural analysis and oral communication.

**FREN 405 Explication De Texte (3)** Oral and written analysis of short literary works, or of excerpts from longer works chosen for their historical, structural, or stylistic interest, with the purpose of training the major to understand literature in depth and to make mature esthetic evaluations of it.

**FREN 406 Commercial French II (3)** *Prerequisite:* FREN 306 or permission of department. Advanced study of commercial French language—terminology and style—leading to preparation for the Paris Chamber of Commerce Examination.

**FREN 407 History of the French Language (3)** Evolution of the French language from Latin to modern French.

**FREN 419 Studies in Medieval French Literature (3)** Repeatable to 6 credits if content differs. Selected topics in medieval French literature.

**FREN 429 Studies in French Literature of the Renaissance (3)** Repeatable to 6 credits if content differs. Selected topics in French literature of the Renaissance.

**FREN 439 Studies in 17th Century French Literature (3)** Repeatable to 6 credits if content differs. Selected topics in seventeenth-century French literature.

**FREN 449 Studies in 18th Century French Literature (3)** Repeatable to 6 credits if content differs. Selected topics in eighteenth-century French literature.

**FREN 459 Studies in 19th Century French Literature (3)** Repeatable to 6 credits if content differs. Selected topics in nineteenth-century French literature.

**FREN 469 Studies in 20th Century French Literature (3)** Repeatable to 6 credits if content differs. Selected topics in twentieth-century French literature.

**FREN 471 French Civilization I (3)** French life, customs, culture, traditions (800-1750).

**FREN 472 French Civilization II (3)** French life, customs, culture, traditions (1750 to the early twentieth century).

**FREN 473 Cross-Cultural Approaches to the Study of Contemporary French (3)** Society Patterns of communication, mythology, and ideology in modern France, from the Third Republic to the present, through historical and cross-cultural approaches, with reference to the Francophone world.

**FREN 474 Contemporary France: A Sociocritical Approach (3)** Recommended: FREN 473. A sociocritical approach to understanding modern French society through the study of print and non-print media documents (autobiography, film, and

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paraliterature), with reference to the Francophone world.

**FREN 478 Themes and Movements of French Literature in Translation (3)** Studies treatments of thematic problems or of literary or historical movements in French literature. Topic to be determined each semester. Taught in English.

**FREN 479 Masterworks of French Literature in Translation (3)** Treats the works of one or more major French writers. Topic to be determined each semester. Taught in English.

**FREN 480 French Cinema: A Cultural Approach (in Translation) (3)** Formerly FREN 475. A study of French culture, civilization, and literature through the medium of film. Taught in English.

**FREN 481 Femmes Fatales and the Representation of Violence in Literature, (3) Opera and Film (in English)** The problem of violence in art with respect to women and marginal populations. Taught in English.

**FREN 482 Gender and Ethnicity in Modern French Literature (3)** 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.

**FREN 483 I and They: Conflict Between Individual and Society in French (3) Literature** The alienation of the individual in conflict with society reflected in French works from the absolutist society of the 17th century to the disintegration of societal norms today. Taught in English.

**FREN 484 The Age of Anxiety: Existentialism and the Absurd (in Translation) (3)** Existentialism and the Absurd in 20th century French literature. Taught in English.

**FREN 485 Ideologies and Relations between the Sexes in French Literature (3) (in Translation)** The evolution of sexual mores in the Western world as reflected in masterworks of French literature from the 12th to the 20th centuries. Taught in English.

**FREN 489 Pro-Seminar in Themes or Movements of French Literature (3)** Repeatable to 6 credits if content differs.

**FREN 495 Honors Thesis Research (3)** Open only to students admitted to the departmental honors program. 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.

**FREN 498 Special Topics in French Literature (3)** Repeatable to 6 credits if content differs.

**FREN 499 Special Topics in French Studies (3)** Repeatable to 6 credits if content differs. An aspect of French studies, the specific topic to be announced each time the course is offered.

## GEMS—Gemstone

**GEMS 101 Technological Innovation: An Historical Perspective (3)** Two hours of lecture, one hour of laboratory, and one hour of discussion/recitation per week. For Gemstone participants only. Recommended: ENES 100G. First in a three-course sequence on the implications of technology that forms part of the Gemstone program. Combines history with technical disciplines to demonstrate: 1) how the discipline of history defines and analyzes problems; 2) how modern technical concepts emerge from historical experience; 3) how the application of these concepts has been shaped by social and cultural issues; 4) the implications of these concepts for defining and addressing modern technological problems.

## GEOG—Geography

**GEOG 100 Introduction to Geography (3)** 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.

**GEOG 110 The World Today: A Regional Geography (3)** An examination of the functioning world today and the regions and major countries that are part of the whole. Organized around the framework of modern and traditional lifestyles with the aim of providing understanding of the world and its regions for the general education student.

**GEOG 120 Nations in Conflict: A Spatial View (3)** The geographic characteristics of conflict areas around the world. Issues common to international disputes such as: uneven access to resources, population pressures, religious differences and boundary disputes.

**GEOG 123 Causes and Implications of Global Change (3)** Also offered as GEOL 123, METO 123, and PBIO 123. Credit will be granted for only one of the following: GEOG 123, GEOL 123, METO 123, or PBIO 123. A unique experience in integrating physical, chemical, geological, and biological sciences with geographical,

economic, sociological, and political knowledge skills toward a better understanding of global change. Review of environmental science relating to weather and climate change, acid precipitation, ozone holes, global warming, and impacts on biology, agriculture, and human behavior. Study of the natural, long-term variability of the global environment, and what influence mankind may have in perturbing it from its natural evolution. Concepts of how physical, biological, and human behavioral systems interact, and the repercussions which may follow human endeavors. The manner in which to approach decision and policy making related to global change.

**GEOG 130 Developing Countries (3)** An introduction to the geographic characteristics of the development problems and prospects of developing countries. Spatial distribution of poverty, employment, migration and urban growth, agricultural productivity, rural development, policies and international trade. Portraits of selected developing countries.

**GEOG 140 Coastal Environments (3)** Introduction to coastal environments with emphasis on U.S. East Coast. Physical and ecological systems, beach processes, waves, currents, human impacts, coastal zone management and shoreline engineering. Case studies of coastal areas, including Ocean City, Maryland.

**GEOG 150 World Cities (3)** An introduction to the forces that affect the growth of cities in different parts of the world. Regional variations in city design and examples of great world cities. The impact of changing technologies, economic and social change on the evolution of the city. Current and emerging trends.

**GEOG 170 Maps and Map Use (3)** The use and interpretation of maps encountered in both "everyday" reading, and in scientific literature. Development of skills in map reading, environmental analysis, interpretation and orienteering.

**GEOG 171 Maps and Map Use Laboratory (1)** Two hours of laboratory per week. Pre- or corequisite: GEOG 170. A laboratory course to accompany GEOG 170. Experience with maps as research tools; coordinate systems; projections; measurement of angles, directions, distance, area; topographic maps; map interpretation; symbolization; statistical mapping; spatial arrangement; and remote sensing.

**GEOG 201 Geography of Environmental Systems (3)** A systematic introduction to the processes and associated forms of the atmosphere and earth's surfaces emphasizing the interaction between climatology, hydrology and geomorphology.

**GEOG 202 The World in Cultural Perspective (3)** The imprint of cultural traits, such as religion, language and livelihood systems, on the earth's landscape. The transformation of the earth's surface as a result of cultural diversity, settlement patterns, political organization, cultural evolution, and population growth.

**GEOG 203 Economic Geography (3)** The spatial characteristics of world and regional economic activities. Population patterns; technology and economic development; principles of spatial interactions in trade; transportation networks; the city as an employment generator; the location of industries and services; the production and trade of agricultural and energy products.

**GEOG 211 Geography of Environmental Systems Laboratory (1)** Two hours of laboratory per week. Pre- or corequisite: GEOG 201 or GEOL 100 or GEOL 120. 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.

**GEOG 212 The World in Cultural Perspective Laboratory (1)** Two hours of laboratory per week. Pre- or corequisite: GEOG 202. For GEOG majors only. Introduction to the basic methods and techniques employed in human geography.

**GEOG 298 Special Topics in Geography (3)** Repeatable to 6 credits if content differs. An introductory course dealing with special topics in geography.

**GEOG 305 Quantitative Methods in Geography (3)** A practical introduction to data sources and measurement, descriptive statistics, data collection, sampling and questionnaire design, field techniques, map use, computer use and data presentation.

**GEOG 310 Research and Writing in Geography (3)** Prerequisite: GEOG 305. Development of research methods in geography including the formulation of problem, the establishment of hypotheses, development of structures for testing hypotheses, and practice with forms of geographic presentation. Maps, quantitative and field methods are used as appropriate.

**GEOG 320 The United States and Canada (3)** The two countries as functioning geographic systems with important differences and key linkages. An examination of the cultural, environmental, and economic components and their spatial variation. Attention to the role of regions in national economies.

**GEOG 321 Maryland and Adjacent Areas (3)** The physical environment, natural resources, and population in relation to agriculture, industry, transport, and trade in the State of Maryland

and adjacent areas.

**GEOG 322 Central America, the Caribbean and Mexico (3)** The physical framework, broad economic and historical trends, cultural patterns, and regional diversification of Mexico, Central America, the West Indies.

**GEOG 323 Latin America (3)** A geography of Latin America and the Caribbean in the contemporary world: political and cultural regions, population and resource distribution, historical development, current levels of economic and social well-being, urbanization, development policies, migration trends, physical features and climates.

**GEOG 324 Europe (3)** The geographical diversity of modern Europe from landscape and regional perspectives. The diverse features of Europe's physical environment and resource base, and their integration into the demographic, economic, social and political patterns of the continent's major geographic regions.

**GEOG 325 Russia and the Commonwealth States (3)** Russia and the Commonwealth States as a functioning geographic system: its ethnic and cultural diversity, historical development, resource base, and economic regions. The characteristics of the relationship existing between Russia and the Commonwealth States.

**GEOG 326 Africa (3)** A geography of sub-Saharan Africa: physical features, climates, political and cultural regions. Population and resource distribution, current levels of economic and social well-being, urbanization development policies, projects and constraints, and migration trends.

**GEOG 327 South Asia (3)** Methods of regional analysis and area studies applied to the Indian Subcontinent, including India, Pakistan, Bangladesh, Sri Lanka and adjacent nations. Locational significance of the natural environment, historical and cross-cultural processes, languages and religion, the economy and government, population, archaeology, urbanization and development.

**GEOG 328 Topics in Regional Geography (3)** Repeatable to 6 credits if content differs. Selected topics in regional geography.

**GEOG 331 Southeast Asia (3)** Spatial organization and development in and among Malaysia, Singapore, Indonesia, the Philippines, Thailand, Vietnam, Laos, Kampuchea and adjacent countries. Locational significance of the natural environment, historical and cross-cultural processes, economic and modernization trends, social conflicts and future development prospects.

**GEOG 340 Geomorphology (3)** 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.

**GEOG 345 Climatology (3)** The geographic aspects of climate with emphasis on energy-moisture budgets, steady-state and non steady-state climatology, and climatic variations at both macro-and micro-scales.

**GEOG 350 The American City: Past and Present (3)** Development of the American city from the early nineteenth century to the present. The internal structure of contemporary metropolitan areas, the spatial arrangement of residential, commercial, and other activities. Washington, D.C. and Baltimore examples.

**GEOG 360 Cultural Geography (3)** Prerequisite: GEOG 201 or GEOG 202 or ANTH 101 or ANTH 102. Junior standing. Credit will be granted for only one of the following: GEOG 360 or GEOG 420. Formerly GEOG 420. Impact of the human race through ideas and technology on the evolution of geographic landscapes. Major themes in the relationships between cultures and environments.

**GEOG 370 Principles of Cartography (3)** Lecture and laboratory learning each week. Techniques and problems of compilation, symbolization, design and construction of special purpose maps. Emphasis on the methods of improving map design based on the organization of map components and the proper selection of symbols.

**GEOG 372 Remote Sensing (3)** Principles of remote sensing in relation to photographic, thermal infra-red 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.

**GEOG 373 Computer Mapping (3)** Prerequisite: GEOG 370 or CMSC 110 or permission of department. Introduction to the use of computers to produce maps, with emphasis on software packages and algorithms used to produce thematic maps. Mathematical and perceptual problems of maps produced on line printers, line plotters, and display screens.

**GEOG 380 Local Field Course (3)** Training in geographic field methods and techniques. Field observation of land use in selected rural and urban areas in Maryland and adjacent areas.

**GEOG 384 Internship in Geography (3)** *Prerequisite: GEOG 305; and GEOG 310; and permission of department. Corequisite: GEOG 385.* 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.

**GEOG 385 Internship Research Paper (3)** *Prerequisite: GEOG 305; and GEOG 310; and permission of department. Corequisite: GEOG 384.* Seminar conducted on campus. Research paper related to the student's internship.

**GEOG 398 Honors Research (3)** 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.

**GEOG 399 Honors Thesis (3)** *Prerequisite: GEOG 398.* Second course in 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.

**GEOG 410 Colonial North America (3)** The changing geography of the U.S. and Canada from pre-Columbian times to the end of the 18th century. Emphasis on areal variations, and changes in the settlements and economies of Indian and colonial populations. Areal specialization, and the changing patterns of agriculture, industry, trade and transportation. Population growth, composition and interior expansion. Regionalization.

**GEOG 411 19th Century North America (3)** An analysis of the changing geography of the U. S. and Canada from 1800 to the 1920's. The settlement, expansion and socio-economic development of the U. S., and comparisons with the Canadian experience. Immigration, economic activities, industrialization, transportation and urbanization.

**GEOG 414 Historical Geography of the Hispanic World (3)** The social, economic, political and cultural geography of the countries of the Iberian peninsula and Latin America in the past with concentration on specific time periods of special significance in the development of these countries.

**GEOG 416 Overseas European Colonization and the Third World (3)** The impact of European overseas expansion on Africa, Asia and Australasia during the 19th and early 20th centuries. Settlement patterns and territorial organization. Cultural and demographic change. Economic organization of space.

**GEOG 421 Cultural Ecology (3)** Basic issues concerning the natural history of the human race from the perspective of the geographer. Basic components of selected behavioral and natural systems, their evolution and adaptation, and survival strategies.

**GEOG 422 Population Geography (3)** The spatial characteristics of population distribution and growth, migration, fertility and mortality from a global perspective. Basic population-environmental relationships; carrying capacity, density, relationships to national development.

**GEOG 423 Political Geography (3)** Geographical factors in the national power and international relations; an analysis of the role of "geopolitics" and "geostrategy," with special reference to the current world scene.

**GEOG 430 Location Theory and Spatial Analysis (3)** Theories and procedures for determining the optimal location of industrial, commercial and public facilities. Techniques to evaluate location decisions. The provision of services within regions and metropolitan areas. Emerging trends.

**GEOG 433 Transportation Networks (3)** Description and modeling of spatial components of transportation systems. The theory and practice of analyzing transportation networks, including nodes, links, routes, flows and regions. Examples drawn from different transportation nodes.

**GEOG 434 Agricultural and Rural Development (3)** Spatial organization of agricultural resources; major types of agricultural activities in the world and their relationship to geographic conditions. Problems of conservation.

**GEOG 436 Issues in Urban Transportation (3)** Spatial patterns of personal travel, movement of goods, and public transit services in cities. Transportation and land use. Public policy issues; transportation access, energy use, and neighborhood disruption. Methods of data collection and analysis, travel demand surveys.

**GEOG 440 Process Geomorphology (3)** *Prerequisite: GEOG 340 or GEOL 340 or permission of department.* A quantitative investigation of the fundamental geomorphic processes shaping modern landscapes, with emphasis on coastal, fluvial or glacial processes. Field, instrumentation and laboratory analyses.

**GEOG 441 Geomorphological Environments (3)** *Prerequisite: GEOG 201 or GEOL 100 or permission of department.* Analysis of regional geomorphic environments; arctic, alpine, coastal, desert. Fluvial and glacial landscape impacts. Discussion of historical environments.

**GEOG 442 Urban Climates (3)** *Prerequisite: GEOG 345 or GEOG 347 or METO 301 or permission of department.* Effects of cities on their climatic environment. Radiant energy budgets, urban heat islands, precipitation patterns and effects of the urban climate on human activities.

**GEOG 446 Applied Climatology (3)** *Prerequisite: GEOG 345 or permission of department.* Components of earth's radiation balance and energy budgets; radiation, soil heat flux and the evaporation process. Measurement and estimation techniques. Practical applications of microclimatological theory and techniques.

**GEOG 448 Field and Laboratory Techniques in Environmental Science (1-3)** *Prerequisite: GEOG 201 or GEOL 100 or AGRO 105 or ENCE 221 or permission of department.* Lecture and laboratory learning each week. A variable credit course that introduces field and laboratory analyses in environmental science. Individual learning contracts are developed with instructor.

**GEOG 450 The Contemporary City (3)** The contemporary urban system: towns, cities and metropolitan areas and their role as concentrations of social and economic activity. Patterns of land-use: residential, employment, commercial activity, manufacturing, and transportation. Explanatory and descriptive models. International comparisons.

**GEOG 454 Washington, D.C.: Past and Present (3)** Development of the Washington, D.C. area from its origin as the Federal Capital to its role as a major metropolitan area. The geographic setting, the L'Enfant Plan and its modification, the federal government role, residential and commercial structure. The growth of Washington's suburbs.

**GEOG 456 The Social Geography of Metropolitan Areas (3)** A socio-spatial approach to human interaction with the urban environment; ways people perceive, define, behave in, and structure their cities and metropolitan areas. Spatial patterns of social activities as formed by the distribution and interaction of people and social institutions.

**GEOG 457 Historical Geography of North American Cities (3)** The urbanization of the United States and Canada prior to 1920. The evolution of the urban system across each country and the spatial distribution of activities within cities. The process of industrialization and the concurrent structuring of residential patterns among ethnic groups.

**GEOG 462 Water Resources Policy and Planning (3)** Critical concepts in U.S. water resources management with emphasis on Federal fresh and surface water policy. Examination of water resources planning models, focusing on demand projections, prediction of water supply, and economic and environmental project evaluation.

**GEOG 463 Geographic Aspects of Pollution (3)** Impact of human activities on the environment and resulting pollution problems. Characteristics and spatial aspects of air, water, and land resource problems. Federal legislation and planning techniques to reduce pollution.

**GEOG 464 Energy Resources and Planning in Developing Countries (3)** The use and provision of energy in the developing countries and the environmental, economic, social and cultural factors which govern energy decisions at the regional, national, local, and household scale. Including some of the tools used in energy decision-making.

**GEOG 467 Energy Resources and the Environment (3)** Effects of energy resource utilization on the physical environment including land use, air and water quality, and solid waste generation. Recent laws and policies designed to reduce environmental impacts. Physical consequences of alternative energy technologies.

**GEOG 470 Development of Cartographic Technology (3)** Impacts of technological improvements in land surveying and maps production of graphic and spatial images. The formation, expansion and diffusion of geographic information. Study of cartographic imagery as a changing form of communication.

**GEOG 471 Cartographic Production (3)** *Prerequisite: GEOG 370.* Lecture and laboratory learning each week. Map making and modern methods of production and reproduction. Organization of artwork for multicolor or series map production including production planning and quality control.

**GEOG 475 Principles of Map Design (3)** *Prerequisite: GEOG 370.* The principles of designing maps for publication in print media, including books and atlases. The selection of symbols, colors, lettering, map projections, and map content. Constraints and problems in the classification and representation of map data.

**GEOG 478 Problems in Cartography (3)** *Prerequisite: six credit hours in cartography or permission of department. Repeatable to 6 credits if content differs.* Special topics in cartography for advanced students. Topics can include problems of cartographic management; special use maps; automated map production; map pattern perception; tabular information from maps; map projections, transformations, and new technologies.

**GEOG 480 Advanced Remote Sensing (3)** *Prerequisite: GEOG 372 or introductory remote sensing course in another department.* Project-oriented approach to specific applications of remote sensing. Use of numerical, digital data and pictorial images from aircraft and space vehicles. Image display and enhancement. Applications in resources management and environmental studies.

**GEOG 481 Advanced Computer Mapping (3)** *Prerequisite: GEOG 373 or permission of department.* Advanced concepts in automated cartography. Computerized map projections and displays. Computer-assisted map design and symbolization.

**GEOG 482 Geographic Information Systems (3)** *Prerequisite: GEOG 373 or permission of department.* The construction and use of computer-based information systems. The collection, manipulation and automated display of geographical data. Applications in areas such as resource management, political districting, terrain analysis, and community planning.

**GEOG 483 Survey of Computer Facilities for Geography and Urban Studies (1)** The PRIME computer system. Graphics terminals, digitizers, plotters. File creation and use (PRIMOS), software for statistical analysis (MINITAB), relational data base management system (INFO), digitizing (DIGSRF2), contour mapping (SURFACE II), mapping of census data (CHOROMAP), symbol mapping (GIMMS). Other computer facilities on campus.

**GEOG 484 Biogeography (3)** The principles of biogeography, including the existing geographical distributions of living organisms from the local to global scale, the processes responsible for these patterns, and possible future changes in distributions as a result of global changes.

**GEOG 498 Topical Investigations (1-3)** *Restricted to advanced undergraduate students with credit for at least 24 hours in geography and to graduate students. Any exceptions should have approval of department. Repeatable to 6 credits if content differs.* Independent study under individual guidance.

## GEOL—Geology

**GEOL 100 Physical Geology (3)** *Credit will be granted for only one of the following: GEOL 100 or GEOL 103 or GEOL 105 or GEOL 107.* 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.

**GEOL 102 Historical Geology (4)** *Three hours of lecture and three hours of laboratory per week. Prerequisite: GEOL 100 or GEOL 103 or GEOL 105 or GEOL 107 or permission of department.* 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.

**GEOL 103 Water, Earth, and Humans (4)** *Three hours of lecture and three hours of laboratory per week. Credit will be granted for only one of the following: GEOL 100 or GEOL 103 or GEOL 105 or GEOL 107.* Focuses on the role of water as a geologic agent and a natural resource. The physical and chemical properties of water, the distribution of water both near the surface and at depth, and the role played by water in such processes as landscape development, ore deposit formation, volcanic eruptions and earthquakes are emphasized. In addition, the relationship between humans and the water cycle with particular reference to water supply, water quality and water power is explored.

**GEOL 104 Dinosaurs: A Natural History (3)** Dinosaurs, their evolution and extinction in the context of changing environments. Students will examine the geologic record and the tools used by geologists to determine geologic ages and sequences, dinosaur biology and classification, dinosaur social structure, and their role in the ecosystem. Mechanisms of global change ranging from plate tectonics to asteroid impact will be discussed.

**GEOL 105 Geology of Maryland (4)** *Three hours of lecture and three hours of laboratory per week. Credit will be granted for only one of the following: GEOL 100 or GEOL 103 or GEOL 105 or GEOL 107.* An exploration of the basic principles of physical geology by using the state of Maryland as a laboratory. Major rock types, evolution of the Appalachian Mountains, the erosion, transport and deposition of the Coastal Plain sediments, major river systems of Maryland, water use in rural, suburban and urban areas and the mining history in Maryland will be covered. Course will include approximately five half-day field trips.

**GEOL 107 Natural Hazards (4)** *Three hours of lecture and three hours of laboratory per week. Credit will be granted for only one of the following: GEOL 100 or GEOL 103 or GEOL 105 or GEOL 107.* A lab-based course to introduce the student to the affects of physical Earth processes on human activity. Concentration will be more on the dramatic geologic events including earthquakes, volcanoes, large mass movements, Tsunamis and bolide impacts.

**GEOL 110 Physical Geology Laboratory (1)** *Three hours of laboratory per week. Pre- or corequisite: GEOL 100.* The basic materials and tools of physical geology stressing familiarization with rocks and minerals and the use of maps in geologic interpretations.

## 180 Approved Courses

**GEOL 120 Environmental Geology (3)** 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.

**GEOL 123 Causes and Implications of Global Change (3)** Also offered as GEOG 123, METO 123, and PBIO 123. Credit will be granted for only one of the following: GEOG 123, GEOL 123, METO 123, or PBIO 123. This course offers a unique experience in integrating physical, chemical, geological, and biological sciences with geographical, economic, sociological and political knowledge skills toward a better understanding of global change. Review of environmental science relating to weather and climate change, acid precipitation, ozone holes, global warming, and impacts on biology, agriculture, and human behavior. Study of the natural, long-term variability of the global environment, and what influence mankind may have in perturbing it from its natural evolution. Concepts of how physical, biological, and human behavioral systems interact, and the repercussions which may follow from human endeavors. The manner in which to approach decision and policy making related to issues of global change.

**GEOL 210 Gems and Gemstones (3)** A survey of the origin, occurrences, properties, fashioning, and treatments of natural and synthetic materials, with emphasis on diamonds and colored stones.

**GEOL 212 Planetary Geology (3)** An examination of the geological 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.

**GEOL 301 Evolution in Geology (3)** Prerequisite: a college-level physical or biological science course with laboratory. An analysis of data, assumptions and logical structure of seafloor spreading and continental drift, biological evolution and the geological record, the concept of geologic time, catastrophism in geology, and "creationist geology."

**GEOL 322 Mineralogy (4)** Three hours of lecture and three hours of laboratory per week. Prerequisites: GEOL 110 and CHEM 103. Basic mineralogy for geology majors. The principles of morphologic crystallography, crystal chemistry, and determinative mineralogy.

**GEOL 331 Invertebrate Paleontology (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: GEOL 102. A systematic review of the morphology, classification, interrelationships and geologic significance of all the commonly fossilized invertebrate phyla.

**GEOL 340 Geomorphology (4)** Three hours of lecture and three hours of laboratory per week. Two Saturday field trips. Prerequisite: GEOL 103 or GEOL 105 or GEOL 107 or GEOL 110. Analysis of landforms, organized on the basis of the geological processes that have operated during the late Cenozoic. Constructional and erosional landforms related to physical systems operating on geologic structures through time.

**GEOL 341 Structural Geology (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: GEOL 102 or permission of department. Deformation of the earth's crust; stress and strain; mechanical behavior of rocks; origin and significance of structural features. Construction of geologic maps and cross sections; stereographic and orthographic representation of structures.

**GEOL 342 Sedimentation and Stratigraphy (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: GEOL 322 or permission of department. Description, origin and distribution of sediments and sedimentary rocks. Mandatory field trip.

**GEOL 375 General Oceanography (3)** Formerly GEOL 475. Introduction to the processes shaping the marine environment. The geological and biological processes contributing significantly to the geological record and the environment.

**GEOL 393 Technical Writing for Geoscientists (3)** Prerequisites: completion of any two of the following and concurrent registration in the third: GEOL 341, GEOL 331, GEOL 322, and GEOL 451. For GEOL majors only. Planning, writing and presenting a plan for research in the geosciences.

**GEOL 394 Research Problems in Geology (3)** Prerequisite: GEOL 393. Investigation of a specific laboratory, library or field problem. Written and oral presentation of the study.

**GEOL 410 Industrial Rocks and Minerals (3)** Prerequisite: GEOL 322. The origin; occurrence; mineralogy; extraction and treatment technology; production and deposit-evaluation of rocks and minerals used in the construction, ceramic, chemical and allied industries. Restricted to non-fuels, non-metallic, non-gem materials. Field trips to industrial locations are required.

**GEOL 423 Optical Mineralogy (3)** One hour of lecture and four hours of laboratory per week. Prerequisite: GEOL 322. The optical behavior of crystals with emphasis on the theory and application of

the petrographic microscope.

**GEOL 432 Biostratigraphy (3)** Two hours of lecture and three hours of laboratory per week. Prerequisite: GEOL 331. Principles of biostratigraphy, paleoecology and paleogeology. Laboratory study emphasizes significant index fossils.

**GEOL 434 Micropaleontology (3)** Two lectures and one laboratory per week. Prerequisite: GEOL 331. A systematic review of the morphology, classification, ecology and geologic ranges of important microfossil groups, particularly ostracodes and foraminifera.

**GEOL 442 Introduction to Solid-Earth Geophysics (3)** Prerequisite: GEOL 100 or GEOL 103 or GEOL 105 or GEOL 107. Formerly GEOL 448. Nature and description of the solid earth as revealed by seismology; magnetic and gravity field studies; and geothermal methods. Development of plate tectonic theory. Earthquake prediction efforts; mantle thermal convection; fluid motion in Earth's core; space-related method for direct detection of plate motion (GPS, VLBI, and SLR).

**GEOL 443 Petrology (4)** Two lectures and one laboratory per week. Prerequisite: GEOL 322. Corequisite: GEOL 423. Study of igneous and metamorphic rocks: petrogenesis; distributions; chemical and mineralogical relations; macroscopic and microscopic descriptions; geologic significance.

**GEOL 445 Principles of Geochemistry (3)** Prerequisites: CHEM 103 and GEOL 322. An introduction to the basic principles of geochemistry including geothermometry, geobarometry, geochronology and the genesis of natural inorganic materials.

**GEOL 446 Geophysics (3)** Two lectures and one laboratory per week. Prerequisite: PHYS 142. An introduction to the basic theories and principles of geophysics stressing such important applications as rock magnetism, gravity anomalies, crustal strain and earthquakes, and surveying.

**GEOL 451 Groundwater Geology (3)** Prerequisites: (CHEM 103 and MATH 140) and (GEOL 100 or GEOL 103 or GEOL 105 or GEOL 107). Corequisite: GEOL 342. For geology majors only or permission of department. Junior standing. An introduction to the basic geologic parameters associated with the hydrologic cycle. Problems in the accumulation, distribution and movement of groundwater will be analyzed.

**GEOL 452 Watershed and Wetland Hydrology (3)** Prerequisites: CHEM 103 and (GEOL 100 or GEOL 103 or GEOL 105 or GEOL 107) and (GEOL 322 or GEOL 340 or GEOL 341 or GEOL 342). 56 semester hours. Junior standing. 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.

**GEOL 453 Economic Geology (3)** Two laboratories per week. Prerequisite: GEOL 322. A study of the geology of metallic ore deposits stressing ore-forming processes, configuration of important ore bodies, and familiarization with characteristic ore mineral suites.

**GEOL 456 Engineering Geology (3)** Two lectures and one laboratory per week. Prerequisite: GEOL 341. A study of the geological problems associated with the location of tunnels, bridges, dams and nuclear reactors, slope control, and natural hazards.

**GEOL 462 Geological Remote Sensing (3)** One lecture and two laboratories per week. Prerequisite: GEOL 341 and GEOL 342. An introduction to geological remote sensing including applications of aerial photographic interpretation to problems in regional geology, engineering geology, structural geology, and stratigraphy. Films, filters, and criteria used in selecting imagery are also discussed. Laboratory exercises include measurements of geologic parameters and compilation and transference of data to base maps.

**GEOL 471 Geochemical Methods of Analysis (3)** Prerequisite: CHEM 103 and CHEM 113. 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.

**GEOL 472 Tectonics (3)** Prerequisite: GEOL 341. Selected tectonic elements of orogenic belts through out the world viewed in the framework of plate tectonics and sea floor spreading.

**GEOL 489 Special Topics (3)** Corequisite: GEOL 393. Senior standing. For GEOL majors only. Recent advances in geology.

**GEOL 490 Geology Field Camp (6)** Prerequisite: GEOL 390 or equivalent. Three-week 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.

**GEOL 491 Environmental Geology Field Camp (3-6)** Prerequisites: GEOL 341 and GEOL 342 and GEOL 451 or permission of department. Credit will be granted for only one of the following: GEOL 490 or GEOL 491. 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.

**GEOL 499 Special Problems in Geology (1-3)** Prerequisites: GEOL 102; and GEOL 110 or equivalent; and permission of department. 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.

## GERM—Germanic Studies

**GERM 101 Elementary German I (4)** One hour of laboratory and four hours of discussion/recitation per week. Formerly GERM 111. Introduction to basic structures and pronunciation by emphasis on the four skills: listening, speaking, reading and writing. Readings concern the current life-style and civilization of the German-speaking world.

**GERM 102 Elementary German II (4)** One hour of laboratory and four hours of discussion/recitation per week. Prerequisite: GERM 101 or equivalent. Formerly GERM 112. A continuation of GERM 101, completing the introduction of basic structures and continuing the involvement with the civilization of the German-speaking world.

**GERM 103 Review of Elementary German (4)** One hour of laboratory and four hours of discussion/recitation per week. Prerequisite: assignment either by placement examination or by the undergraduate director (Germanic Section). Designed specifically for students who are too advanced for GERM 101 but are not sufficiently prepared to take GERM 102. GERM 103 covers the coursework to the completion of GERM 102 in one semester.

**GERM 148 Germanic Languages-Elementary I (3)** Repeatable to 6 credits if content differs. 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.

**GERM 149 Germanic Languages-Elementary II (3)** Prerequisite: GERM 148 in the same language. Continuation of GERM 148. May be repeated in a different language. Subtitle will reflect the language.

**GERM 201 Intermediate German I (4)** One hour of laboratory and four hours of discussion/recitation per week. Prerequisite: GERM 102. Grammar review and greater mastery of vocabulary, idioms, conversational fluency, and compositional skills. Readings stress the current life-style and civilization of the German-speaking world.

**GERM 202 Intermediate German II (4)** Four hours of lecture and one hour of laboratory per week. Prerequisite: GERM 201. Not open to students who have completed GERM 211. Credit will be granted for only one of the following: GERM 202 or GERM 211 or GERM 104. Formerly GERM 211. Continuation of GERM 201. Grammar review and greater mastery of vocabulary, idioms, conversational fluency and compositional skills. Readings stress the current life-style and civilization of the German-speaking world.

**GERM 220 Introduction to German Literature (3)** Prerequisite: GERM 202. Reading and discussion of major authors with emphasis on contemporary German literature. Readings and instruction in German.

**GERM 248 Germanic Languages Intermediate-I (3)** Prerequisite: GERM 149 in the same language. Intermediate instruction in a Germanic language other than German. May be repeated in a different language. Subtitle will reflect the language.

**GERM 249 Germanic Languages-Intermediate II (3)** Prerequisite: GERM 248 in the same language. Continuation of German 248. May be repeated in a different language. Subtitle will reflect the language.

**GERM 280 German-American Cultural Contrast (3)** A study of German-American culture in contemporary literature.

**GERM 281 Women in German Literature and Society (3)** Also offered as WMST 281. Credit will be granted for only one of the following: GERM 281 or WMST 281. A study of changing literary images and social roles of women from the beginning of the 19th century to the present.

**GERM 282 Germanic Mythology (3)** An introduction to the religious beliefs of the pagan Germanic peoples. Comparison of Germanic myths with those of other Indo-European peoples. The conversion of the Germania to Christianity and the preservation of pagan beliefs in superstition and literature.

**GERM 283 Viking Culture and Civilization (3)** Formerly GERM 383. An introduction to the lifestyle of northern Europe in the 9th to 11th centuries. Readings and instruction in English.

**GERM 284 German Chivalric Culture (3)** Formerly GERM 384. An introduction to the lifestyle of northern Europe in the 12th to 14th centuries. Readings and instruction in English.

**GERM 285 German Film and Literature (3)** A visual approach to German literature through a study of the historical, cultural, and literary significance of German films. Representative examples from the golden age of German silent films to the new German cinema.

**GERM 286 Ancient Indic Culture and Civilization (3)** Formerly GERM 371. An introduction to the culture and civilization of Ancient India: religion, literature, arts, ethics, and law of the vedic period; younger Hinduism, and Buddhism. Reconstruction of each period's lifestyle with emphasis on the historic development of the principles which ruled everyday activities. Instruction and readings in English.

**GERM 287 Ancient Celtic Culture and Civilization (3)** Formerly GERM 372. An introduction to the culture and civilization of the Ancient Celts; religion, arts, ethics and law of the continental and island Celts. Focus on the Ulster and Fenian cycles in Ireland; Taliesin, Aneirin and the Mabinogion in Wales. Reconstruction of the lifestyle of the period. Instruction and readings in English.

**GERM 301 Conversation and Composition I (3)** Prerequisite: GERM 202 or equivalent. Practice in contemporary spoken and written German. Systematic review of grammar, and exercise in composition. Emphasis on cultural contrasts.

**GERM 302 Conversation and Composition II (3)** Prerequisite: GERM 301 or equivalent. Continuation of GERM 301.

**GERM 321 Highlights of German Literature I (3)** Prerequisite: GERM 220 or equivalent. Selected masterworks from different periods of German literature: middle ages, reformation, baroque, 18th century, classicism. Readings and instruction in German.

**GERM 322 Highlights of German Literature II (3)** Prerequisite: GERM 220 or equivalent. Selected masterworks from different periods of German literature: romanticism, Biedermeier, Junges Deutschland, realism, naturalism and its counter currents, expressionism to the present. Readings and instruction in German.

**GERM 339 German Literature In Translation (3)** Repeatable to 6 credits if content differs. 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.

**GERM 349 Germanic Literatures in Translation (3)** Repeatable to 6 credits if content differs. Study of an important author, period or theme in a Germanic literature other than German: Yiddish, Netherlandic or Scandinavian. Readings and instruction in English.

**GERM 360 Women in Scandinavian Literature (3)** Prerequisite: a literature, culture, diversity course or permission of department. Introduction to and examination of women's creative work from Scandinavia from the Middle Ages to the present.

**GERM 368 Scandinavian Civilization (3)** Repeatable to 6 credits if content differs. Literary, artistic and historic traditions, folklore and superstition, customs and life-style shared by Scandinavian nations. Readings and instruction in English.

**GERM 369 Scandinavian Literature in Translation (3)** Repeatable to 6 credits if content differs. Study of a major Scandinavian author, genre, period or theme. Readings and instruction in English.

**GERM 381 German Civilization I (3)** A survey of the literary, educational and artistic traditions, great men and women, customs and general culture of the German-speaking world from the beginnings to the middle of the 18th century. All readings and instruction are in English.

**GERM 382 German Civilization II (3)** A continuation of GERM 381 covering the development of German, Austrian and Swiss civilizations from the middle of the 18th century to the present. All readings and instruction are in English.

**GERM 389 Topics in Germanic Culture (3)** Repeatable to 6 credits if content differs. Topics in the cultures of the German, Germanic, Indo-European peoples and of their culturally related non-Indo-European neighbors. In English.

**GERM 397 Honors Reading (Independent Study) (3)** Supervised reading to be taken normally only by students admitted into honors program.

**GERM 398 Honors Research (3)** Prerequisite: permission of department. Repeatable to 6 credits if content differs. 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.

**GERM 401 Advanced Conversation (3)** Prerequisite: GERM 302 or equivalent. Development of fluency in spoken German. Discussion of contemporary issues.

**GERM 403 Advanced Composition (3)** Prerequisite: GERM 302 or equivalent. Advanced instruction in writing skills.

**GERM 405 Stylistics (3)** Prerequisite: GERM 302 or equivalent. Stylistic analysis of oral and written German both literary and non-literary. Intensive study of vocabulary and syntax. Dictionary and composition exercises.

**GERM 411 German for International Business I (3)** Prerequisite: GERM 302 or equivalent or permission of department. Advanced skills in German for international business, including understanding and writing correspondence, reports, graphics, ads, etc., according to current German commercial style.

**GERM 412 German for International Business II (3)** Prerequisite: GERM 411 or equivalent or permission of department. Continuation of GERM 411.

**GERM 415 German/English Translation I (3)** Does not fulfill major requirements in German. Not open to students who have completed GERM 101, GERM 102, GERM 201, GERM 202, GERM 301 or GERM 302. 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.

**GERM 416 German/English Translation II (3)** Prerequisite: GERM 415 or equivalent. Written translation of materials from the student's field of study. Discussion of basic problems of German-to-English translation, with examples from students' projects. Instruction in English. Cannot be used to satisfy the arts and humanities foreign language requirement.

**GERM 419 Selected Topics in German Language Study (3)** Prerequisite: GERM 302 and permission of department. Repeatable to 6 credits if content differs.

**GERM 421 Literature of the Middle Ages (3)** Prerequisite: GERM 321 and 322 or permission of department. German literature from the 8th through the 15th centuries. Readings include old high German texts; the German heroic, courtly and popular epic; Minnesang, Meistersang, the late Medieval epic; folk literature of the late Middle Ages. Read in modern German translation.

**GERM 422 From the Reformation Through the Baroque (3)** Prerequisite: GERM 321 and GERM 322 or permission of department. Readings of representative authors from the reformation and the period of humanism through the baroque (ca. 1450-1700). Readings and instruction in German.

**GERM 423 From Enlightenment through Storm and Stress (3)** Prerequisite: GERM 321 and GERM 322, or permission of department. Readings of representative authors from the Enlightenment (1720-1785), the Age of Sentimentalism (1740-1780), and Storm and Stress (1767-1785). Readings and instruction in German.

**GERM 424 Classicism (3)** Prerequisite: GERM 321 and GERM 322, or permission of department. Readings of representative authors from the Age of Classicism (1786-1832). Readings and instruction in German.

**GERM 431 Romanticism and Biedermeier (3)** Prerequisite: GERM 321 and GERM 322, or permission of department. Readings of representative authors from the periods of Romanticism (1798-1835) and Biedermeier (1820-1850). Readings and instruction in German.

**GERM 432 Junges Deutschland and Realism (3)** Prerequisite: GERM 321 and 322, or permission of department. Readings of representative authors from the periods of Junges Deutschland (1830-1850) and Realism (1850-1890). Readings and instruction in German.

**GERM 433 Naturalism and Its Counter Currents (3)** Prerequisite: GERM 321 and GERM 322, or permission of department. Readings of representative authors from the period of naturalism and its counter currents (1880-1920). Readings and instruction in German.

**GERM 434 Expressionism to 1945 (3)** Prerequisite: GERM 321 and GERM 322, or permission of department. Readings of representative authors from Expressionism through the period between the wars to the contrast of Nazi and Exile Literature (ca. 1910-1945). Readings and instruction in German.

**GERM 435 From 1945 to the Present (3)** Prerequisite: GERM 321 and GERM 322, or permission of department. Readings of representative authors from the "Two Germanies," Austria, and Switzerland in the period from the end of World War II to the present. Readings and instruction in German.

**GERM 439 Selected Topics in German Literature (3)** Prerequisites: (GERM 321 and GERM 322) or permission of department. Repeatable to 6 credits if content differs. Special study of an author, school, genre, or theme. Readings and instruction in German.

**GERM 449 Selected Topics in Germanic Studies (3)** Prerequisite: permission of department. Repeatable to 6 credits if content differs. Study of a linguistic, literary or cultural topic in Yiddish, Netherlandic, or Scandinavian studies.

**GERM 461 Reading Swedish, Danish and Norwegian I (3)** Not open to students who have completed GERM 148S, GERM 149S, GERM 148D, GERM 149D, GERM 148N or GERM 149N. Develops reading facility in three languages in one semester. Texts read include Bergman's Seventh Seal, tales by H.C. Andersen, excerpts from works by Ibsen and Hamsun, and selected folk literature. No foreign language prerequisite.

**GERM 462 Reading Swedish, Danish and Norwegian II (3)** GERM 461 or permission of department. Further development of reading facility.

**GERM 463 The Icelandic Family Saga (3)** Analysis of the old Norse saga as historiography, literature, and folklore. Readings and instruction in English.

**GERM 472 Introduction to Germanic Philology (3)** Prerequisite: GERM 202 or equivalent. Reconstructed proto-Germanic and surveys of Gothic, Old Norse, Old English, Old Saxon. The development of High German from the Old High German period through Middle High German to modern German; a short introduction to modern German dialectology. Instruction in English.

**GERM 475 Old Norse (3)** The language of the old Icelandic saga, the Eddas and Skaldic poetry. Reading of texts in the original: historical development of Old Norse and its role in the Germanic language family. No knowledge of German or a Scandinavian language required; instruction in English.

**GERM 476 Sanskrit I (3)** Introduction to reading Sanskrit text in Devanagari script. Descriptive and historic/comparative grammar stressing Indo-European origins and comparison with Classical and modern European languages.

**GERM 477 Sanskrit II (3)** Prerequisite: GERM 476. Continuation of GERM 476. Completion of grammatical introduction. Reading of epic, folkloric, and vedic texts.

**GERM 479 Selected Topics in Germanic Philology (3)** Prerequisite: permission of department. Repeatable to 6 credits if content differs. Selected topics such as comparative Germanic studies, Old Norse language or readings in Old Norse literature, modern German dialectology.

**GERM 489 Selected Topics in Area Studies (1-3)** Prerequisite: GERM 302 or equivalent or permission of department. Recommended: GERM 411 or GERM 412. Repeatable to 6 credits if content differs. Selected topics in German area studies of specific interest to international business students.

**GERM 498 Honors Thesis Writing (3)** Prerequisite: permission of department. Repeatable to 6 credits if content differs. Required for students pursuing departmental honors in Germanic languages and literatures. Under the direction of a German department faculty member, students write their honors theses.

**GERM 499 Directed Study (1-3)** Prerequisite: permission of department. Repeatable to 6 credits if content differs.

## GNED—General Education

**GNED 288 Introduction to British Culture (3)** Aspects of British culture they will encounter during their stay in London for students in the Study in London Program. An historical introduction to the development of London, illustrating the city's dominant role in British life and culture. Studies of the different communities, the media, architecture, the relationship between the community and the arts, environmental issues, as well as the political and commercial life of the city.

## GREK—Greek

**GREK 101 Elementary Ancient Greek I (4)** A student who has had two units of Greek in high school may register for GREK 101 for purposes of review but not for credit. Study of basic grammar, development of reading facility, and introduction to Athenian life and culture in the fifth century B.C.

**GREK 102 Elementary Ancient Greek II (4)** Prerequisite: GREK 101 or equivalent. Continuing development of basic grammar and reading skills; study and discussion of central aspects of Greek culture.

**GREK 201 Intermediate Ancient Greek (4)** Prerequisite: GREK 102 or equivalent. Advancing beyond the basic skills developed in GREK 101 and GREK 102; review of selected grammatical concepts; continuous reading of passages from Greek literature.

**GREK 301 Euripides (3)** Credit will be granted for only one of the following: GREK 301 or GREK 351. Formerly GREK 351.

**GREK 353 Herodotus (3)**

**GREK 402 Greek Philosophers (3)**

**GREK 403 Greek Tragedy (3)**

## 182 Approved Courses

**GREK 415 Homer (3)** *Prerequisite: permission of department.* Extensive readings in Greek from the Iliad and the Odyssey, with special attention to the features of Homeric style and the similarities and differences between the two epics.

**GREK 488 Greek Readings (3)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs.* The reading of one or more selected Greek authors. Reports.

**GREK 490 Survey of Greek Literature (3)** Greek literature, including authors, genres and periods. The reading of selections from many of the major authors, combined with the study of the history of Greek literature. Review of Greek grammar.

**GREK 499 Independent Study in Greek Language and Literature (1-3)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs.*

### GVPT—Government and Politics

**GVPT 100 Principles of Government and Politics (3)** A study of the basic principles and concepts of political science.

**GVPT 170 American Government (3)** A comprehensive study of national government in the United States: national, state and local.

**GVPT 200 International Political Relations (3)** *Prerequisite: GVPT 100. Formerly GVPT 300.* A study of the major factors underlying international relations, the methods of conducting foreign relations, the foreign policies of the major powers, and the means of avoiding or alleviating international conflicts.

**GVPT 210 Introduction to Public Administration and Policy (3)** *Prerequisite: GVPT 170.* An introduction to the study of the administrative process in the executive branch with an examination of the concepts and principles of administration and their relationship to public policy. The organizational structure, theory and the behavior of participants in the administration of policy.

**GVPT 220 Introduction to Political Behavior (3)** *Prerequisite: GVPT 100 or GVPT 170.* Development, concepts and techniques of the behavioral approach to political science and other recent developments in the field.

**GVPT 221 Introduction to Formal Theories of Political Behavior and Politics (3)** *Prerequisite: GVPT 170.* 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.

**GVPT 231 Law and Society (3)** *Prerequisite: GVPT 170.* A study of the basis of law and its relationship with various contemporary institutions such as the courts, the legal profession, and society at large.

**GVPT 240 Political Ideologies (3)** *Prerequisite: GVPT 100.* A survey and analysis of the leading ideologies of the modern world, including anarchism, communism, socialism, fascism, nationalism, and democracy.

**GVPT 241 The Study of Political Philosophy: Ancient and Modern (3)** *Prerequisite: GVPT 100.* Examines some of the salient continuities and breaks between the ancient and modern traditions in Western political philosophy.

**GVPT 250 Introduction to International Negotiation (3)** *Prerequisite: GVPT 100. Recommended: GVPT 200.* Introduction to the complexities of international negotiation and cross-cultural decision-making. Students will apply advanced computer technology in an interactive simulation involving actual negotiations.

**GVPT 260 State and Local Government (3)** *Prerequisite: GVPT 170.* A study of the functioning and problems of state and local government in the United States, with illustrations from Maryland jurisdictions.

**GVPT 270 Introduction to Public Policy (3)** *Prerequisite: GVPT 170.* Complex nature of public policy making at the national level in the United States. Policy making will be described and analyzed in terms of major actors, relationships, and characteristics.

**GVPT 272 The Politics of Race Relations in the United States (3)** *Prerequisite: GVPT 170.* Political dimension of historical and contemporary racial cleavage in the United States with particular emphasis on the post World War II period.

**GVPT 273 Introduction to Environmental Politics (3)** *Prerequisite: GVPT 170.* A comprehensive overview of environmental problems, institutions, policies, practices, and remedies found in present-day world society, with special emphasis on environmental matters as objects of American public policy, both domestic and foreign.

**GVPT 280 Comparative Politics and Governments (3)** *Prerequisite: GVPT 100.* An introduction to the comparative study of politics and governance, including the analytical frameworks for

studies of politics and governmental institutions and a survey of the major types of European regimes.

**GVPT 282 The Government and Politics of the Third World (3)** *Prerequisite: GVPT 100.* A study of the governmental institutions, processes and problems, and the socio-economic environment which are common to the great majority of the third world states of Africa. The Middle East, Asia, and Latin America; and in which internal politics develop.

**GVPT 289 Special Topics in Government and Politics (1-6)** *Repeatable to 6 credits if content differs.* Substantive issues of and theoretical approaches to political phenomenon. Topics and credit vary.

**GVPT 306 Global Ecopolitics (3)** *Prerequisite: GVPT 200.* Consideration of global problems such as the growth controversy, agricultural productivity, pollution, resource depletion, the energy crisis, and the general impact of science and technology on the world ecological, socio-economic, and political system, with particular emphasis on such matters as objects of public policy.

**GVPT 309 Topics in International Relations (3)** *Repeatable to 6 credits if content differs.* The study of topics in international relations.

**GVPT 321 Intermediate Formal Theories of Political Behavior and Politics (3)** *Prerequisite: GVPT 221 or permission of department.* Analysis of the theory of games, social choice, voting and such notions of social welfare as distributive justice and liberty.

**GVPT 339 Topics in Public Law (3)** *Repeatable to 6 credits if content differs.* The study of topics in public law.

**GVPT 341 Political Morality and Political Action (3)** *Prerequisite: GVPT 100.* The ethical problems implicit in public actions by individuals, groups, and government. Selected topics in contemporary political theory such as distribution, participation, and equality.

**GVPT 349 Topics in Political Philosophy (3)** *Repeatable to 6 credits if content differs.* The study of topics in political philosophy.

**GVPT 350 International Relations of the Third World (3)** *Prerequisite: GVPT 200.* A systemic view of relations between the industrialized and third world nations examining specific themes such as the legacy of colonialism, the origins and goals of national liberation movements, efforts to promote regional cooperation, and global movements such as nonalignment and the quest for a new international economic order.

**GVPT 359 Topics in Comparative Politics (3)** *Repeatable to 6 credits if content differs.* The study of topics in comparative politics.

**GVPT 376 Applied Field Research in Government and Politics (3-6)** *Prerequisite: GVPT 170. Corequisite: GVPT 377.* 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 adviser, 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.

**GVPT 377 Seminar For Academic Interns (3)** *Prerequisite: GVPT 170. Corequisite: GVPT 376.* The application of major concepts of political science to the realities of the political process. Readings and discussion attempt to relate the experiences of the academic interns to appropriate literature on the subject of political decision-making.

**GVPT 379 Topics in American Politics (3)** *Repeatable to 6 credits if content differs.* The study of topics in American politics.

**GVPT 388 Topical Investigations (1-3)** *Prerequisite: one 200-level GVPT course. Repeatable to 6 credits if content differs.* Independent research and writing on selected topics in government and politics.

**GVPT 396 Introduction to Honors Research (3)** *Prerequisite: admission to and permission of GVPT Honors Program.* 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.

**GVPT 397 Honors Research (3)** *Prerequisite: GVPT 396 and admission to GVPT honors program.* Individual reading and research. Preparation of an original paper.

**GVPT 399 Seminar in Government and Politics (3)** *Prerequisite: one 200-level GVPT course.* 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.

**GVPT 401 Problems of World Politics (3)** *Prerequisite: GVPT 200.* A study of governmental problems of international scope, such as

causes of war, problems of neutrality, and propaganda. Students are required to report on readings from current literature.

**GVPT 402 International Law (3)** *Prerequisite: GVPT 200.* 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.

**GVPT 403 Law, Morality and War (3)** *Prerequisite: GVPT 200.* An exploration of fundamental moral and legal issues concerning war.

**GVPT 405 Defense Policy and Arms Control (3)** *Prerequisite: GVPT 200.* Contemporary issues of military strategy and international security are covered, including: nuclear war, conventional (limited) war, guerrilla insurgency, arms control, disarmament, moderation of war, defense policy processes, and defense economics.

**GVPT 406 Problems of International Cooperation (3)** *Prerequisite: GVPT 200.* The analysis of the problems inherent in international cooperation with applications to such specific international issues as the environment, human rights, economic development and conflict resolution.

**GVPT 407 International Political Economy (3)** *Prerequisite: GVPT 200.* Introduces the field of international political economy, which analyzes the ways in which economic and political changes produce both economic and political reactions.

**GVPT 409 Seminar in International Relations and World Politics (3)** *Repeatable to 6 credits if content differs.* Reading, writing, and research on topics in international relations and world politics. Both substantive issues and methodological approaches will be considered. Primarily for government and politics majors.

**GVPT 411 Public Personnel Administration (3)** *Prerequisite: GVPT 210.* A survey of public personnel administration, including the development of merit civil service, the personnel agency, classification, recruitment, examination techniques, promotion, service ratings, training, discipline, employee relations, and retirement.

**GVPT 412 Public Financial Administration (3)** *Prerequisite: GVPT 210.* A survey of governmental financial procedures, including processes of current and capital budgeting, the administration of public borrowing, the techniques of public purchasing, and the machinery of control through pre-audit and post-audit.

**GVPT 414 Administrative Law (3)** *Prerequisite: GVPT 210.* A study of the discretion exercised by administrative agencies, including analysis of their functions, their powers over persons and property, their procedures, and judicial sanctions and controls.

**GVPT 419 Seminar in Public Policy (3)** *Repeatable to 6 credits if content differs.* Reading, writing, and research on topics in public policy. Both substantive issues and methodological approaches will be considered. Primarily for government and politics majors.

**GVPT 422 Quantitative Political Analysis (3)** *Prerequisite: GVPT 220.* Introduction to quantitative methods of data analysis, including selected statistical methods, block analysis, content analysis, and scale construction.

**GVPT 423 Elections and Electoral Behavior (3)** *Prerequisite: GVPT 220.* 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.

**GVPT 424 Topics in Formal Theories of Political Behavior and Politics (3)** *Prerequisite: GVPT 221 or permission of department.* The focus of this course will vary both by its theoretical core and its applications. The theories are likely to be those of games, social choice, and voting. The applications will usually be to problems of distributive and social justice, community organizing, responsive public policy, institutional design, alliance and coalition formation, etc. Some of the topics will involve research projects.

**GVPT 426 Public Opinion (3)** *Prerequisite: GVPT 220.* An examination of public opinion and its effect on political action, with emphasis on opinion formation and measurement, propaganda and pressure groups.

**GVPT 427 Political Sociology (3)** *Prerequisite: GVPT 220.* A study of the societal aspects of political life including selected aspects of the sociology of group formation and group dynamics, political association, community integration and political behavior.

**GVPT 428 Topics in Formal Theories of Political Behavior and Politics (3)** *Prerequisite: GVPT 221 or permission of department. Repeatable to 6 credits if content differs.* 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.

**GVPT 429 Problems in Political Behavior (3)** *Prerequisite: GVPT 220.* The problem approach to political behavior with emphasis on

theoretical and empirical studies on selected aspects of the political process.

**GVPT 431 Introduction to Constitutional Law (3)** *Prerequisite: GVPT 231.* 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.

**GVPT 432 Civil Rights and the Constitution (3)** *Prerequisite: GVPT 231.* A study of civil rights in the American constitutional context, emphasizing freedom of religion, freedom of expression, minority discrimination, and the rights of defendants.

**GVPT 433 The Judicial Process (3)** *Prerequisite: GVPT 231.* An examination of judicial organization in the United States at all levels of government, with some emphasis on legal reasoning, legal research and court procedures.

**GVPT 434 Race Relations and Public Law (3)** *Prerequisite: GVPT 231.* A political and legal examination of the constitutionally protected rights affecting racial minorities and of the constitutional power of the federal courts, congress, and the executive to define, protect and extend these rights.

**GVPT 436 The Legal Status of Women (3)** *Prerequisite: GVPT 231. Also offered as WMST 436. Credit will be granted for only one of the following: GVPT 436 or WMST 436.* An examination of judicial interpretation and application of common, statutory, and constitutional law as these affect the status of women in American society.

**GVPT 439 Seminar in Public Law (3)** *Repeatable to 6 credits if content differs.* Reading, writing, and research on topics in public law. Both substantive issues and methodological approaches will be considered. Primarily for government and politics majors.

**GVPT 441 History of Political Theory: Ancient and Medieval (3)** *Prerequisite: GVPT 100.* A survey of the principal political theories set forth in the works of writers before Machiavelli.

**GVPT 442 History of Political Theory—Medieval to Recent (3)** *Prerequisite: GVPT 100.* A survey of the principal theories set forth in the works of writers from Machiavelli to Nietzsche.

**GVPT 443 Contemporary Political Theory (3)** *Prerequisite: GVPT 100.* A survey of the principal political theories and ideologies set forth in the works of writers from Karl Marx to the present.

**GVPT 444 American Political Theory (3)** *Prerequisite: GVPT 100 or GVPT 170.* A study of the development and growth of American political concepts from the Colonial period to the present.

**GVPT 445 Marxism and Postmarxism (3)** *Prerequisite: GVPT 100.* The study of Marxist thought and an assessment of the critical transformations and reassessments of the theory and practice of Marxism.

**GVPT 446 Psychoanalysis and Politics (3)** *Prerequisites: GVPT 100 and GVPT 340.* Psychological sources of individual and group behavior as applied to political phenomenon such as voting, war, revolution, and genocide.

**GVPT 447 Islamic Political Philosophy (3)** The writings of one or several authors from the rise of Islamic philosophy until today are examined in order to see how they understand the conflicting claims of revelations and unaided human reason about the best regime, justice, and human virtue.

**GVPT 448 Non-Western Political Thought (3)** *Prerequisite: GVPT 100; permission of department required for repeat.* 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.

**GVPT 449 Seminar in Political Philosophy (3)** *Repeatable to 6 credits if content differs.* Reading, writing, and research on topics in political philosophy. Both substantive issues and methodological approaches will be considered. Primarily for government and politics majors.

**GVPT 450 Comparative Study of Foreign Policy Formation (3)** *Prerequisite: GVPT 200.* The opportunity to learn the theoretical underpinnings of foreign policy decision-making and to apply this knowledge in a simulation of a "real world" negotiation arena.

**GVPT 451 Foreign Policies of Russia and the States of the Former Soviet (3) Union** *Prerequisite: GVPT 280 or GVPT 282.* A study of the development of the foreign policies of Russia and the other states of the former Soviet Union, with attention paid to the processes of policy formation and the forces and conditions that make for continuities and changes.

**GVPT 453 Recent East Asian Politics (3)** *Prerequisite: GVPT 280 or GVPT 282.* The background and interpretation of recent political events in East Asia and their influence on world politics.

**GVPT 454 Contemporary African Politics (3)** *Prerequisite: GVPT 280 or GVPT 282.* A survey of contemporary development in the

international politics of Africa, with special emphasis on the role of an emerging Africa in world affairs.

**GVPT 455 Contemporary Middle Eastern Politics (3)** *Prerequisite: GVPT 280 or GVPT 282.* A survey of contemporary development in the international politics of the Middle East, with special emphasis on the role of emerging Middle East nations in world affairs.

**GVPT 457 American Foreign Relations (3)** *Prerequisite: GVPT 200.* The principles and machinery of the conduct of American foreign relations, with emphasis on the Departments of State and Defense, and an analysis of the major foreign policies of the United States.

**GVPT 459 Seminar in Comparative Politics (3)** *Repeatable to 6 credits if content differs.* Reading, writing, and research on topics in comparative politics. Both substantive issues and methodological approaches will be considered. Primarily for government and politics majors.

**GVPT 460 Problems in State and Local Government (3)** *Prerequisite: GVPT 260.* A study of the structure, procedures and policies of state and local governments with special emphasis on the state level and on intergovernmental relationships, and with illustrations from Maryland governmental arrangements.

**GVPT 461 Metropolitan Government (3)** *Prerequisite: GVPT 260.* An examination of administrative problems relating to public services, planning and coordination in a metropolitan environment.

**GVPT 462 Urban Politics (3)** *Prerequisite: GVPT 260.* Urban political process and institutions considered in the light of changing social and economic conditions.

**GVPT 473 Legislatures and Legislation (3)** *Prerequisite: GVPT 170.* A detailed survey of lawmaking and the legislative process, emphasizing the U.S. Congress and its members.

**GVPT 474 Political Parties (3)** *Prerequisite: GVPT 170.* A descriptive and analytical examination of American political parties, nominations, elections, and political leadership.

**GVPT 475 The Presidency and the Executive Branch (3)** *Prerequisite: GVPT 170.* 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.

**GVPT 476 The Business Government Relationship (3)** *Prerequisite: GVPT 270.* Examines the structures, process, and outcomes of business and government and the politics and products of their cooperative-adversarial relationship in the United States. The design integrates interest group and administrative politics and the public policy process.

**GVPT 479 Seminar in American Politics (3)** *Repeatable to 6 credits if content differs.* Reading, writing, and research on topics in American politics. Both substantive issues and methodological approaches will be considered. Primarily for government and politics majors.

**GVPT 480 Comparative Political Systems (3)** *Prerequisite: GVPT 280 or GVPT 282.* A study, along functional lines, of major political institutions, such as legislatures, executives, courts, bureaucracies, public organizations, and political parties.

**GVPT 481 Government and Administration of Russia and the States of the (3) Former Soviet Union** *Prerequisite: GVPT 280 or GVPT 282.* A comparative study of the governmental systems and political processes of the states of the former Soviet Union.

**GVPT 482 Government and Politics of Latin America (3)** *Prerequisite: GVPT 280 or GVPT 282.* A comparative study of the governmental systems and political processes of the Latin American countries.

**GVPT 483 Government and Politics of Asia (3)** *Prerequisite: GVPT 280 or GVPT 282.* A comparative study of governments and politics of Asian countries.

**GVPT 484 Government and Politics of Africa (3)** *Prerequisite: GVPT 280 or GVPT 282.* 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.

**GVPT 485 Government and Politics of the Middle East (3)** *Prerequisite: GVPT 280 or GVPT 282.* A comparative study of the governmental systems and political processes of the Middle Eastern countries, with special emphasis on the problems of nation-building in emergent countries.

**GVPT 486 Comparative Studies in European Politics (3)** *Prerequisite: GVPT 280 or GVPT 282.* Comparative studies in the forms of governance, political processes, and public policies in European countries.

**GVPT 492 The Comparative Politics of Race Relations (3)** *Prerequisite: GVPT 280 or GVPT 282.* Impact of government and politics on race relations in various parts of the world. The origins,

problems, and manifestations of such racial policies as segregation, apartheid, integration, assimilation, partnership, and nonracialism will be analyzed.

## HEBR—Hebrew

**HEBR 111 Elementary Hebrew I (6)** *Six hours of discussion/recitation per week.* Modern Israeli Hebrew. Emphasis on conversation. Study of linguistic structure and development of audio-lingual, writing and reading ability.

**HEBR 112 Elementary Hebrew II (6)** *Six hours of discussion/recitation per week.* *Prerequisite: HEBR 111 or equivalent.* Continuation of HEBR 111.

**HEBR 211 Intermediate Hebrew I (6)** *Six hours of discussion/recitation per week.* *Prerequisite: HEBR 112 or equivalent.* 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.

**HEBR 212 Intermediate Hebrew II (6)** *Six hours of discussion/recitation per week.* *Prerequisite: HEBR 211 or permission of department.* Continuation of HEBR 211.

**HEBR 298 Special Topics in Jewish Studies (3)** *Repeatable to 6 credits if content differs.*

**HEBR 313 Conversation and Composition I (3)** *Prerequisite: HEBR 212 or equivalent.* A practical language course recommended for all students continuing with Hebrew. Review of grammar and composition. Selected readings. Oral and written exercises.

**HEBR 314 Conversation and Composition II (3)** *Prerequisite: HEBR 313 or equivalent.* A practical language course recommended for all students continuing with Hebrew. Review of grammar and composition. Selected readings. Oral and written exercises.

**HEBR 381 Advanced Conversation and Composition (3)** *Prerequisite: HEBR 314 or permission of department.* Concentrated practice in spoken and written Hebrew.

**HEBR 382 Readings in Hebrew Newspapers and Periodicals (3)** *Prerequisite: HEBR 314 or permission of department.* Current events, editorials, theatrical reports, book reviews, and scholarly articles. Conducted in Hebrew.

**HEBR 498 Special Topics in Hebrew (3)** *Repeatable to 6 credits if content differs.*

## HESP—Hearing and Speech Sciences

**HESP 120 Introduction to Linguistics (3)** 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.

**HESP 202 Introduction to Hearing and Speech Sciences (3)** Introduction to phonetics, the physiological bases of speech production and reception, and the physics of sound.

**HESP 300 Introduction to Psycholinguistics (3)** *Prerequisite: HESP 202.* 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.

**HESP 305 Anatomy and Physiology of the Speech Mechanism (3)** *Prerequisite: HESP 202.* Anatomy, physiology, and neurology of speech mechanism.

**HESP 311 Anatomy, Pathology and Physiology of the Auditory System (3)** *Prerequisite: HESP 202.* 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.

**HESP 400 Speech and Language Development in Children (3)** *Prerequisite: HESP 300.* Analysis of the normal processes of speech and language development in children.

**HESP 402 Speech Pathology I (3)** *Prerequisite: HESP 300.* Etiology, assessment and treatment of language and phonological disorders in children.

**HESP 403 Introduction to Phonetic Science (3)** *Prerequisite: HESP 305.* An introduction to physiological, acoustic and perceptual phonetics; broad and narrow phonetic transcription; current models of speech production and perception.

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**HESP 404 Speech Pathology II (3)** *Prerequisite:* HESP 305. Etiology, assessment and therapeutic management of phonation, resonance, and fluency disorders in children and adults.

**HESP 406 Speech Pathology III (3)** *Prerequisites:* HESP 300 and HESP 305. Survey of the dysarthrias and aphasia in adults from an interdisciplinary point of view.

**HESP 407 Bases of Hearing Science (3)** *Prerequisite:* HESP 311. 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.

**HESP 411 Introduction to Audiology (3)** *Prerequisite:* HESP 311. An introduction to the field of audiology. Evaluation and remediation of hearing handicaps.

**HESP 417 Principles and Methods in Speech-Language Pathology and Audiology (3)** *Prerequisite:* HESP 402, HESP 411. The principles underlying the treatment of speech, language and hearing disorders in children and adults.

**HESP 418 Clinical Practice in Speech-Language Pathology and Audiology (3)** *Prerequisite:* HESP 417. Repeatable to 6 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.

**HESP 438 Seminar: Special Issues in Early Childhood Special Education (1-3)**

**HESP 498 Seminar (3)** *Prerequisite:* permission of department. Repeatable to 6 credits if content differs. Selected topics in human communication and its disorders.

**HESP 499 Independent Study (1-3)** *Prerequisite:* permission of department. Repeatable to 6 credits if content differs. A directed study of selected topics pertaining to human communication and its disorders.

## HIST—History

**HIST 106 American Jewish Experience (3)** *Also offered as JWST 141. Credit will be granted for only one of the following: HIST 106 or JWST 141.* 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.

**HIST 110 The Ancient World (3)** *Formerly HIST 130.* 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.

**HIST 111 The Medieval World (3)** *Formerly HIST 131.* 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.

**HIST 112 The Rise of the West: 1500-1789 (3)** *Formerly HIST 132.* History of early modern Europe. Development of the national consciousness of European peoples. Evolution of state power and bureaucracy, economic institutions, art, literature, science and religion.

**HIST 113 Modern Europe: 1789-Present (3)** *Formerly HIST 133.* Evolution of modern nation states. Industrial-economic structure and demography. Emergence of modern secular society.

**HIST 120 Islamic Civilization (3)** *Formerly HIST 280.* Islamic civilization. The major institutions of Islam. Pre-Islamic Arabia, rise of Muhammad, basic tenets of Islam, Islamic religious law, and sectarian developments.

**HIST 122 African Civilization to 1800 (3)** *Formerly HIST 290.* 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.

**HIST 123 Sub-Saharan Africa Since 1800 (3)** *Formerly HIST 290.* Overviews early-to-mid nineteenth century changes in African societies, European conquest and African resistances in the late nineteenth century, colonial states and societies, African nationalisms and decolonization and the independence era. Struggles over social, economic, and political changes are emphasized.

**HIST 126 Jewish Civilization (3)** *Also offered as JWST 121. Credit will be granted for only one of the following: HIST 126 or JWST 121. Formerly HIST 105.* Jewish history, culture, and society from Biblical times to the present.

**HIST 156 History of the United States to 1865 (3)** The United States from colonial times to the end of the Civil War. Establishment and development of American institutions.

**HIST 157 History of the United States Since 1865 (3)** 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.

**HIST 170 The Humanities I (3)** *Formerly HIST 144.* Cultural development of western civilization from pre-historic times to the Renaissance. Influences on the common cultural heritage of western civilization.

**HIST 174 Introduction to the History of Science (3)** *Formerly HIST 200.* Major issues in the development of modern science. Specific examples of discoveries and theories from the viewpoint of theories of historical change, philosophies of science, and interaction of science with philosophy.

**HIST 175 Science and Technology in Western Civilization (3)** *Formerly HIST 201.* Key periods of change in science and technology; the causes and effects of these changes beginning with prehistory and ending with the current century.

**HIST 176 Modern Business History (3)** *Formerly HIST 115.* Evolution of the modern business system in Europe and America. Modern corporations and banks and their relations with government and the rest of society.

**HIST 178 Biography in History (3)** *Repeatable to 6 credits if content differs.* Detailed investigations in the lives, times, and works of important and visible figures in world history. Concern for both the theory of the individual in history and close examination of the single person. Course content changes semester to semester.

**HIST 180 The Chinese World (3)** An introduction to China, both traditional and modern. The various aspects of Chinese culture, including the language, family, history, art, and agriculture.

**HIST 209 Selected Topics (3)**

**HIST 210 Women in America to 1880 (3)** *Also offered as WMST 210. Credit will be granted for only one of the following: HIST 210 or WMST 210.* An examination of the economic, family and political roles of colonial, slave, immigrant and frontier women in America from pre-industrial colonial period through the early stages of nineteenth century industrialization and urbanization.

**HIST 211 Women in America Since 1880 (3)** *Also offered as WMST 211. Credit will be granted for only one of the following: HIST 211 or WMST 211.* 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.

**HIST 212 Women in Western Europe, 1750-Present (3)** *Also offered as WMST 212. Credit will be granted for only one of the following: HIST 212 or WMST 212.* 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.

**HIST 219 Special Topics in History (3)**

**HIST 219F Special Topics in History: Material Culture in American History (3)**

**HIST 224 Modern Military History, 1494-1815 (3)** Survey of 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 dynastic wars of the Valois and Habsburgs to the national wars of the French Revolution and Empire.

**HIST 225 Modern Military History, 1815-Present (3)** 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.

**HIST 234 History of Britain to 1485 (3)** 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.

**HIST 235 History of Britain 1461 to 1714 (3)** 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; 17th century crises and revolutions; intellectual and cultural changes; the beginnings of empire; the achievement of political and intellectual order.

**HIST 236 History of Britain 1688 to Present (3)** 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.

**HIST 237 Russian Civilization (3)** 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.

**HIST 250 Latin American History I (3)** Latin America from pre-Columbian Indian cultures to the beginnings of the wars for independence (ca. 1810), covering cultural, political, social, and economic developments.

**HIST 251 Latin American History II (3)** The political culture of the republics of Latin America. Themes include nation building, modernization, race relations, economic development, gender, reform and reevaluation, and relations between the United States and Latin America.

**HIST 255 Afro-American History (3)** A survey of the Afro-American in American history, covering the African background, slavery, the role of the Negro in the social, political, economic, cultural and artistic life of the United States. Emphasis will be placed on the enduring themes of the black experience in American society, including contemporary problems in race relations.

**HIST 265 Social and Cultural History of Modern America (3)** American social history from Civil War to the present. Examination of a network of social interaction accompanying the rise of male-dominated, business-oriented urban culture after the Civil War. Concentration on the major social forces clashing and cooperating to produce the modern United States: "business republicanism", urban workers; intellectuals; rural populists; immigrants (especially Jewish); Black Americans; and struggling women liberators. The swift crosscurrents of a "free-society" still wrestling with inherent contradictions of the democratic experiment begun in the American colonies some 350 years ago.

**HIST 266 The United States in World Affairs (3)** 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.

**HIST 275 Law and Constitutionalism in American History (3)** An exploration of the relationship between law and the social and political order between 1750 and 1950. Discussion of important historical issues—religious liberty, economic development, slavery and the Civil War, the political economy of industrialization, the creation of the modern state—from a legal and constitutional perspective.

**HIST 280 Reconstructing the Civilization of Ancient Mesopotamia (3)** *Also offered as JWST 227. Not open to students who have completed HEBR 440. Credit will be granted for only one of the following: HIST 280 or JWST 227. Formerly HEBR 440.* History and culture of Ancient Mesopotamia, as reconstructed from archaeology, language, and texts of the region. Emphasis on culture, literature, religion, and institutions.

**HIST 281 The Rabbinic Movement: History and Culture (3)** *Also offered as JWST 230. Credit will be granted for only one of the following: HIST 281 or HIST 230.* Introduction to the Rabbinic movement and its history, first to seventh century CE. Survey of the essential texts of ancient Rabbinic literature, both halakhic (legal) and aggadic (non-legal).

**HIST 282 History of the Jewish People I (3)** *Also offered as JWST 234. Credit will be granted for only one of the following: HIST 282 or JWST 234.* Political, economic, social and cultural development within Jewish history from the Biblical period to the late Middle Ages. Special attention to the emergence of Rabbinic Judaism and its subsequent encounter with medieval Christian and Islamic civilizations.

**HIST 283 History of the Jewish People II (3)** *Also offered as JWST 235. Credit will be granted for only one of the following: HIST 283 or JWST 235.* 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.

**HIST 284 East Asian Civilization I (3)** 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.

**HIST 285 East Asian Civilization II (3)** 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 eighteenth and nineteenth centuries, and their attempts to survive as nations in the twentieth century.

**HIST 305 The Eastern Orthodox Church: Its Cultural History (3)** A study of the development of the Christian church in the Near East and Eastern Europe from the conversion of Constantine to the

present. Emphasis on the relations between church and state in various periods and on the influence of Eastern Christianity on the cultures of traditionally Eastern Orthodox nations.

**HIST 306 History of Religion in America (3)** A history of religion, religious movements, and churches in America from the early colonial period to the present, with special attention to the relation of church and society.

**HIST 307 The Holocaust of European Jewry (3)** *Also offered as JWST 345. Not open to students who have completed HIST 206. Credit will be granted for only one of the following: HIST 307 or JWST 345. Formerly HIST 206.* 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.

**HIST 309 Proseminar in Historical Writing (3)** Discussions and research papers designed to acquaint the student with the methods and problems of research and presentation. Students will be encouraged to examine those phases of history which they regard as their specialties.

**HIST 312 Crisis and Change in the United States (3)** *Prerequisite: one course in history.* Major historical crises, controversies, and readjustments in the United States.

**HIST 313 Crisis and Change in European Society (3)** *Prerequisite: one course in history.* Major historical crises, controversies, and readjustments in European society.

**HIST 314 Crisis and Change in the Middle East and Africa (3)** *Prerequisite: one course in history.* Major historical crises, controversies, and readjustments in the Middle East and Africa.

**HIST 315 Crisis and Change in East Asia (3)** *Prerequisite: one course in history.* Major historical crises, controversies, and readjustments in East Asia.

**HIST 316 Crisis and Change in Latin America (3)** *Prerequisite: one course in history.* Major historical crises, controversies, and readjustments in Latin America.

**HIST 319 Special Topics in History (3)** *Repeatable to 6 credits if content differs.*

**HIST 320 Early Christianity: Jesus to Constantine (3)** *Prerequisite: one course in ancient history at the 200 level. Also offered as JWST 331. Credit will be granted for only one of the following: HIST 320 or JWST 331.* Social and religious history of early Christianity from its origins in the First Century to the reign of Constantine.

**HIST 321 Biblical History and Culture (3)** *Also offered as JWST 324. Not open to students who have completed HEBR 333. Credit will be granted for only one of the following: HIST 321 or JWST 324. Formerly HEBR 333.* Study of the political, social and religious development of the Jewish nation from its inception to its return from exile in Babylonia around 536 C.E. Focus on biblical texts, archaeological finds, and source materials from neighboring cultures to reconstruct political history and the development of religious concepts.

**HIST 324 Classical Greece (3)** 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.

**HIST 325 Alexander the Great and the Hellenistic Age (3)** 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.

**HIST 326 The Roman Republic (3)** 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 which brought it about, and the consequent transformation and decline of the republic.

**HIST 327 The Roman Empire (3)** Roman history from Augustus to Heraclius, 44 B.C.-A.D. 641: 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.

**HIST 330 Europe in the Making: The Early Medieval West (A.D. 300-1000) (3)** 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.

**HIST 331 Europe in the High Middle Ages: 1000-1250 (3)** Medieval civilization in the 11th through 13th 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. Recommended as a sequel to HIST 330.

**HIST 332 Europe During the Renaissance and Reformation I (3)** Continental Europe from 1450 to 1650: development and spread of Renaissance culture; growth in the powers of central government; economic expansion and beginnings of overseas colonization; division of Western Christendom into two rival religious camps. Particular emphasis on the Protestant and Catholic reformations and their consequences for Europe's political, social, and cultural development. Renaissance and reformation, 1450-1555. The age of religious wars, 1555-1650.

**HIST 333 Europe During the Renaissance and Reformation II (3)** Continuation of HIST 332.

**HIST 334 The Age of Absolutism, 1600-1715 (3)** Europe in the age of Louis XIV, with emphasis upon social, religious, and cultural developments.

**HIST 335 Society, Ideas and Culture in the Old Regime, 1715-1789 (3)** Europe during the French revolution and Napoleonic period. Intellectual, social, and cultural movements in revolutionary Europe.

**HIST 336 Europe in the 19th Century, 1815-1919 (3)** The political, economic, social, and cultural development of Europe from the Congress of Vienna to the First World War.

**HIST 337 Europe in the World Setting of the 20th Century (3)** Political, economic and cultural developments in 20th century Europe with special emphasis on the factors involved in the two world wars and their global impacts and significance.

**HIST 340 Eastern Europe under Communism (3)** The evolution of communist regimes and socialist societies in Poland, Czechoslovakia, Hungary, East Germany, Romania and Bulgaria with separate treatment of Yugoslavia. Emphasis on pre-1945 continuity and post-1945 change.

**HIST 341 History of Anti-Semitism (3)** The historical development of anti-Semitism in its European context. Anti-Semitism both as a set of ideas and as a political movement from the ancient era to the present, with emphasis on the modern era.

**HIST 342 Fascism: Theory and Practice (3)** The origins and history of fascism in Europe, 1918-1945. Emphasis divided between the industrialized (or industrializing) nations and the largely agrarian countries of Europe. The rise of fascism in other parts of the world.

**HIST 344 Revolutionary Russia (3)** An exploration of the roots, dynamics and consequences of the Russian Revolution of 1917. Major interpretations of the fall of tsarism, social and political forces at play, Leninism and Stalinism.

**HIST 346 Social and Cultural History of Europe (3)** An exploration of social structure, life styles, rituals, symbols, and myths of the peoples of Europe.

**HIST 347 History of Crime and Punishment (3)** Emphasis on the historical development of law enforcement agencies, criminal jurisdictions and trial procedure, 1500-1800. Nature of principal felonies and major trends in crime; penal theory and practice in historical perspective.

**HIST 351 Social History of Washington, D.C. (3)** Development of the "resident city" of Washington: neighborhoods, schools, places of worship, economic establishments, and local population groups.

**HIST 352 America in the Colonial Era, 1600-1763 (3)** The founding of the English colonies in America and their European backgrounds, with emphasis on the reasons for the instability of colonial society to 1689; 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.

**HIST 353 America in the Revolutionary Era, 1763-1815 (3)** *Credit will be granted for only one of the following: HIST 353 or HIST 361.* 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.

**HIST 354 Ante-Bellum America 1815-1861 (3)** *Recommended: HIST 156 or HIST 210. Credit will be granted for only one of the following: HIST 354 or HIST 363.* Tracing how the strong nationalism after the War of 1812 transformed into the sectionalism that led to Civil War, the course concentrates on the controversies over slavery and other issues contributing to North-South antagonism. These include Jacksonian democracy, capitalism, racism, immigration, manifest destiny and religious, social, and intellectual movements, each of which produced their own social tendencies and tensions.

**HIST 355 Civil War and the Rise of Industrialization, 1860-1900 (3)** *Credit will be granted for only one of the following: HIST 355 and HIST 364.* 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.

**HIST 356 Emergence of Modern America, 1900-1945 (3)** *Recommended: HIST 157 or HIST 211. Credit will be granted for only one of the following: HIST 356 and HIST 365 or HIST 366.* The emergence of modern institutions and identities, 1900-1945. These institutions may include corporate enterprises and the welfare state; identities include homosexuality, the New Negro, and the New Woman.

**HIST 357 Recent America: 1945-Present (3)** *Recommended: HIST 157 or HIST 356. Credit will be granted for only one of the following: HIST 357 or HIST 367.* 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.

**HIST 367 The United States Since World War II (3)** 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.

**HIST 370 Jews and Judaism in Antiquity I: Sixth Century BCE through the (3) First Century CE** *Also offered as JWST 325. Credit will be granted for only one of the following: HIST 370 or JWST 325.* 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.

**HIST 371 Jews and Judaism in Antiquity II: First through Seventh Century (3)** *Recommended: HIST 370. Also offered as JWST 326. Credit will be granted for only one of the following: HIST 371 or JWST 326.* 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 transformation of Judaism under late Roman Christianity, and the rise of the Rabbinic movement.

**HIST 374 Modern Jewish History I: The Road to Emancipation, 1650-1870 (3)** *Also offered as JWST 343. Credit will be granted for only one of the following: HIST 374 or JWST 343.* Social, political, economic, and cultural change in the Jewish world since 1650. Emphasis on emancipation, assimilation, and new forms of Jewish identity in Western and Eastern European Jewry from the 17th to the 20th centuries.

**HIST 375 Modern Jewish History II: World Jewry Since 1870 (3)** *Also offered as JWST 344. Credit will be granted for only one of the following: HIST 375 or JWST 344.* Continuation of HIST 374.

**HIST 376 History of Zionism and the State of Israel (3)** *Also offered as JWST 342. Credit will be granted for only one of the following: HIST 376 or JWST 342.* Ideological and political factors leading to the establishment of a secular Jewish state in 1948; Zionist thought of Herzl, Ahad Ha-am, the socialist and religious Zionists, and the revisionists; diplomatic activities; Arab-Israeli conflict; post-1948 Israeli society.

**HIST 380 American Relations With China and Japan, 1740-1970 (3)** American political, economic, and cultural relations with China and Japan from the American colonial era to the present. Diplomacy and power politics; Christian missions; immigration and exclusion; overseas education; art and literature; trade, investment, technology.

**HIST 390 Middle East I (3)** A survey of the political, cultural and institutional history covering the period up to the tenth century.

**HIST 391 Middle East II (3)** A survey of the political, cultural and institutional history covering the period up from the tenth century to the beginning of the nineteenth century.

**HIST 392 History of the Contemporary Middle East (3)** The rise of sovereign nation-states; modernization, westernization and secularization in a traditional society; shifting political and economic power groupings within a regional and global context.

**HIST 395 Honors Colloquium I (3)** *Prerequisite: permission of department. For HIST majors only.* History and theory: the conceptual underpinnings of the historical discipline. Students evaluate several contrasting theories of history. Prerequisite for other honors courses.

**HIST 396 Honors Colloquium II (3)** *Prerequisite: HIST 395 or permission of department. For HIST majors only.* 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.

**HIST 398 Honors Thesis (3)**

**HIST 401 The Scientific Revolution: From Copernicus to Newton (3)** Major events in the history of physical science during the 16th and 17th centuries and their relation to philosophy, religion and society in Western Europe. The attack on ancient and medieval scientific theories: the transition from geocentric to heliocentric astronomy; discoveries of Kepler, Galileo and Newton; and the establishment of the "mechanical philosophy" that dominated early modern science.

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**HIST 402 The Development of Modern Physical Science: From Newton to Einstein (3)** *Prerequisites: MATH 110; and PHYS 112 or PHYS 117 or equivalent.* The history of physics in the 18th and 19th centuries, including some of its connections with mathematics, technology, chemistry and planetary science. Emphasis on internal technical developments in physical theory, with some discussion of experimental, philosophical and sociological aspects. This is the second part of a three-semester sequence (HIST 401, HIST 402, PHYS 490); each part may be taken independently of the others.

**HIST 403 20th Century Revolutions in the Physical Sciences (3)** *Prerequisites: MATH 110 or equivalent and six credits of college-level physics.* Major changes in knowledge of the physical world, including quantum theory/atomic structure, relativity/cosmology, and continental drift/plate tectonics; theories about the nature of scientific revolutions.

**HIST 404 History of Modern Biology (3)** The internal development of biology in the nineteenth and twentieth centuries, including evolution, cell theory, heredity and development, spontaneous generation, and mechanism-vitalism controversies. The philosophical aspects of the development of scientific knowledge and the interaction of biology with chemistry and physics.

**HIST 406 History of Technology (3)** *Not open to students who have completed HIST 407 prior to Fall Semester, 1989.* 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.

**HIST 407 Technology and Social Change in History (3)** *Students with HIST 407 prior to Fall Semester 1989 must have permission of department to enroll in this course.* Social consequences of technological innovations and the ways in which societies people have coped with new technologies.

**HIST 410 Introduction to Archives I (3)** *Prerequisite: permission of department. Corequisite: HIST 411.* History of the basic intellectual problems relating to archives and manuscript repositories; emphasis on problems of selection, access, preservation, inventorying and editing as well as the variety of institutions housing documents.

**HIST 411 Introduction to Archives II (3)** *Prerequisite: permission of department. Corequisite: HIST 410.* Practical experience through placement in cooperating archives or manuscript repositories in the Baltimore/Annapolis/Washington, D.C. areas. Assignments to specific projects based on intellectual interest of students.

**HIST 414 History of European Ideas I (3)** Review of the basic western intellectual traditions as a heritage from the ancient world. Selected important currents of thought from the scientific revolution of the 16th and 17th centuries down to the end of the 18th century.

**HIST 415 History of European Ideas II (3)** A continuation of HIST 414 emphasizing 19th and 20th century thought.

**HIST 418 Jews and Judaism: Selected Historical Topics (3)** *Repeatable to 6 credits if content differs.*

**HIST 419 Special Topics in History (3)** *Repeatable to 9 credits if content differs.*

**HIST 422 Byzantine Empire I (3)** The Eastern Roman Empire from Constantine the Great to the crisis of the ninth century. The development of the late Roman state into the Medieval Christian Byzantine empire and the evolution of a distinctive Byzantine culture.

**HIST 423 Byzantine Empire II (3)** The Byzantine empire from the Macedonian renaissance to the conquest of Constantinople by the Turks in 1453: the Byzantine empire at its height, the crusades, Byzantium as a minor power, and its contributions to the Renaissance and the cultures of Russia and the Balkans.

**HIST 424 Early Russia (3)** A study of the evolution of the East Slavic peoples from prehistory to the time of Peter the Great. Major segments are devoted to the Kievan Rus state, Mongol rule, Muscovite autocracy, the absorption of Ukraine, and the advent of Westernization.

**HIST 425 Imperial Russia (3)** 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.

**HIST 426 Age of Industry: Britain 1760 to 1914 (3)** An economic, social, political and cultural analysis of Britain in the age of its industrial supremacy. The nature of the first industrial revolution; the emergence of modern social classes; the cultural impact of industrialization; politics and society in the early and mid-nineteenth century; Victorianism and its critics; imperialism and politics; high and low culture; the rise of labor; social and political tensions 1910-1914.

**HIST 427 Age of Decline: Britain 1914 to Present (3)** British society since the First World War. The social, cultural, economic

and political impact of the First World War; labor and politics in the 1920s and 1930s; the inter-war depression, appeasement and foreign policy; the social impact of the Second World War; the welfare state and nationalization of industry; the dissolution of Empire; the emergence of a consumer society; social criticism in 1950s; the economic and political problems of the 1960s and 1970s.

**HIST 430 Tudor England (3)** 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.

**HIST 431 Stuart England (3)** An examination of the political, religious and social forces in English life, 1603-1714, with special emphasis on Puritanism and the English revolutions.

**HIST 433 Changing Perceptions of Gender Identities in the U.S., 1880-1935 (3)** 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.

**HIST 435 Constitutional and Legal History of Britain (3)** *Not open to students who have completed HIST 434 or HIST 435.* Constitutional and legal developments in England from the Anglo-Saxon settlement to the present day. The rise and decline of monarchical government, the development of parliament, and the emergence of systematized, democratic government. The origins of the common law and legal profession, the development of a centralized judicial system, and the emergence of modern trial procedures. Survey knowledge of English history desirable.

**HIST 436 French Revolution and Napoleon (3)** The causes and course of the French Revolution with emphasis on the struggle among elites, popular intervention, the spread of counterrevolution, the Terror as repression and popular government, the near collapse of the Republic, and the establishment and defeat of dictatorship.

**HIST 437 Modern France from Napoleon to DeGaulle (3)** 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.

**HIST 440 Germany in the Nineteenth Century, 1815-1914 (3)** Examines the social, economic, cultural, and political development of the major German states before 1871 and of Germany, excluding Austria, from 1871 to 1914.

**HIST 441 Germany in the Twentieth Century: 1914-Present (3)** Germany's aims and policies during World War I, its condition and policies in the inter-war period, the rise of National Socialism, World War II, and post-war Germany.

**HIST 442 Twentieth-Century Russia (3)** 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.

**HIST 443 Modern Balkan History (3)** A political, socio-economic, and cultural history of Yugoslavia, Bulgaria, Romania, Greece, and Albania from the breakdown of Ottoman domination to the present. Emphasis is on movements for national liberation during the nineteenth century and on approaches to modernization in the twentieth century.

**HIST 445 Twentieth Century European Diplomatic History (3)** The development and execution of European diplomacy from the outbreak of World War I to the conclusion of World War II, concentrating on Central and Western Europe.

**HIST 447 European Economic History Since 1750 (3)** The mainsprings of the Industrial Revolution first in 18th century England and then across the rest of Europe during the 19th and 20th centuries. Emphasis on the English, French, German, Austro-Hungarian and Russian experiences with private capitalism and public policy, including fascism and communism. Social consequences of industrial development such as urbanization and the rise of labor movements.

**HIST 450 Economic History of the United States to 1865 (3)** The development of the American economy from Columbus through the Civil War.

**HIST 451 Economic History of the United States After 1865 (3)** The development of the American economy from the Civil War to the present.

**HIST 452 Diplomatic History of the United States to 1914 (3)** American foreign relations from the American Revolution to the beginning of World War I. International developments and domestic influences that contribute to American expansion in world affairs. Analyses of significant individuals active in American diplomacy and foreign policy.

**HIST 453 Diplomatic History of the United States from 1914 (3)** American foreign relations in the twentieth century. World War I, the Great Depression, World War II, the Cold War, the Korean War, and Vietnam. A continuation of HIST 452.

**HIST 454 Constitutional History of the United States: From Colonial Origins (3) to 1860** 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 and political system as a whole.

**HIST 455 Constitutional History of the United States: Since 1860 (3)** American public law and government, with emphasis on the interaction of government, law, and politics. Emphasis on the political-constitutional system as a whole, rather than simply the development of constitutional law by the Supreme Court. Major crises in American government and politics such as Civil War, reconstruction, the 1890's, the New Deal era, the civil disorders of the 1960's.

**HIST 456 History of American Culture and Ideas to 1865 (3)** The culture and ideas that have shaped American society and character from the first settlements to the Civil War.

**HIST 457 History of American Culture and Ideas Since 1865 (3)** A continuation of HIST 456, from the Civil War to the present.

**HIST 459 Society in America: Historical Topics (3)** *Repeatable to 6 credits if content differs.* 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.

**HIST 460 History of Labor in the United States (3)** The American working class in terms of its composition; its myths and utopias; its social conditions; and its impact on American institutions.

**HIST 461 Blacks in American Life: 1865 to Present (3)** The role of the Black in America since slavery, with emphasis on twentieth century developments: the migration from farm to city; the growth of the civil rights movement; the race question as a national problem.

**HIST 462 The United States Civil War (3)** Causes of the Civil War; sectional politics and secession; resources and strategy of the Confederacy and the Union; changing character of the war; emancipation and its consequences; economic, social and political conditions on the homefront; and the wartime origins of Reconstruction. Not a military history course; little attention to the tactics of particular battles.

**HIST 463 History of the Old South (3)** The golden age of the Chesapeake, the institution of slavery, the frontier south, the antebellum plantation society, the development of regional identity and the experiment in independence.

**HIST 467 History of Maryland (3)** Political, social and economic history of Maryland from the seventeenth century to the present.

**HIST 471 History of Brazil (3)** The history of Brazil with emphasis on the national period.

**HIST 472 History of the Argentine Republic (3)** Concentration upon the recent history of Argentina with emphasis upon the social and economic development of a third world nation.

**HIST 473 History of the Caribbean (3)** 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."

**HIST 474 History of Mexico and Central America I (3)** History of Mexico and Central America, beginning with the Pre-Spanish Indian cultures and continuing through European contact, conquest, and colonial dominance, down to the beginning of the Mexican War for Independence in 1810.

**HIST 475 History of Mexico and Central America II (3)** A continuation of HIST 474 with emphasis on the political development of the Mexican nation.

**HIST 480 History of Traditional China (3)** China from earliest times to 1644 A.D. Emphasis on the development of traditional Chinese culture, society, and government.

**HIST 481 A History of Modern China (3)** 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.

**HIST 482 History of Japan to 1800 (3)** 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 townsman's culture. A survey of political, economic, religious, and cultural history.

**HIST 483 History of Japan Since 1800 (3)** 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.

**HIST 487 History of Soviet Foreign Relations, 1917 to Present (3)** A history of Soviet foreign relations both conventional diplomacy and the spread of international proletarianism from the October Revolution to the present.

**HIST 491 History of the Ottoman Empire (3)** 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.

**HIST 493 Victorian Women in England, France, and the United States (3)** Examines the lives of middle and upper-class women in England, France, and the United States during the Victorian era. Topics include gender roles, work, domesticity, marriage, sexuality, double standards, and women's rights.

**HIST 494 Women in Africa (3)** The place of women in African societies: the role and function of families; institutions such as marriage, birthing, and child-rearing; ritual markers in women's lives; women in the work place; women's associations; women's health issues; measures designed to control women's behavior; women and development.

**HIST 495 Women in Medieval Culture and Society (3)** 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; contemporary assumptions about women.

**HIST 496 Africa Since Independence (3)** Analysis of socio-political and economic changes in Africa since approximately 1960; development of class structures, the role of the military, personal rule and the patrimonial state; decline of party politics and participatory politics. Discussion of changes in economic policies, policies with respect to rural communities, and their relationship to the state and decision-making.

**HIST 497 Islam in Africa (3)** The introduction of Muslims and Islam into Africa from approximately the eighth to nineteenth century. Impact of Islam on a regional-cultural basis, as well as Islam in state development. A discussion of political theory in Islamic Africa, and the impact of Islam on social structures, e.g., domestic African slavery. Role of Islam in resistance movements against imperialism and colonization, as well as the place of Islam in the independence movements of the 1950's and 1960's.

**HIST 499 Independent Study (1-3)** *Prerequisite: permission of department. Repeatable to 6 credits.*

## HLHP—Health and Human Performance

**HLHP 488 Children's Health and Development Clinic (1-4)** *Prerequisite: permission of department. Repeatable to 4 credits. Formerly PERH 488.* 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.

## HLTH—Health

**HLTH 105 Science and Theory of Health (2)** The scientific and philosophical bases for various theories of health, including health, wellness, individual control and limitations of health status, and holistic health.

**HLTH 106 Drug Use and Abuse (3)** 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.

**HLTH 140 Personal and Community Health (3)** 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.

**HLTH 150 First Aid and Emergency Medical Services (2)** Lecture, demonstration and training in emergency care, including cardiopulmonary resuscitation, hemorrhage control, shock, poisons and bone injury treatment and childbirth. American Red Cross and Heart Association of Maryland Certification awarded.

**HLTH 230 Introduction to Health Behavior (3)** 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.

**HLTH 285 Controlling Stress and Tension (3)** Health problems related to stress and tension. Analysis of causative psycho-social stressors and intervening physiological mechanisms. Emphasis on prevention and control of stress through techniques such as biofeedback, meditation and neuromuscular relaxation.

**HLTH 289 Topical Investigations (1-3)** *Repeatable to 6 credits if content differs.* Independent study by an individual student or an experimental course in special areas of knowledge not covered by regularly scheduled courses.

**HLTH 340 Curriculum, Instruction and Observation (3)** *Prerequisite: HLTH 140; and HLTH 420.* A course designed to provide directed observation and discussion, coordinating these experiences with those from previous methods courses in the development of curricula for health and physical education. The course is planned to prepare for student teaching which follows in the same semester. The observations will be made of health programs in junior and senior high schools.

**HLTH 371 Communicating Safety and Health (3)** 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.

**HLTH 377 Human Sexuality (3)** *Formerly HLTH 477.* 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.

**HLTH 380 Peer Education: Alcohol and Other Drugs (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisite: HLTH 106; and permission of department.* Peer training dealing with drug information and abuse to facilitate workshops in various outreach locations (dorms, Greek system, classrooms).

**HLTH 381 Peer Education: Stress Management (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisite: HLTH 285; and permission of department.* Peer training in different forms of stress management to facilitate workshops in various outreach locations (dorms, Greek system, classes).

**HLTH 382 Peer Education: Sexuality and Communication (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisite: HLTH 377; and permission of department.* Peer training in communication and issues of sexuality to facilitate workshops in various outreach locations (dorms, Greek system, classes).

**HLTH 383 Peer Education: Reproductive Health (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisite: HLTH 377; and permission of department.* Peer training in methods of birth control, sexually transmitted disease and AIDS education to facilitate workshops in the student Health Center and various outreach locations (dorms, Greek system, classes).

**HLTH 389 Topical Investigations (1-3)** *Repeatable to 6 credits if content differs.* Independent study by an individual student or an experimental course in special areas of knowledge not covered by regularly scheduled courses.

**HLTH 391 Introduction to Community Health (3)** *Prerequisites: HLTH 140 and HLTH 230.* Broad overview of community health. Health promotion, consumer health, public health, school health, environmental health, preventive medicine, human biology and the health care system are examined. Each area's contribution to community health is discussed.

**HLTH 420 Methods and Materials in Health Education (3)** *Prerequisites: HLTH 105 or HLTH 140.* The purpose of this course is to present the interrelationships of curriculum planning, methodology and the selection and use of teaching aids and materials. Special problems associated with health teaching are discussed. Students become familiar with a variety of resources as well as planning for and presenting demonstration lessons.

**HLTH 430 Health Education in the Workplace (3)** 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.

**HLTH 437 Consumer Behavior (3)** *Prerequisites: PSYC 100; and SOCY 100. Credit will be granted for only one of the following: CNEC 437 or HLTH 437.* An application of the behavioral sciences to a study of consumer behavior. Current theories, models and empirical research findings are explored.

**HLTH 440 Health Education and Behavioral Approaches to Nutrition (3)** *Prerequisite: NUTR 100 or equivalent.* Health education and health behavior methods, techniques and approaches applied to nutrition behavior, ways of changing nutrition and dietary behavior, relationship between nutrition and health, nutrition education, psychology of eating, and behavioral and cultural factors in diet.

**HLTH 450 Health of Children and Youth (3)** A study of the health of 5 to 18 year olds. Physical, mental, social, and emotional health. Psychosexual development, diet, exercise, recreation, and the roles of parents and teachers.

**HLTH 455 Physical Fitness of the Individual (3)** Study of major physical fitness problems confronting the adult in modern society. Consideration given to the scientific appraisal, development and maintenance of fitness at all age levels. Obesity, weight reduction, chronic fatigue, posture, and special exercise programs are explored. Open to persons outside the physical education and health fields.

**HLTH 456 Health of the Aging and Aged (3)** Psychological, physiological and socio-economic aspects of aging; nutrition; sexuality; death, dying, and bereavement; self-actualization and creativity; health needs and crises of the aged.

**HLTH 471 Women's Health (3)** *Also offered as WMST 471. Credit will be granted for only one of the following: HLTH 471 or WMST 471.* 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.

**HLTH 476 Death Education (3)** Examination of the genesis and development of present day death attitudes and behavior by use of a multidisciplinary life cycle approach.

**HLTH 485 Ways of Knowing About Human Stress and Tension (3)** *Prerequisite: HLTH 285. Not open to students who have completed HLTH 498T.* A critical examination of propositions describing the nature of the human condition and the consequences of the propositions on human stress and tension.

**HLTH 486 Stress and the Healthy Mind (3)** *Prerequisite: HLTH 285. For HLTH majors only.* Explores diverse mental health and related behavioral skills as needed by health educators that: facilitate coping with stress, are preventive in nature; and are suitable for learning by healthy individuals in educational settings.

**HLTH 487 Adult Health and Developmental Program (3)** Training and experience in a clinically oriented development program for the aged.

**HLTH 489 Field Laboratory Projects and Workshop (1-6)** *Note: the maximum total number of credits that may be earned toward any degree in kinesiology, recreation, or health education under KNES, RECR, or HLTH 489 is six.* 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.

**HLTH 490 Principles and Techniques of Community Health (3)** *Two hours of lecture and four hours of laboratory per week. Prerequisite: HLTH 391.* Students will be involved in the applied aspects of community health education. They will work with specific local community groups, planning, developing, implementing and evaluating a community health project. Health agencies and community health marketing techniques will be investigated.

**HLTH 491 Community Health Internship (12)** *40 hours of laboratory per week. Prerequisite: HLTH 490. For community health majors only.* Integrating theory with practice in a community health setting.

**HLTH 498 Special Topics in Health (3)** *Prerequisite: permission of department. Repeatable to 3 credits if content differs.* Topics of special interest in areas not covered by regularly scheduled courses.

## HONR—Honors

**HONR 100 Honors Colloquium (1)** *Prerequisite: permission of University Honors Program.* 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.

**HONR 149 Honors Colloquium (3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.* A colloquium on a variety of topics.

**HONR 168 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 169 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

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**HONR 200 Honors Research Colloquium (1)** *Prerequisite: permission of University Honors Program. Recommended for students in their second semester. All others should meet with the Honors Advisor.* Introduction to scholarly research through readings and meetings with faculty from various disciplines; exploration of research methods and some of the problems encountered in research; discussion of the creative process; attendance at scholarly lectures; and other activities designed to prepare students to enter college or departmental honors programs.

**HONR 218 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 219 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 228 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 229 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 238 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 239 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 248 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 249 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 258 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 259 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 268 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 269 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 278 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 279 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 288 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 289 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 298 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 299 Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.*

**HONR 318 Advanced Honors Seminar (3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.* A series of seminars, often interdisciplinary in character, and sometimes team taught. The subjects will vary from semester to semester.

**HONR 328 Advanced Honors Seminar (3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.* A series of seminars, often interdisciplinary in character, and sometimes team taught. The subjects will vary from semester to semester.

**HONR 338 Advanced Honors Seminar (3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.* A series of seminars, often interdisciplinary and sometimes team taught. The subjects will vary from semester to semester.

**HONR 348 Advanced Honors Seminar (1-3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.* A series of seminars, often interdisciplinary and sometimes team taught. The subjects will vary from semester to semester.

**HONR 349 Honors Colloquium (1-3)** *Prerequisite: University or departmental Honors student or permission of instructor and the Director of University Honors. Repeatable to 3 credits if content differs.* A series of seminars, often interdisciplinary and sometimes team taught. Subjects may vary.

**HONR 358 Honors Practicum (3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs. Formerly HONR 379.* For student section leaders of HONR 100 or HONR 200.

**HONR 359 Honors Workshop (1-6)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.* Honors workshops are small seminar classes which concentrate on skill development.

**HONR 368 Advanced Honors Seminar (3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.* A series of seminars, often interdisciplinary in character and sometimes team-taught. The subjects will vary from semester to semester.

**HONR 378 Advanced Honors Seminar (3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.* A series of seminars, often interdisciplinary in character and sometimes team-taught. The subjects will vary from semester to semester.

**HONR 379 Honors Independent Study (1-6)** *Prerequisite: permission of University Honors Program. Repeatable to 6 credits if content differs.* Involves reading or research directed by individual faculty, especially in areas outside of the student's major. Open only to University honors students.

**HONR 388 Honors Thesis or Project (3-6)** *Repeatable to 6 credits if content differs. Formerly HONR 370.*

**HONR 389 Guided Honors Teaching (3)** *Prerequisite: permission of University Honors Program. Repeatable to 9 credits if content differs.* For HONR 100 and HONR 200 section leaders. Guided teaching experience for selected students in the University Honors Program.

## HORT—Horticulture

**HORT 100 Introduction to Horticulture (4)** *Two hours of lecture, two hours of laboratory, and one hour of discussion/recitation per week.* 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.

**HORT 101 Practical Plant Science (4)** *Two hours of lecture, one hour of laboratory, and one hour of discussion/recitation per week.* Emphasizes the growing of plants and their importance to civilization.

**HORT 160 Introduction to Landscape Architecture (3)** Theory and general principles of landscape architecture with their application to public and private areas.

**HORT 200 Land Surveying (2)** *One hour of lecture and two hours of laboratory per week. For HORT majors only.* Understanding the principles of land surveying such as measurements of distance, elevation and angles, instrumentation, and mapping.

**HORT 201 Environmental Factors and Horticultural Crop Production (4)** *Three hours of lecture and three hours of laboratory per week. Prerequisite: HORT 100. Recommended: BIOL 105.* The first of a two semester sequence. The influence and interaction of light, mineral nutrition, water, temperature and gas exchange on growth, physiological responses, productivity and quality of horticultural crops.

**HORT 202 Management of Horticultural Crops (4)** *Three hours of lecture and three hours of laboratory per week. Prerequisite: HORT 100. Recommended: BIOL 105.* A study of the principles and practices used in the production of horticultural crops. Management of soils and soilless media, vegetative and reproductive growth and development, pests, harvest, post-harvest environment and marketing will be presented for model commodities.

**HORT 253 Woody Plant Material I (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: PBIO 250 or HORT 100. Formerly HORT 453.* A field and laboratory study of trees, shrubs, and vines used in ornamental plantings. Major emphasis is placed on native deciduous plant materials.

**HORT 254 Woody Plant Material II (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: PBIO 250 or HORT 100. Formerly HORT 454.* A field and laboratory study of trees, shrubs, and vines used in ornamental plantings. Major emphasis

is placed on introduced and evergreen plant materials.

**HORT 255 Landscape Design and Implementation (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisite: HORT 253 or HORT 254. Not open to HORT students who have completed LARC 141 and LARC 341.* Principles of landscape architecture applied to residential and commercial landscaping: informal and formal designs and plan graphics.

**HORT 261 Electronic Studio (3)** *One hour of lecture and four hours of laboratory per week. Prerequisite: HORT 260 or LARC 260. Recommended: HORT 160 or LARC 160.* For HORT and LARC majors only. Integration of computer, photographic video, audio and other information technologies with the traditional design studio including: word processing/design with type, electronic publishing, spreadsheets/ graphs/numeracy, drawing, printing, drafting, designing, image processing, electronic presentations and input/output choices.

**HORT 271 Plant Propagation (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisites: BIOL 105 and HORT 100.* A study of the principles and practices in the propagation of plants.

**HORT 320 Principles of Site Engineering (3)** *One hour of lecture and five hours of laboratory per week. Prerequisites: LARC 140 or HORT 255 and HORT 200. For HORT majors only. Also offered as LARC 320. Formerly HORT 364.* The study and application of landscape construction principles as applied to grading, drainage, layout and vehicular and pedestrian circulation.

**HORT 321 Landscape Structures and Materials (3)** *One hour of lecture and five hours of laboratory per week. Prerequisite: HORT 320. For HORT majors only. Also offered as LARC 321. Formerly HORT 465.* An examination of the use, properties, and detailing of materials used in landscape construction. The use and design of structures in the landscape.

**HORT 389 Horticultural Internship (1-6)** *Prerequisite: permission of department. Junior standing. For HORT and LARC majors only. Repeatable to 6 credits if content differs.* Credit will be given for practical work carried out at one or more horticultural industries, botanical gardens, arboreta or farms under formally arranged internships.

**HORT 398 Seminar (1)** Oral presentation of the results of investigational work by reviewing recent scientific literature in the various phases of horticulture.

**HORT 399 Special Problems in Horticulture (1-2)** *Prerequisites: 12 credits in HORT and permission of department. For HORT and BOTN majors only. Repeatable to 4 credits if content differs.* Research projects in horticulture including field, greenhouse, laboratory, studio or library research under the direction of a faculty member.

**HORT 432 Greenhouse Crop Production (3)** *Prerequisite: HORT 201; and HORT 202. Pre- or corequisite: PBIO 420.* The commercial production and marketing of ornamental plant crops under greenhouse, plastic houses and out-of-door conditions.

**HORT 433 Technology of Fruit and Vegetable Production (4)** *Three hours of lecture and three hours of laboratory per week. Prerequisite: HORT 201; and HORT 202; and HORT 271; and AGRO 411. Corequisite: PBIO 420. Recommended: AGRO 202. 60 semester hours. Junior standing. Credit will be granted for only one of the following: HORT 411, HORT 422, or HORT 433.* 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.

**HORT 452 Principles of Landscape Establishment and Maintenance (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: HORT 202; and HORT 253; and HORT 254. For HORT majors only.* Establishment and maintenance of landscape plants, stressing the physiological determinants of recommended practices.

**HORT 456 Nursery Crop Production (3)** Two lectures a week and four all-day compulsory Saturday laboratories. *Prerequisites: HORT 201; and HORT 202; and HORT 271.* The methods used for producing ornamental plants and an introduction to the different types of commercial nurseries.

**HORT 472 Advanced Plant Propagation (2)** *Prerequisite: HORT 201; and HORT 202; and HORT 271.* A study of the anatomy, morphology and physiology of the seed and plant as related to macro and micro forms of propagation. A review of research in propagation.

**HORT 474 Physiology of Maturation and Storage of Horticultural Crops (3)** *Two hours of lecture and two hours of laboratory per week. Pre- or corequisite: PBIO 420.* The physiological and biochemical changes occurring during storage of horticultural commodities. Application of scientific principles to handling and storage of fresh produce.

**HORT 489 Special Topics in Horticulture (1-3)** Credit according to time scheduled and organization of course. A lecture and/or laboratory series organized to study in depth a selected phase of horticulture not covered by existing courses.

## ITAL—Italian

**ITAL 101 Elementary Italian I (4)** *Credit will be granted for only one of the following: ITAL 101 or ITAL 121.* Introduction to basic grammar and vocabulary; written and oral work.

**ITAL 102 Elementary Italian II (4)** *Prerequisite: ITAL 101 or permission of department.* Continuation of study of basic grammar; written and oral work, with increased emphasis on spoken Italian.

**ITAL 121 Accelerated Italian I (3)** *Credit will be granted for only one of the following: ITAL 101 or ITAL 121.* An intensive beginning course in Italian language skills: guided practice in reading, writing, understanding and conversation, to enable the student to move more quickly to advanced courses. Restricted to students already having a good background in at least one other foreign language. With ITAL 122, may be used to satisfy language requirement.

**ITAL 122 Accelerated Italian II (3)** *Prerequisite: ITAL 121 or permission of department. Credit will be granted for only one of the following: ITAL 203 or ITAL 122.* Continuation of ITAL 121. Completion of accelerated cycle. May be used to satisfy language requirement.

**ITAL 203 Intermediate Italian (4)** *Prerequisite: ITAL 102 or permission of department. Credit will be granted for only one of the following: ITAL 203 or ITAL 122.* Completion of study of basic grammar; extensive reading, discussion, and composition. Completion of this course fulfills the Arts and Humanities language requirement.

**ITAL 204 Review Grammar and Composition (3)** *Prerequisite: ITAL 203 or ITAL 122, or permission of department.* An intensive review of major aspects of contemporary grammatical usage; training in comprehension; an introduction to guided composition.

**ITAL 211 Intermediate Conversation (3)** *Prerequisite: ITAL 203 or permission of department. Not open to native speakers.* Practice in spoken Italian with emphasis on contemporary Italian culture.

**ITAL 241 Modern Italian Women Writers-in Translation (3)** An analysis of the writings and the ideas of modern Italian women writers.

**ITAL 251 Aspects of Contemporary Italian Literature and Culture (3)** *Prerequisite: ITAL 204 or ITAL 211 or permission of department.* Reading of selected literary texts; discussion and brief essays in Italian.

**ITAL 301 Composition and Style (3)** *Prerequisite: ITAL 204 or permission of department.* Techniques of composition; grammatical analysis; elements of style; free composition.

**ITAL 302 Introduction to Translation (3)** *Prerequisite: ITAL 301 or permission of department.* Translation exercises into English and Italian; problems and strategies.

**ITAL 311 Italian Conversation: Current Events (3)** *Prerequisite: ITAL 211 or permission of department.* Oral expression; development of idiomatic forms and vocabulary to level of the Italian press. Not open to students with native fluency.

**ITAL 350 Readings in Italian Literature (3)** *Prerequisite: ITAL 251 or permission of department.* An exploration of principal figures, themes and styles from Dante through the Renaissance to Pirandello and present-day writers.

**ITAL 351 Italian Literature From Dante to the Renaissance (3)** *Prerequisite: ITAL 251 or permission of department.* Basic survey of history of Italian literature.

**ITAL 399 Directed Study in Italian (1-3)** *Prerequisite: permission of department. Repeatable to 3 credits.* Intended for undergraduates who wish to work on an individual basis with a professor of their choice.

**ITAL 411 Dante-in Translation (3)** *Credit will be granted for only one of the following: ITAL 411 or ITAL 412.* Dante's thought as expressed in his major writings: The Vita Nuova, De Monarchia and The Divine Comedy. In English.

**ITAL 412 Dante-in Italian (3)** *Credit will be granted for only one of the following: ITAL 411 or ITAL 412.* Dante's thought as expressed in his major writings: The Vita Nuova, De Monarchia and The Divine Comedy. In Italian.

**ITAL 421 The Italian Renaissance (in Translation) (3)** *Credit will be granted for only one of the following: ITAL 421 or ITAL 422. Formerly ITAL 410.* Major trends in Renaissance literature, art, and science. In English.

**ITAL 422 The Italian Renaissance (in Italian) (3)** *Credit will be granted for only one of the following: ITAL 421 or ITAL 422.* A study of major trends of thought in Renaissance literature, art, and science. In Italian.

**ITAL 431 Italian Civilization-in Translation (3)** *Credit will be granted for only one of the following: ITAL 431 or ITAL 432.*

Formerly ITAL 370. Political, social, intellectual, literary and artistic forces shaping contemporary Italy from the late Middle Ages to the present. In English.

**ITAL 432 Italian Civilization-in Italian (3)** *Credit will be granted for only one of the following: ITAL 431 or ITAL 432. Formerly ITAL 470.* Political, social, intellectual, literary and artistic forces shaping contemporary Italy from the late Middle Ages to the present. In Italian.

**ITAL 471 Italian Cinema: A Cultural Approach (in Translation) (3)** *Credit will be granted for only one of the following: ITAL 471 or ITAL 472. Formerly ITAL 475.* The culture of Italy through the medium of film from the silent days up to the present. In English.

**ITAL 472 Italian Cinema: A Cultural Approach (in Italian) (3)** *Credit will be granted for only one of the following: ITAL 471 or ITAL 472.* The culture of Italy through the medium of film from the silent days up to the present. In Italian.

**ITAL 475 The Italian Opera Libretto-in English (3)** *Prerequisite: one course in literature. Credit will be granted for only one of the following: ITAL 376, ITAL 475, or ITAL 476. Formerly ITAL 376.* History and analysis of Italian opera librettos from Monteverdi through Mozart to Verdi and Puccini. In English.

**ITAL 476 The Italian Opera Libretto-in Italian (3)** *Credit will be granted for only one of the following: ITAL 476 or ITAL 475.* History and analysis of Italian opera librettos from Monteverdi through Mozart to Verdi and Puccini. In Italian.

**ITAL 497 Senior Project (3)** *Prerequisite: four courses at 400-level in Italian; permission of department.* Individual independent study of an aspect of Italian literature, culture or society selected according to student interest and need in consultation with a member of the Italian program.

**ITAL 498 Special Topics in Italian Literature (3)** *Repeatable to 6 credits if content differs.*

**ITAL 499 Special Topics in Italian Studies (3)** *Repeatable to 6 credits if content differs.*

## IVSP—Individual Studies Program

**IVSP 317 Progress Report (1)** *Prerequisite: admission to IVSP major.* A written analysis of the program. Students register for IVSP 317 only once, the semester before the final term.

**IVSP 318 Independent Learning Activities (1-6)** *Prerequisite: admission to IVSP major and prior arrangements with faculty sponsor. For IVSP majors only. Repeatable to 9 credits if content differs.* An independent study course which students can use for a variety of out-of-class internship and research opportunities.

**IVSP 420 Senior Paper (3)** *Prerequisite: admission to IVSP major. For IVSP majors only.* Synthesizing final paper or a final special project.

## JAPN—Japanese

**JAPN 101 Elementary Japanese I (6)** Introduction to basic patterns of contemporary spoken Japanese and to the two phonetic syllabaries (Katakana and Hiragana).

**JAPN 102 Elementary Japanese II (6)** *Prerequisite: JAPN 101 or equivalent.* Continued introduction to the basic spoken patterns of contemporary Japanese.

**JAPN 201 Intermediate Japanese I (6)** *Prerequisite: JAPN 102 or equivalent. Formerly JAPN 205.* Contemporary spoken and written Japanese.

**JAPN 202 Intermediate Japanese II (6)** *Prerequisite: JAPN 201 or equivalent. Formerly JAPN 206.* Contemporary spoken and written Japanese.

**JAPN 301 Advanced Japanese I (6)** *Prerequisite: JAPN 202 or equivalent. Formerly JAPN 305.* Advanced conversation, oral comprehension, and selected readings.

**JAPN 302 Advanced Japanese II (6)** *Prerequisite: JAPN 301 or equivalent. Formerly JAPN 306.* Continued readings in varied modern texts and advanced conversation and oral comprehension.

**JAPN 317 Buddhism and Japanese Literature in Translation (3)** *Credit will be granted for only one of the following: JAPN 217 or JAPN 317.* Religious and philosophical traditions central to Japanese imaginative life and literature from ancient to modern times.

**JAPN 401 Readings in Modern Japanese I (3)** *Prerequisite: JAPN 302 or equivalent.* Development of translation techniques, vocabulary, grammar, and reading speed. Readings in history, social sciences, modern literature, and modern newspaper and periodical literature.

**JAPN 402 Readings in Modern Japanese II (3)** *Prerequisite: JAPN 401 or equivalent.* Continuation of more advanced readings.

**JAPN 403 Business Japanese I (3)** *Prerequisite: JAPN 302 or equivalent. Formerly JAPN 303.* Conversation, reading, and writing applicable to Japanese business transactions, social meetings, and meetings with government organizations, with background material in English on professional business practices and social customs associated with business.

**JAPN 404 Business Japanese II (3)** *Prerequisite: JAPN 403 or equivalent. Formerly JAPN 304.* Continuation of JAPN 403.

**JAPN 405 Readings in Advanced Modern Japanese (3)** *Prerequisite: JAPN 402 or equivalent or permission of department.* Designed to further improve reading and translation skills; the course will include readings from newspaper articles, literary works, and academic publications in the social sciences and humanities. Listening exercises are included.

**JAPN 406 Translating Diplomatic Japanese (3)** *Prerequisite: JAPN 306 and permission of department.* Formal, written, diplomatic Japanese to develop practical translation skills and to learn to use the computer as a telecommunications and translation workstation.

**JAPN 411 Introduction to Classical Japanese (3)** *Prerequisite: JAPN 306 or equivalent.* Classical Japanese grammar and the varied styles of classical Japanese. Readings in classical texts drawn from the Heian, Kamakura, Muromachi, and Edo periods.

**JAPN 412 Classical Japanese (3)** *Prerequisite: JAPN 411.* Continuation of JAPN 411 with more advanced classical Japanese.

**JAPN 414 Masterpieces of Classical Japanese Literature in Translation (3)** Major classics, with focus on philosophical, historical and cultural backgrounds.

**JAPN 415 Modern Japanese Fiction in Translation (3)** Major themes and literary developments in fiction from the late 19th century to the present. Emphasis on the works of Kawabata, Tanizaki, Mishima, and Abe.

**JAPN 416 Japanese Women and Women Writers (3)** Fiction and poetry by Japanese women from the Ninth Century to the present. Women's early role in creating and shaping a variety of literary genres, the silencing of women during the age of the shoguns, and the reemergence of a feminist tradition and women writers in the Twentieth Century. In English.

**JAPN 418 Japanese Literature in Translation (3)** *Repeatable to 9 credits if content differs.* Representative works of Japanese literature in translation.

**JAPN 421 History of the Japanese Language (3)** Investigation of the origin of the Japanese language, its relationship with other languages, and its development. In English.

**JAPN 422 Introductory Japanese Linguistics (3)** An investigation of Japanese sound patterns and syntax through a comparison with English.

**JAPN 499 Directed Study in Japanese (1-3)** *Prerequisite: permission of instructor. Repeatable to 6 credits if content differs.*

## JOUR—Journalism

**JOUR 100 Introduction to Mass Communication (3)** 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. Introduction to public relations, advertising, and news analysis.

**JOUR 101 Professional Orientation (1)** Survey of journalism professions, emphasizing appropriate academic and career development strategies.

**JOUR 198 Survey Apprenticeship (1)** *Prerequisite: permission of department. For JOUR majors only. Repeatable to 6 credits if content differs.* College-monitored experience in approved mass-communications organizations and industries.

**JOUR 201 Writing For Mass Media (3)** *Pre- or corequisite: JOUR 101. Prerequisite: 30 words per minute wordprocessing ability; and grammar competency demonstrated by a score of 52 or higher on the TSWE.* Introduction to news, feature and publicity writing for the printed and electronic media, development of news concepts; laboratory in news gathering tools and writing skills.

**JOUR 202 Editing For the Mass Media (3)** *Prerequisite: grade of C or better in JOUR 201. For JOUR majors only.* Basic editing skills applicable to all mass media: copy editing, graphic principles and processes, new media technology.

**JOUR 320 News Reporting (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: grade of C or better in JOUR 201. For JOUR majors only.* Principles and practices of news reporting with special emphasis on news gathering for all the media; covering news beats and other news sources, including

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researching a news story for accuracy, comprehensiveness and interpretation.

**JOUR 321 Advanced Reporting: Public Affairs (3)** *Prerequisite:* JOUR 320. Advanced training in writing news for publication in specialized areas, particularly city, county, and federal news. Students meet in seminar with news sources and leading news reporters and work in Washington, D.C., Annapolis, and Baltimore covering news in depth for publication.

**JOUR 322 Advanced Reporting: Beats and Investigation (3)** *Prerequisite:* JOUR 320. Advanced training and practice in writing, interviewing, beat reporting and investigative techniques. Students meet in weekly seminars and work with metropolitan-area newspapers covering beats and writing stories for publication.

**JOUR 323 Newspaper Editing (3)** *Prerequisite:* grade of C or better in JOUR 202. Principles and practices of editing for publication. Copy improvement, headline writing, news photos and cutlines, wire services, copy control and scheduling, page design and layout.

**JOUR 324 News Commentary and Critical Writing (3)** *Not open to students who have completed JOUR 326 prior to January 1, 1992. Formerly JOUR 326.* Journalistic interpretation and analysis; editorial and critical writing.

**JOUR 325 Reporting from Annapolis and Washington (6)** *32 hours of laboratory per week. Prerequisite:* permission of department. *Corequisite:* JOUR 462. Advanced training in public affairs journalism. Students report state and federal news as part of College's Capital News Service.

**JOUR 326 Supervised Internship-News Editorial (3)** *Prerequisites:* a grade of "C" or better in JOUR 201, JOUR 202 and JOUR 320 and permission of department. *For JOUR majors only.* Supervised internship experience with communication professionals in newspapers, magazines, photojournalism. Relation of academic training to professional experience.

**JOUR 328 Specialized News Reporting (3)** *Prerequisite:* JOUR 320. *Repeatable to 6 credits if content differs.* Advanced training and practice in writing and reporting news of one specialized field of interest.

**JOUR 330 Public Relations Theory (3)** *Prerequisite:* grade of C or better in JOUR 201. *For JOUR majors only.* The historical development and contemporary status of public relations in business, government, associations and other organizations. Application of communication theory and social science methods to the research, planning, communication and evaluation aspects of the public relations process.

**JOUR 331 Public Relations Techniques (3)** *Prerequisites:* JOUR 330; and grade of C or better in JOUR 202. 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.

**JOUR 332 Specialized Writing in Public Relations (3)** *Prerequisite:* grade of C or better in JOUR 201. *Recommended:* JOUR 330. Public Relations writing for science, technology, health, medicine, corporate finance, educational policy, law and government in broadcast and technical media, as well as newspapers and magazines and also including proposals, speeches and correspondence.

**JOUR 333 Organizational Communication in Public Relations (3)** *Prerequisites:* JOUR 330; and grade of C or better in JOUR 202. Theory and techniques for planning and producing organizational publications and internal communication programs. Theories of organizational communication, principles of layout and design, non-print communication media, and methods of pretesting and evaluating communications programs.

**JOUR 334 Public Relations Programs (3)** *Prerequisite:* JOUR 330. 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.

**JOUR 336 Supervised Internship-Public Relations (3)** *Prerequisites:* a grade of "C" or better in JOUR 201, JOUR 202, JOUR 330, and JOUR 331 and permission of department. *For JOUR majors only.* Supervised internship experience with communication professionals in public relations. Relation of academic training to professional experience.

**JOUR 340 Advertising Communication (3)** *Prerequisite:* grade of C or better in JOUR 201. *For JOUR majors only.* Advertising as a mass communication profession and its role in the public information system of the United States. Application of communication theory and research methods to the research, planning, communication, and evaluation aspects of advertising.

**JOUR 341 Advertising Techniques (3)** *Prerequisites:* JOUR 340; and grade of C or better in JOUR 202. Writing and production of print and broadcast advertisements; application of these techniques in laboratory and field projects.

**JOUR 342 Advertising Media Planning (3)** *Prerequisite:* JOUR 340. Principles of planning, placing and evaluating advertising media in U.S. media markets. Application of theory and methods to specific advertising situations.

**JOUR 346 Supervised Internship-Advertising (3)** *Prerequisites:* a grade of C or better in JOUR 201, JOUR 202, JOUR 340, and either JOUR 341 or JOUR 342, and permission of department. *For JOUR majors only.* Supervised internship experience with communication professionals in advertising. Relation of academic training to professional experience.

**JOUR 350 Photojournalism (3)** *Prerequisite:* grade of C or better in JOUR 201. *For JOUR majors only. Not open to students who have completed JOUR 372.* Fundamentals of camera operation, composition, developing and printing black and white still photographs for publication; history of photojournalism.

**JOUR 351 Advanced Photojournalism (3)** *Prerequisite:* JOUR 350. Analysis of the role of photography in mass communication, with emphasis on the photographic essay, and use of the 35 mm camera. Students provide 35 mm equipment and supplies.

**JOUR 360 Broadcast News I (3)** *Prerequisite:* grade of C or better in JOUR 201. *For JOUR majors only.* Writing for the broadcast media and the production of news stories.

**JOUR 361 Broadcast News II (3)** *Prerequisite:* JOUR 360. Writing and editing for the broadcast media. Interpretive and documentary news stories.

**JOUR 362 Broadcast News Management (3)** *One hour of lecture and four hours of laboratory per week. Prerequisite:* JOUR 360. Management of a broadcast station's news operations.

**JOUR 365 Theory of Broadcast Journalism (3)** Descriptive and critical analysis of broadcast news practices; evaluation of news judgments; decision-making and organizational aspects of the broadcast news industry.

**JOUR 366 Supervised Internship-Broadcast News (3)** *Prerequisites:* a grade of C or better in JOUR 201, JOUR 202, and JOUR 360 and permission of department. *Recommended:* JOUR 361 for television internship. *For JOUR majors only.* Supervised internship experience with communication professionals in broadcast news. Relation of academic training to professional experience.

**JOUR 371 Magazine Article and Feature Writing (3)** *Prerequisite:* JOUR 320. Types of feature articles, particularly for the magazine market, analysis of the magazine medium and specialized audiences; practice in researching and writing the feature article; analysis of free-lance markets.

**JOUR 373 Graphics (3)** *Prerequisite:* grade of C or better in JOUR 202. Intensive analysis of the components of publication content and design. Type and typography, printing processes, illustration and production with emphasis on contemporary technology.

**JOUR 374 Magazine Production (3)** *Prerequisites:* JOUR 371; and JOUR 373. Publication of a laboratory magazine.

**JOUR 380 Science Writing for Magazines and Newspapers (3)** *Prerequisite:* JOUR 320 or permission of department. Writing of scientific and technical material for the general audience.

**JOUR 396 Supervised Internship (3)** *Prerequisites:* grade of C or better in JOUR 202; and first course of journalism sequence related to techniques (i.e. JOUR 320; or JOUR 331; or JOUR 341; or JOUR 350; or JOUR 360; or JOUR 380) and permission of department. Internship experience with communication professionals in newspapers, news broadcasting, public relations, advertising, magazines, photojournalism, and science communication. Relation of academic training to professional experience.

**JOUR 397 Professional Seminar (3)** *Prerequisites:* grade of C or better in JOUR 201; and permission of department. Projects and discussions relating professional work experience to study of journalism. Limited to students who participated in an advanced summer internship after their junior year.

**JOUR 398 Independent Study (1-3)** *Repeatable to 3 credits.* Individual projects in journalism.

**JOUR 400 Law of Mass Communication (3)** *Junior standing.* Legal rights and constraints of mass media: libel, privacy, copyright, monopoly, contempt, and other aspects of the law applied to mass communication. Previous study of the law not required.

**JOUR 410 History of Mass Communication (3)** *Junior standing.* Development of newspapers, magazines, radio, television and motion pictures as media of mass communication. Analysis of the influences of the media on the historical development of America.

**JOUR 420 Government and Mass Communication (3)** *Junior standing.* Relationship between news media and government; media coverage of government and politics; governmental and political information and persuasion techniques.

**JOUR 430 Comparative Mass Communication Systems (3)** *Junior standing.* Comparative analysis of the role of the press in different societies.

**JOUR 440 Readings in Journalism Literature (3)** *Prerequisite:* JOUR 320 or permission of department. Analysis of books by journalists highly regarded for writing style and/or the content of their reporting with an emphasis on understanding the books in the context of national and international affairs.

**JOUR 450 Mass Media in Society (3)** *Junior standing.* Ethical, moral, political, economic, and social consideration of mass communication.

**JOUR 451 Advertising and Society (3)** *Junior standing.* 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.

**JOUR 452 Women in the Media (3)** *Junior standing. Also offered as WMST 452. Credit will be granted for only one of the following: JOUR 452 or WMST 452.* Participation and portrayal of women in the mass media from colonial to contemporary times.

**JOUR 453 News Coverage of Racial Issues (3)** *Junior standing.* Analysis of news media coverage of issues relating to racial minorities in the United States, with special attention to Hispanics, Asian Americans, African Americans and Native Americans.

**JOUR 459 Special Topics in Mass Communication (3)** *Repeatable to 6 credits if content differs.* Issues of special concern and current interest. Open to all students.

**JOUR 461 Newsroom Management (3)** *Prerequisite:* JOUR 320 or JOUR 360 or permission of department. Organization, operation, and administration of a newsroom and its departments. Emphasis on ethical planning, personnel, leadership and content problems confronting newspaper and broadcast newsrooms.

**JOUR 462 Professional Seminar in Public Affairs Reporting (3)** *Prerequisite:* permission of department. Explore theoretical and practical issues in the press coverage of governments. Examine the complex press-government relationship.

**JOUR 471 Public Opinion Research (3)** Measurement of public opinion and media habits; role of the mass media in the formation of public opinion.

**JOUR 477 Mass Communication Research (3)** *Prerequisite:* MATH 110 or equivalent; students are encouraged to have completed the theory and technique courses in their major sequence. Communication research methods used in measuring public opinion and evaluating public relations, advertising, and mass media programs and materials.

**JOUR 481 Writing the Complex Story (3)** *Pre- or corequisite:* JOUR 371. Explanatory journalism technique applied to complex subjects (such as science, economics and large scale social change) for books, magazines and newspaper series.

**JOUR 483 Senior Seminar in Public Relations (3)** *Prerequisite:* JOUR 331; and JOUR 477. 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.

**JOUR 484 Advertising Campaigns (3)** *Prerequisite:* JOUR 341; and JOUR 342. Planning and executing advertising campaigns in actual agency situations. Integration of advertising theories and techniques into a complete campaign.

**JOUR 486 Advanced Television Journalism (3)** *Prerequisite:* JOUR 361 or permission of department. A skills course in which students assume major responsibility for the production of a weekly TV news and public affairs program. Students will work on extended TV reporting assignments such as mini-series and news documentaries. Note: In addition to classroom time, students are required to devote time out of class in reporting and editing.

**JOUR 487 Literary Journalism (3)** *Pre- or corequisite:* JOUR 371. Practice in the use of literary techniques and especially of dramatic structure in modern newspaper series, magazine pieces and books. Analysis, researching and writing of nonfiction stories, usually with a focus on a specialized area chosen by the student.

**JOUR 492 Typography and Layout For Student Publications (3)** Type design, type families, graphics, art, photography, and editorial and advertisement layout of school newspapers, yearbooks, and magazines.

**JOUR 493 Advanced Techniques For Student Publication Advisors (3)** Interpretative and investigative reporting; interviewing and scientific survey methods; curriculum and courses for high school and community colleges; textbooks, teaching units, state of the art techniques and resource aids.

**JOUR 494 Yearbook Short Course (1)** *Prerequisite:* JOUR 201 or permission of department. *Credit not applicable toward major in journalism.* Intensive course dealing with the theme, content, copy, design, advertising, budget, finance, law and ethics of yearbook

development and production.

**JOUR 498 Topics in Scholastic Journalism (1-3)** Repeatable if content differs. Seminars on specialized areas on the practice of scholastic journalism.

## JWST—Jewish Studies

**JWST 121 Jewish Civilization (3)** Also offered as HIST 126. Credit will be granted for only one of the following: JWST 121 or HIST 126. Jewish history, culture and society from Biblical times to the present.

**JWST 141 American Jewish Experience (3)** Also offered as HIST 106. Credit will be granted for only one of the following: JWST 141 or HIST 106. 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.

**JWST 171 The Modern Jewish Experience Through Literature (3)**

**JWST 219 Special Topics in Jewish Studies (3)** Repeatable to 9 credits if content differs.

**JWST 230 Introduction to the Rabbinic Movement: History and Culture (3)** Also offered as HIST 281. Credit will be granted for only one of the following: JWST 230 or HIST 281. The emergence of the Rabbinic movement after the destruction on the Temple in 70 CE through the 7th Century CE. The essential texts of ancient rabbinic literature.

**JWST 234 History of the Jewish People I (3)** Also offered as HIST 282. Credit will be granted for only one of the following: JWST 234 or HIST 282. Political, economic, social and cultural development within Jewish history from the Biblical period to the late Middle Ages. Special attention to the emergence of Rabbinic Judaism and its subsequent encounter with medieval Christian and Islamic civilizations.

**JWST 235 History of the Jewish People II (3)** Also offered as HIST 283. Credit will be granted for only one of the following: JWST 235 or HIST 283. 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.

**JWST 250 Fundamental Concepts of Judaism (3)** Also offered as PHIL 234. Not open to students who have completed PHIL 234. Credit will be granted for only one of the following: JWST 250 or PHIL 234. A conceptual 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.

**JWST 251 Authority, Faith, and Reason in Judaism (3)** Also offered as PHIL 235. Not open to students who have completed PHIL 235 or HEBR 298J. Credit will be granted for only one of the following: JWST 251 or PHIL 235. A broad survey of the concepts of authority, faith, and reason in Jewish tradition from the Bible to the modern period, and their interrelationships.

**JWST 260 Introduction to Classical Hebrew I (3)** Prerequisite: HEBR 111 or equivalent. Also offered as HEBR 298A. Not open to students who have completed HEBR 401. Formerly HEBR 401. Readings of the Bible and other classical texts in original Hebrew. Emphasis on classical grammar and vocabulary, and reading of textual passages.

**JWST 261 Introduction to Classical Hebrew II (3)** Prerequisite: JWST 260 or permission of department. Also offered as HEBR 298B. Not open to students who have completed HEBR 402. Formerly HEBR 402. Continuation of JWST 260. Readings in the Bible and other classical texts in original Hebrew. Emphasis on classical grammar and vocabulary, and reading of textual passages.

**JWST 262 The Hebrew Bible: Narrative (3)** Not open to students who have completed HEBR 223. Formerly HEBR 223. Selected readings from narrative sections of the Hebrew Bible stressing the new literary approaches to the biblical text. In English; no knowledge of Hebrew required.

**JWST 263 Hebrew Bible: Poetry and Rhetoric (3)** Not open to students who have completed HEBR 224. Formerly HEBR 224. Readings of poetic and prophetic selections from the Hebrew Bible. Analysis of devices and their rhetorical effort. Comparison of biblical poetry with other poetry of the ancient Near East. In English; no Hebrew required.

**JWST 281 Yiddish I (3)** Also offered as GERM 148Y. Not open to students who have completed GERM 148Y. 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.

**JWST 282 Elementary Yiddish II (3)** Prerequisite: JWST 281 or GERM 148Y or permission of department. Also offered as GERM 149Y. Not open to students who have completed GERM 149Y. Continuation of JWST 281.

**JWST 309 Research Seminar in Jewish Studies (3)** Prerequisite: two upper level JWST courses or permission of department. Junior standing. Repeatable to 6 credits if content differs. Discussions and research papers designed to acquaint the student with the methods and problems of research and presentation. Students will be encouraged to examine those phases of Jewish studies which they regard as their specialties.

**JWST 325 Jews and Judaism in Antiquity I: Sixth Century BCE through the (3) First Century CE** Also offered as HIST 370. Credit will be granted for only one of the following: JWST 325 or HIST 370. Political, social and religious history of the Jews from the Persian Period to the Judean Revolt of 66-70CE. Special attention to the rise of sectarian and revolutionary movements.

**JWST 326 Jews and Judaism in Antiquity II: First through Seventh Century (3)** Also offered as HIST 371. Credit will be granted for only one of the following: JWST 326 or HIST 371. 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.

**JWST 331 Early Christianity: Jesus to Constantine (3)** Also offered as HIST 320. Not open to students who have completed HIST 320. Credit will be granted for only one of the following: JWST 331 or HIST 320. Social and religious history of early Christianity from its origin in the first century to the reign of Constantine.

**JWST 342 History of Zionism and the State of Israel (3)** Also offered as HIST 376. Credit will be granted for only one of the following: JWST 342 or HIST 376. Ideological and political factors leading to the establishment of a secular Jewish state in 1948; Zionist thought of Herzl, Ahad Haam, the socialist and religious Zionists, and the revisionists; diplomatic activities; Arab-Israeli conflict; post-1948 Israeli society.

**JWST 343 Modern Jewish History I: The Road to Emancipation, 1650-1870 (3)** Also offered as HIST 374. Credit will be granted for only one of the following: JWST 343 or HIST 374. Social, political, economic, and cultural change in the Jewish world since 1650. Emphasis on emancipation, assimilation, and new forms of Jewish identity in Western and Eastern European Jewry from the 17th to the 20th centuries.

**JWST 344 Modern Jewish History II: World Jewry Since 1870 (3)** Also offered as HIST 375. Credit will be granted for only one of the following: JWST 344 or HIST 375. Continuation of JWST 343: 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.

**JWST 345 The Holocaust of European Jewry (3)** Also offered as HIST 307. Credit will be granted for only one of the following: JWST 345 or HIST 307. 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.

**JWST 419 Special Topics in Jewish Studies (3)** Repeatable to 9 credits if content differs.

**JWST 451 Issues in Jewish Ethics and Law (3)** Prerequisite: three credits in philosophy or Jewish studies (excluding Hebrew language), or permission of department. Also offered as PHIL 433. Not open to students who have completed PHIL 433 or HEBR 451. Credit will be granted for only one of the following: PHIL 433 or JWST 451 or HEBR 451. Formerly HEBR 451. Philosophical and meta-legal questions concerning the nature of Jewish law and its relation to morality.

**JWST 452 The Golden Age of Jewish Philosophy (3)** Prerequisite: three credits in Philosophy or permission of department. Also offered as PHIL 417. Not open to students who have completed PHIL 417. Credit will be granted for only one of the following: JWST 452 or PHIL 417. 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.

**JWST 453 Philosophy of Spinoza (3)** Prerequisite: six credits in philosophy or permission of department. Also offered as PHIL 424. Not open to students who have completed PHIL 424. Credit will be granted for only one of the following: JWST 453 or PHIL 424. An investigation of the metaphysical, ethical and political thought of the 17th century philosopher Benedict Spinoza.

**JWST 466 Readings in Medieval Hebrew (3)** Prerequisite: HEBR 212 or permission of department. Not open to students who have completed HEBR 472. Credit will be granted for only one of the

following: HEBR 472 or JWST 466. Formerly HEBR 472. Introductory readings in Medieval Hebrew texts. Language of instruction English; all texts in Hebrew.

**JWST 468 Readings in the Hebrew Bible (3)** Prerequisite: HEBR 212 or equivalent. Formerly HEBR 441 and HEBR 442. Not open to students who have completed HEBR 441 and HEBR 442. 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.

**JWST 469 Readings in Rabbinic Hebrew (3)** Prerequisite: HEBR 212 or equivalent. Repeatable to 9 credits if content differs. Credit will be granted for only one of the following: HEBR 471 or JWST 469. Introductory readings in Mishnaic and Talmudic Hebrew texts. Language of instruction English; all texts in Hebrew.

**JWST 499 Independent Study in Jewish Studies (1-3)** Prerequisite: permission of department. Repeatable to 6 credits if content differs.

## KNES—Kinesiology

KNES Activities Program Courses: 1-3 credits per course

KNES 100—179 Physical Education Activities

KNES Professional Program Courses:

**KNES 180 Foundations of Physical Education (2)** Formerly PHED 180. Introduction to the study of physical education with attention to the foundation, content and practice of human movement as the focus. Explore, describe, and increase understanding of physical education as it is practiced and studied.

**KNES 181 Fundamentals of Movement (2)** Formerly PHED 181. Introduction to the scientific foundations of human movement including factual knowledge and application of content areas such as human growth and development, anatomy, physiology, neurology, biomechanics and motor learning to fundamental movement skills.

**KNES 182 Rhythmic Activities (2)** Six hours of laboratory per week. Formerly PHED 182. Development of rhythmic sensitivity through analysis of rhythm and its application to movement, skills in folk, square and social dance and teaching techniques for use in schools and recreational programs.

**KNES 183 Movement Content for Elementary School Children (3)** Formerly PHED 183. Participation in movement activities with a focus on educational dance, gymnastics and games. Observation and analysis of movement behavior in relation to specific aspects of movement. Examination of relationships among movement forms.

**KNES 200 Gymnastics Skills Laboratory (2)** Formerly PHED 200. Progressive techniques of teaching and practice of skills in gymnastics.

**KNES 202 Badminton Skills Laboratory (1)** Formerly PHED 202. Progressive techniques of teaching and practice of skills in badminton.

**KNES 204 Basketball Skills Laboratory (1)** Formerly PHED 204. Progressive techniques of teaching and practice of skills in basketball.

**KNES 206 Golf Skills Laboratory (1)** Formerly PHED 206. Progressive techniques of teaching and practice of skills in golf.

**KNES 210 Field Games Skills Laboratory (1)** Formerly PHED 210. Progressive techniques of teaching and practice of skills in soccer, field hockey and lacrosse.

**KNES 211 Field Hockey Skills Laboratory (1)** Formerly PHED 211. Progressive techniques of teaching and practice of skills in field hockey.

**KNES 213 Lacrosse Skills Laboratory (1)** Formerly PHED 213. Progressive techniques of teaching and practice of skills in lacrosse.

**KNES 214 Soccer Skills Laboratory (1)** Formerly PHED 214. Progressive techniques of teaching and practice of skills in soccer.

**KNES 215 Softball Skills Laboratory (1)** Formerly PHED 215. Progressive techniques of teaching and practice of skills in softball.

**KNES 217 Tennis Skills Laboratory (1)** Formerly PHED 217. Progressive techniques of teaching and practice of skills in tennis.

**KNES 218 Laboratory in Teaching (1)** Prerequisite: permission of department. Repeatable to 2 credits. Formerly PHED 218. The course is designed to prepare the student for the student teaching experience by assisting in a class.

**KNES 220 Track and Field Skills Laboratory (1)** Formerly PHED 220. Progressive techniques of teaching and practice of skills in

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track and field.

**KNES 221 Volleyball Skills Laboratory (1)** Formerly PHED 221. Progressive techniques of teaching and practice of skills in volleyball.

**KNES 223 Weight Training and Aerobic Skills Laboratory (2)** Credit will be granted for only one of the following: KNES 222, KNES 223, and KNES 224. Progressive techniques of teaching and practice of skills in weight training and aerobic activities.

**KNES 240 Exploring Cultural Diversity Through Movement (3)** Cultural diversity through an analysis of the different meanings that movement activities serve within different cultural groups. Students will examine how cultural affiliations can influence why and how members of different cultural groups engage in movement activities.

**KNES 250 Advanced Volleyball Skills Laboratory (2)** Prerequisite: KNES 221. Formerly PHED 250. Progressive techniques of teaching/coaching and practice of skills in volleyball at the advanced level.

**KNES 260 Science of Physical Activity and Cardiovascular Health (3)** 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.

**KNES 261 Development of Endurance and Strength Fitness (3)** Formerly PHED 261. An appraisal of various components of physical fitness and of a prescription exercise program. The parameters of physical fitness and the exercises to improve these parameters.

**KNES 262 Philosophy of Sport (3)** Not open to students who have completed KNES 362. Credit will be granted for only one of the following: KNES 262 or KNES 362. Formerly KNES 362. Form and content of the philosophy of sport. The basis of knowledge in and about sport, the structure and theories of the discipline, the ontological and moral implications and dilemmas involving sport, and the interactions between philosophy and the scientific and humanistic aspects of sport.

**KNES 287 Sport and American Society (3)** Formerly PHED 287. 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.

**KNES 289 Topical Investigations (1-6)** Repeatable to 6 credits. Formerly PHED 289. Independent study by an individual student or a group of students in special areas of knowledge not covered by regularly scheduled courses.

**KNES 293 History of Sport in America (3)** Formerly PHED 293. 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.

**KNES 300 Biomechanics of Human Motion (4)** Three hours of lecture and two hours of laboratory per week. Prerequisites: ZOO 201; and ZOO 202. Formerly PHED 300. 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.

**KNES 314 Methods in Physical Education (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: KNES 183. Formerly PHED 314. Application of educational philosophy and principles to class organization and techniques of teaching physical education.

**KNES 333 Physical Activity for the Handicapped (3)** Formerly PHED 333. Handicapped conditions, Federal and State regulations, implications for planning and implementing physical activity programs, evaluation strategies of assessing motor performance and the role of physical activity in educational programs for handicapped students.

**KNES 335 Swimming Pool Management (2)** Formerly PHED 335. Analysis of the position of the swimming pool manager. The systematic treatment of swimming pool water; swimming pool first aid; and laws pertaining to swimming pool operation. Qualifies the student for a pool operator's license in most Maryland counties.

**KNES 340 Theory of Coaching Athletics (2)** Formerly PHED 340. General theory and practice of coaching selected competitive sports found in secondary schools and community recreation programs.

**KNES 341 Theory of Coaching Basketball (2)** Formerly PHED 341. Philosophy, preparation for season, practice organization, scouting, film analysis, and strategies.

**KNES 342 Theory of Coaching Baseball (2)** Formerly PHED 342. Philosophy, preparation for season, practice organization, scouting, film analysis, and strategies.

**KNES 343 Theory of Coaching Football (2)** Formerly PHED 343. Philosophy, preparation for season, practice organization, scouting, film analysis, and strategies.

**KNES 344 Theory of Coaching Swimming (2)** Formerly PHED 344. Philosophy, preparation for season, practice organization, scouting, film analysis, and strategies.

**KNES 345 Theory of Coaching Track and Field (2)** Formerly PHED 345. Philosophy, preparation for season, practice organization, scouting, film analysis, and strategies.

**KNES 350 The Psychology of Sports (3)** Formerly PHED 350. An exploration of the personality factors, including, but not limited to motivation, aggression and emotion, as they affect sports participation and motor skill performance.

**KNES 351 Contemporary Issues in American Sport (3)** Prerequisite: KNES 287. Formerly PHED 351. Seminar/discussion of theoretical and practical issues in contemporary sport.

**KNES 360 Physiology of Exercise (3)** Two hours of lecture and two hours of laboratory per week. Prerequisites: ZOO 201; and ZOO 202; or permission of department. Formerly PHED 360. 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.

**KNES 361 Weight Control Through Diet and Exercise (3)** Lecture and laboratory. Formerly PHED 361. The basic principles of weight control are given and the students participate in diet and exercise programs.

**KNES 370 Motor Development (3)** Formerly PHED 370. 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.

**KNES 371 Elementary School Physical Education: A Movement Approach (3)** Prerequisites: KNES 183 and KNES 370. Formerly KNES 421. An analysis of movement philosophy and content, focusing upon cognitive, psychomotor and affective developmental characteristics in relation to progression and planning of games, educational dance and educational gymnastics for elementary school age children.

**KNES 381 Prevention and Care of Athletic Injuries (3)** Prerequisites: ZOO 201; and ZOO 202. Formerly PHED 381. Theoretical and practical foundations of the prevention, recognition, and treatment of athletic injuries. Physical conditioning and re-conditioning, preventive taping, first aid, CPR, and various modalities are emphasized.

**KNES 385 Motor Learning and Skilled Performance (3)** Formerly PHED 385. A study of the research dealing with motor learning and motor performance. Scientific methodology, individual differences, specificity, proprioceptive control of movement, motivation, timing, transfer, and retention.

**KNES 389 Topical Investigations (1-3)** Repeatable to 6 credits. Formerly PHED 389. Independent study by an individual student or a group of students in special areas of knowledge not covered by regularly scheduled courses.

**KNES 390 Practicum in Teaching Physical Education (3)** Prerequisite: KNES 371. Formerly PHED 390. Teaching of children in a physical education setting. Specific emphasis on curriculum development, lesson planning, progressions and analysis of teacher behavior.

**KNES 398 Honors Seminar (1)** One hour of discussion/recitation per week. Prerequisite: participation in honors program. Repeatable to 3 credits. Formerly PHED 398. Guided discussion of research topics of current interest.

**KNES 399 Honors Thesis (3)** Prerequisites: KNES 398H; and candidacy for honors in physical education. Formerly PHED 399. Advisement will be on the individual basis. Thesis must be defended in the honors seminar.

**KNES 402 Biomechanics of Sport (3)** Prerequisite: KNES 300. Formerly PHED 402. 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.

**KNES 450 Sport Psychology: Applications (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: KNES 350. Formerly PHED 450. Application of the principles of sport psychology to the competitive or recreational athlete, with an emphasis on the techniques that have been used with competitors to maximize skill acquisition and performance.

**KNES 455 Scientific Bases of Athletic Conditioning (3)** Prerequisite: KNES 360. Formerly PHED 455. An examination of physical fitness/athletic conditioning programs stressing the practical application of exercise physiology theory for enhancing athletic performance. Cardiovascular considerations, strength and power development, nutrition, speed, muscular endurance, environmental considerations and ergogenic aids.

**KNES 461 Exercise and Body Composition (3)** Prerequisite: KNES 360. Formerly PHED 461. Physiological concepts relating body composition factors to exercise and human performance. The scientific basis for the establishment and evaluation of conditioning programs where body composition may play an important role, such as weight control and athletics.

**KNES 462 Neural Basis of Human Movement (3)** Prerequisites: (ZOO 201; and ZOO 202; and KNES 385) or permission of department. Formerly PHED 462. 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.

**KNES 466 Graded Exercise Testing (3)** Two hours of lecture and three hours of laboratory per week. Prerequisite: KNES 360 or permission of department. 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.

**KNES 470 Seminar For Student Teachers (2)** Formerly PHED 470. A seminar held concurrently with student teaching in physical education. An intensive examination of current problems and issues in teaching physical education.

**KNES 480 Measurement in Physical Education (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: MATH 110. Formerly PHED 480. A study of the principles and techniques of educational measurement as applied to teaching of physical education; study of the functions and techniques of measurement in the evaluation of student progress toward the objectives of physical education and in the evaluation of the effectiveness of teaching.

**KNES 481 Biophysical Aspects of Human Movement (3)** Prerequisites: KNES 300; and KNES 360; and KNES 370; and KNES 385. Formerly PHED 481. Scientific principles and research techniques in the investigation of the biophysical basis of human movement.

**KNES 482 Socio-behavioral Aspects of Human Movement (3)** Prerequisites: KNES 287; and KNES 293; and KNES 350. Formerly PHED 482. Derivation, formulation, and application of research in the socio-behavioral aspects of human movement.

**KNES 486 Politics and Economics of Organized Contemporary Sport (3)** Prerequisite: KNES 287. Formerly PHED 486. Interdependence of sport, politics, and economics. The structure, organization, and uses of sport in contemporary societies.

**KNES 489 Field Laboratory Projects and Workshop (1-6)** Repeatable to 6 credits. Formerly PHED 489. Workshops and research projects in special areas of knowledge not covered by regularly structured courses.

**KNES 490 Administration of Physical Education and Sport (3)** Prerequisite: KNES 180 or KNES 287. Formerly PHED 490. Principles and functions of administration in physical education and sport. Administrative duties in relation to financing, budgeting, staffing, planning, organizing, directing, coordinating, evaluating, reporting, and discipline.

**KNES 491 The Curriculum in Physical Education (3)** Prerequisites: KNES 300, KNES 360, and KNES 371. Formerly PHED 491. Curriculum sources, principles, and planning concepts, with emphasis on using valid criteria for the selection of content for physical education programs.

**KNES 492 History of the Sportswoman in American Organizations (3)** Prerequisite: KNES 293. Also offered as WMST 492. Credit will be granted for only one of the following: KNES 492 or WMST 492. Formerly PHED 492. Women's involvement in and contributions to America's sporting culture, especially in the 19th and 20th Centuries until enactment of Title IX. The interactions among historical perceptions of women's roles, responsibilities, and potential and their sporting lives; the effects of role stereotyping and opportunities for and directions taken in developing sport organizations. Other issues affecting women's involvement in institutional sport.

**KNES 493 History and Philosophy of Sport and Physical Education (3)** Formerly PHED 493. History and philosophical implications of sport and physical education through ancient, medieval, and contemporary periods in western civilization.

**KNES 496 Quantitative Methods (3)** Formerly PHED 496. Statistical techniques most frequently used in research pertaining to physical education. Effort is made to provide the student with

the necessary skills, and to acquaint him with the interpretations and applications of these techniques.

**KNES 497 Independent Studies Seminar (3)** *Formerly PHED 497.* 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.

**KNES 498 Special Topics in Physical Education (3)** *Prerequisite: permission of department. Repeatable when the subject matter is different. Formerly PHED 498.* Topics of special interest in areas not covered by regularly scheduled courses.

## KORA—Korean

**KORA 211 Introductory Reading for Speakers of Korean I (3)** *Not open to students who have completed three or more years of Korean schooling.* Designed to improve the language skills of students already conversant in Korean; instruction entirely in Korean; introduction in hangul; reading of simple essays and poems; letter writing.

**KORA 212 Introductory Reading for Speakers of Korean II (3)** *Prerequisite: KORA 211. Not open to students who have completed three or more years of Korean schooling.* Continuation of KORA 211; grammar, style, usage, and vocabulary of written Korean.

## LARC—Landscape Architecture

**LARC 140 Graphic Fundamentals (3)** *One hour of lecture and five hours of laboratory per week. Recommended: LARC 160, concurrently. For LARC majors only. Not open to students who have completed EDIT 160. Formerly LARC 150.* Basic techniques and the use of various media of graphic communication associated with landscape architecture.

**LARC 141 Design Fundamentals (3)** *One hour of lecture and five hours of laboratory per week. Prerequisite: LARC 140. For LARC majors only. Formerly LARC 161.* Fundamentals of basic design focusing on creative problem solving associated with landscape architecture.

**LARC 160 Introduction to Landscape Architecture (3)** *Two hours of lecture and one hour of discussion/recitation per week.* 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.

**LARC 220 Land Surveying (2)** *One hour of lecture and two hours of laboratory per week. For LARC majors only. Formerly LARC 200.* Principles of land surveying such as measurements of distance, elevation and angles, instrumentation and mapping.

**LARC 240 Graphic Communications (3)** *One hour of lecture and five hours of laboratory per week. Prerequisites: LARC 141 and LARC 160. For LARC majors only. Formerly LARC 260.* Exploration of graphic presentation techniques for landscape architectural planning and design documents.

**LARC 241 Electronic Studio (3)** *One hour of lecture and five hours of laboratory per week. Prerequisite: LARC 240. For LARC majors only. Formerly LARC 261.* An innovative approach to the integration of computer, photographic, video, audio and other information technologies with the traditional landscape architecture studio.

**LARC 263 History of Landscape Architecture (3)** *Formerly LARC 370.* 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.

**LARC 265 Site Analysis and Design (3)** *Prerequisite: permission of department. For LARC majors only. Also offered as ARCH 460.* Principles and methods of site analysis; the influence of landscape character and site features (natural and built) on planning, architecture and landscape architecture.

**LARC 320 Principles of Site Engineering (3)** *One hour of lecture and five hours of laboratory per week. Prerequisites: LARC 220 and LARC 241. For LARC majors only. Also offered as HORT 320. Formerly LARC 364.* The study and application of landscape construction principles as applied to grading, drainage, layout, vehicular and pedestrian circulation.

**LARC 321 Landscape Structures and Materials (3)** *One hour of lecture and five hours of laboratory per week. Prerequisites: LARC 320 and LARC 340. For LARC majors only. Also offered as HORT 321. Formerly LARC 465.* An examination of the use, properties,

and detailing of materials used in landscape construction. The use and design of structures in the landscape.

**LARC 340 Site Design Studio (4)** *Two hours of lecture and six hours of laboratory per week. Prerequisites: LARC 241 and (LARC 265 or ARCH 460). For LARC majors only. Formerly LARC 466.* An examination of the influence of landscape character and site features (natural and built) on planning, architecture and landscape architecture through application in the studio setting.

**LARC 341 Community Design Studio (4)** *Two hours of lecture and six hours of laboratory per week. Prerequisite: LARC 340. For LARC majors only. Formerly LARC 361.* Examines the landscape architect's role within the community and neighborhood context by utilizing community analysis, site and community factors in design, master-plan design process, user design, report writing and presentation.

**LARC 420 Professional Practice (3)** *Prerequisite: LARC 321. For LARC majors only. Formerly LARC 467.* 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.

**LARC 440 Urban Studio Design (4)** *Two hours of lecture and six hours of laboratory per week. Prerequisites: LARC 321 and LARC 341. For LARC majors only. Formerly LARC 462.* 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.

**LARC 450 Environmental Resources (3)** *Prerequisite: AGRO 202 or permission of department.* A review of ecosystems and an examination of planning strategies for preservation, conservation, management and development of sensitive natural and cultural landscape resources in the mid-Atlantic region.

**LARC 451 Sustainable Communities (3)** Explores concepts, strategies and examples of community design which address the needs of a growing population while preserving the environment and its resources.

**LARC 470 Landscape Architecture Seminar (3)** *Prerequisites: LARC 321 and LARC 341. For LARC majors only.* A combination of self-directed study, seminar, and lecture formats. An introduction to aspects of research methods, critical analysis, and proposal writing. Students will identify a topic to research, conduct a literature review and prepare a proposal for a landscape architecture project to be carried out in LARC 471.

**LARC 471 Capstone Studio (4)** *Two hours of lecture and six hours of laboratory per week. Prerequisites: LARC 420 and LARC 440 and LARC 470. For LARC majors only.* A self-directed study in the area of specialization selected by the student. The goal is the completion of a landscape architectural project proposal written during the LARC 470 course. Requires the student to submit a final project report and make an oral presentation, open to the university.

**LARC 489 Special Topics in Landscape Architecture (1-4)** *Prerequisite: permission of department. Repeatable to 4 credits if content differs.* 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.

**LARC 499 Independent Studies in Landscape Architecture (1-4)** *Prerequisite: 12 credits in LARC or permission of department. For LARC and HORT majors only. Repeatable to 4 credits if content differs.* Independent studies in landscape architecture including field, studio or library research under the direction of a faculty member.

## LATN—Latin

**LATN 101 Elementary Latin I (4)** *Four hours of discussion/recitation per week. A student who has two units of Latin in high school may register for LATN 101 for the purposes of review, but ordinarily not for credit.*

**LATN 102 Elementary Latin II (4)** *Four hours of discussion/recitation per week. Prerequisite: LATN 101 at UMCP or permission of department.*

**LATN 120 Intensive Latin (4)** *Prerequisite: permission of department. Not open for credit to students with credit for LATN 102.* Elements of Latin grammar and vocabulary; elementary reading. The first year's study of Latin compressed into a single semester.

**LATN 201 Intermediate Latin (4)** *Prerequisite: LATN 102 at UMCP or permission of department. Formerly LATN 203.*

**LATN 220 Intermediate Intensive Latin (4)** *Prerequisite: LATN 102, or LATN 120, or equivalent. Not open to students with credit for LATN 204.* Review of Latin grammar; reading in prose and poetry from selected authors.

**LATN 301 Plautus (3)** Plautine drama. Literary, linguistic and socio-cultural aspects.

**LATN 302 Ovid (3)** Major works of Ovidian poetry. Literary and moral atmosphere of Augustan age.

**LATN 351 Horace and Catullus (3)** *Prerequisite: LATN 201 or equivalent.*

**LATN 402 Tacitus (3)**

**LATN 403 Roman Satire (3)**

**LATN 405 Lucretius (3)**

**LATN 410 Latin Historians (3)** Latin historical writing as a literary genre. Influences, style, and literary techniques.

**LATN 415 Virgil's Aeneid (3)** *Formerly LATN 305.* Virgil's Aeneid: readings of selections in Latin and of the entire epic in English translation along with critical essays.

**LATN 420 Cicero and Caesar (3)** Reading and analysis of texts by M. Tullius Cicero and C. Iulius Caesar, with emphasis on the relationships between them and on the period of the Civil War.

**LATN 424 Silver Latin (3)** Reading and analysis of selected texts. Emphasis on the role of Nero and Seneca in literary developments.

**LATN 472 Historical Development of the Latin Language (3)** *Credit will be granted for only one of the following: LATN 472 or LING 431.* An analysis of the development of the Latin language from archaic times to the Middle Ages.

**LATN 488 Latin Readings (3)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs.* The reading of one or more selected Latin authors from antiquity through the Renaissance. Reports.

**LATN 499 Independent Study in Latin Language and Literature (1-3)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs.*

## LBSC—Library Science

**LBSC 208 Special Topics in Information Studies (3)** *Repeatable to 6 credits if content differs.* Special topics in aspects of information use, technology, and policy.

**LBSC 488 Recent Trends and Issues in Library and Information Services (1-3)** *Repeatable to 9 credits.* Discussions of recent trends and issues in library and information services. Designed for practicing professionals.

**LBSC 499 Workshops, Clinics, and Institutes (1-9)** *Repeatable to 9 credits.* Workshops, clinics, and institutes developed around specific topics or problems. Primarily for practicing librarians.

## LING—Linguistics

**LING 200 Introductory Linguistics (3)** *Not open to students who have completed ANTH 371 or HESP 120.* Ways of studying human language; basic concepts of modern linguistic analysis (sound systems, word formation, syntax, meaning). The nature of human language; the social aspects of language; language change; dialects; writing systems; language universals, etc.

**LING 210 Structure of American Sign Language (3)** Overview of phonology, morphology and syntax of American Sign Language. History of the language and the unique social, political and linguistic situation of the deaf.

**LING 240 Language and Mind (3)** 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. Relevant philosophical literature. Relationship to study of other cognitive abilities: reasoning, perception, sensory-motor development.

**LING 311 Syntax I (3)** *Prerequisite: LING 240.* 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.

**LING 312 Syntax II (3)** *Prerequisite: LING 311.* Continuation of LING 311. Development of theories of syntax. Criteria for revising theories. Methods and strategies of "scientific" efforts to explain natural phenomena.

**LING 321 Phonology I (3)** *Prerequisite: LING 240.* 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.

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**LING 322 Phonology II (3)** *Prerequisite:* LING 321. Continuation of LING 321. Further investigation of phonological phenomena and phonological theory. Revising and elaborating the theory of the phonological representation; interaction of phonology and morphology.

**LING 330 Historical Linguistics (3)** 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.

**LING 350 Philosophy of Language (3)** *Prerequisite:* PHIL 170 or PHIL 371, or LING 311. The nature and function of language and other forms of symbolism from a philosophical perspective.

**LING 410 Grammar and Meaning (3)** *Prerequisite:* LING 312. 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.

**LING 411 Comparative Syntax (3)** *Prerequisite:* LING 312. Comparison of data from a variety of languages with respect to some aspect of current versions of syntactic theory in order to investigate how parameters of universal grammar are fixed differently in different languages. Attempts to work out fragments of grammars for some languages.

**LING 419 Topics in Syntax (3)** *Repeatable to 6 credits if content differs.*

**LING 420 Word Formation (3)** *Prerequisite:* LING 322. Definition 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.

**LING 421 Advanced Phonology (3)** *Prerequisite:* LING 322. Topics in current phonological theory, as they relate to data from the sound systems of various languages. Segmental and prosodic analysis. Discussion of autosegmental theory, metrical theory, etc.

**LING 429 Topics in Phonology (3)** *Repeatable to 6 credits if content differs.*

**LING 430 Language Change (3)** *Prerequisite:* LING 240. Changes in grammars from generation to generation. Consequences for the theory of grammars. Traditional work on historical change.

**LING 439 Topics in Diachronic Linguistics (3)** *Repeatable to 6 credits if content differs.*

**LING 440 Grammars and Cognition (3)** 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.

**LING 444 Child Language (3)** *Prerequisite:* LING 200 or LING 240. Examines children's language development from the perspective of Chomsky's 'Universal Grammar'. Parts of children's knowledge which are innate, and parts which are learned from the environment. This issue will motivate discussion of a variety of topics including children's knowledge of the lexicon and word meaning, grammatical structure, and semantics.

**LING 451 Grammars and Variation (3)** *Prerequisite:* LING 311. Grammars and the use of language in a variety of styles: formal, casual, literary, etc. Consequences for concepts of grammars. Variation theory. Literary styles.

**LING 453 Mathematical Approaches to Language (3)** *Prerequisite:* LING 312. The aspects of mathematics used in linguistic discussions: recursion theory, Chomsky's hierarchy of grammars, set theory, Boolean algebra, finite state grammars, context-free grammars, etc. Applications to theories of grammars. Formalizations of grammatical theories.

**LING 455 Second Language Learning (3)** Relationship between theories of grammars, first language acquisition by children and the learning of second languages by adults.

**LING 487 Computer Science for Cognitive Studies (3)** *Also offered as PHIL 487. Credit will be granted for only one of the following: LING 487 or PHIL 487.* List processing and discrete mathematics. Preparation for the study of artificial intelligence and other mathematically oriented branches of cognitive studies. Intended for students of linguistics, philosophy, and psychology. LISP computer language, graphs and trees, the concept of computational complexity, search algorithms.

**LING 499 Directed Studies in Linguistics (1-3)** *Prerequisite:* permission of department. *Repeatable to 6 credits if content differs.* Independent study or research on language under the supervision of a faculty member.

## MAPL—Applied Mathematics

**MAPL 460 Computational Methods (3)** *Prerequisites:* (a grade of C or better in MATH 240 and MATH 241); and (CMSC 104 or CMSC 113). *Also offered as CMSC 460. Credit will be granted for only one of the following: MAPL/CMSC 460 or MAPL/CMSC 466.* 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.

**MAPL 466 Introduction to Numerical Analysis I (3)** *Prerequisites:* (a grade of C or better in MATH 240 and MATH 241); and CMSC 104. *Also offered as CMSC 466. Credit will be granted for only one of the following: MAPL/CMSC 460 or MAPL/CMSC 466.* Floating point computations, direct methods for linear systems, interpolation, solution of nonlinear equations.

**MAPL 467 Introduction to Numerical Analysis II (3)** *Prerequisites:* MAPL/CMSC 466 with a grade of C or better. *Also offered as CMSC 467. Credit will be granted for only one of the following: CMSC 467 or MAPL 467.* Advanced interpolation, linear least squares, eigenvalue problems, ordinary differential equations, fast Fourier transforms.

**MAPL 472 Methods and Models in Applied Mathematics I (3)** *Prerequisites:* (MATH 241; and MATH 246; and MATH 240; and PHYS 161 or 171) or permission of department. *Recommended: one of the following: MATH 410, MATH 414, MATH 415, MATH 462, MATH 463, PHYS 262, PHYS 273.* *Also offered as MATH 472. Credit will be granted for only one of the following: MATH 472 and MAPL 472.* Mathematical models in fluid dynamics and elasticity, both linear and non-linear partial differential equations, variational characterizations in eigenvalue problems, numerical algorithms. Additional optional topics as time permits. Some examples are Hamiltonian systems, Maxwell's equations, non-linear programming.

**MAPL 473 Methods and Models in Applied Mathematics II (3)** *Prerequisite:* MAPL 472 or permission of department. *Also offered as MATH 473. Credit will be granted for only one of the following: MAPL 473 or MATH 473.* Continuation of the two-semester sequence, MAPL 472 and MAPL 473.

**MAPL 477 Optimization (3)** *Prerequisites:* (CMSC/MAPL 460, or CMSC/MAPL 466 or CMSC/MAPL 467) with a grade of C or better. *Also offered as CMSC 477. Credit will be granted for only one of the following: CMSC 477 or MAPL 477.* Linear programming including the simplex algorithm and dual linear programs, convex sets and elements of convex programming, combinatorial optimization, integer programming.

**MAPL 498 Selected Topics in Applied Mathematics (1-3)** *Repeatable to 6 credits if content differs.* Topics in applied mathematics of special interest to advanced undergraduate students.

## MATH—Mathematics

**MATH 001 Review of High School Algebra (3)** *Recommended for students who plan to take MATH 110 or MATH 002 but are not currently qualified to do so. Special fee required in addition to the regular tuition charge for fall and spring semesters. This course does not carry credit towards any degree at the University.* Review of the algebraic skills fundamental to any further study of mathematics. Exponents, polynomials, linear equations in one and two variables, quadratic equations.

**MATH 002 Advanced Review of High School Algebra (3)** *Recommended for students who plan to take but who are not currently qualified for MATH 115. Prerequisite:* MATH 001 or satisfactory score on the mathematics placement exam. *Special fee required in addition to the regular tuition charge for fall and spring semesters. This course does not carry credit towards any degree at the University.* Review of high school algebra at a faster pace and at a more advanced level than MATH 001. Exponents; polynomials; linear equations in one and two variables; quadratic equations; and polynomial, rational, exponential and logarithmic functions.

**MATH 110 Elementary Mathematical Models (3)** *Prerequisite:* permission of department based on satisfactory score on the mathematics placement exam, or MATH 002. *Not open to students majoring in mathematics, engineering, and the physical sciences. Not open to students who have completed MATH 140, 220, or any MATH or STAT course for which MATH 140 or 220 is a prerequisite.* Elementary introduction to models useful in the biological, management, and social sciences. Matrices, systems of linear equations, and linear inequalities in two or three variables are used to solve simple but representative problems in linear programming, stochastic processes, game theory, and the mathematics of mortgages and annuities.

**MATH 111 Introduction to Probability (3)** *Prerequisite:* permission of department based on satisfactory score on the mathematics placement exam, or MATH 110, or MATH 115. *Not open to students majoring in mathematics, engineering or the physical sciences. Not open to students who have completed STAT 100 or any MATH or STAT course with a prerequisite of MATH 141. Credit will be granted for only one of the following: MATH 111 or STAT 100.* Logic, Boolean algebra, counting, probability, random variables, expectation applications of the normal probability distribution.

**MATH 113 College Algebra with Applications (3)** *Prerequisite:* permission of department based on satisfactory score on the mathematics placement exam, or MATH 002. *Not open to students who have completed MATH 140 or MATH 220 or any course for which MATH 140 or MATH 220 is a prerequisite. Credit will be granted for only one of the following: (MATH 110 or MATH 113), or (MATH 113 or MATH 115).* Graphs and applications of elementary functions including: polynomial, rational, exponential and logarithmic functions. Systems of linear equations and linear inequalities used to solve representative problems in linear programming. Matrices and matrix operations including inverse. Sequences.

**MATH 115 Precalculus (3)** *Prerequisite:* permission of department based on satisfactory score on the mathematics placement exam or MATH 002. *Not open to students who have completed MATH 140 or any MATH or STAT course for which MATH 140 is a prerequisite.* Preparation for MATH 220 or MATH 140. Elementary functions and graphs: polynomials, rational functions, exponential and logarithmic functions, trigonometric functions. Algebraic techniques preparatory for calculus.

**MATH 140 Calculus I (4)** *Prerequisite:* permission of department based on 3 1/2 years of college preparatory mathematics (including trigonometry) and satisfactory score on the mathematics placement exam or MATH 115. *Credit will be granted for only one of the following: MATH 140 or MATH 220.* 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 and mathematics majors.

**MATH 141 Calculus II (4)** *Prerequisite:* MATH 140 or equivalent. *Credit will be granted for only one of the following: MATH 141 or MATH 221.* Continuation of MATH 140, 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.

**MATH 210 Elements of Mathematics (4)** *Prerequisite:* one year of college preparatory algebra. *Required for majors in elementary education, and open only to students in this field.* Topics from algebra and number theory, designed to provide insight into arithmetic: inductive proof, the natural number system based on the Peano axioms; mathematical systems, groups, fields; the system of integers; the system of rational numbers; congruence, divisibility; systems of numeration.

**MATH 211 Elements of Geometry (4)** *Prerequisite:* MATH 210. Structure of mathematics systems, algebra of sets, geometrical structures, logic, measurement, congruence, similarity, graphs in the plane, geometry on the sphere.

**MATH 220 Elementary Calculus I (3)** *Prerequisite:* permission of department based on 3 1/2 years of college preparatory mathematics (including trigonometry) and satisfactory performance on the mathematics placement exam, or MATH 113, or MATH 115. *Not open to students majoring in mathematics, engineering or the physical sciences. Credit will be granted for only one of the following: MATH 140 or MATH 220.* Basic ideas of differential and integral calculus, with emphasis on elementary techniques of differentiation and applications.

**MATH 221 Elementary Calculus II (3)** *Prerequisite:* MATH 220, or MATH 140, or equivalent. *Not open to students majoring in mathematics, engineering or the physical sciences. Credit will be granted for only one of the following: MATH 141 or MATH 221.* Differential and integral calculus, with emphasis on elementary techniques of integration and applications.

**MATH 240 Introduction to Linear Algebra (4)** *Prerequisite:* MATH 141 or equivalent. *Credit will be granted for only one of the following: MATH 240 or MATH 400 or MATH 461.* 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.

**MATH 241 Calculus III (4)** *Prerequisites:* MATH 141 and any one of the following: MATH 240 or ENES 102 or PHYS 161 or PHYS 171. 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.

**MATH 246 Differential Equations for Scientists and Engineers (3)** *Prerequisite:* MATH 141 or equivalent. 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.

**MATH 250 Analysis I (Honors) (4)** *Prerequisite: permission of department.* First semester of a year course giving a rigorous treatment of calculus in one and several variables. Topics covered during the year: properties of the real and complex numbers, Euclidean spaces, basic set theory and topology, metric spaces, sequences and series, continuity, differentiability, uniform convergence, Riemann-Stieltjes integrals, multiple integrals, inverse and implicit function theorems, line integrals, theorems of Green, Gauss, and Stokes.

**MATH 251 Analysis II (Honors) (4)** *Prerequisite: MATH 250.* Continuation of MATH 250. Students successfully completing MATH 250-MATH 251 will not need to take MATH 410-MATH 411.

**MATH 299 Selected Topics in Mathematics (1-3)** *Prerequisite: permission of department.* Topics of special interest under the general guidance of the departmental committee on undergraduate studies.

**MATH 400 Vectors and Matrices (3)** *Prerequisite: MATH 221 or equivalent. Not open to students in the CMPS or Engineering Colleges. Credit will be granted for only one of the following: MATH 240, MATH 400, or MATH 461.* The essentials of matrix theory needed in the management, social and biological sciences. Main topics: systems of linear equations, linear independence, rank, orthogonal transformations, eigenvalues, the principal axes theorem. Typical applications: linear models in economics and in statistics, Markov chains, age-specific population growth.

**MATH 401 Applications of Linear Algebra (3)** *Prerequisite: MATH 240 or MATH 461.* 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, transportation problems.

**MATH 402 Algebraic Structures (3)** *Prerequisite: MATH 240 or equivalent. Not open to mathematics graduate students. Credit will be granted for only one of the following: MATH 402 or MATH 403.* For students having only limited experience with rigorous mathematical proofs. Parallels MATH 403. Students planning graduate work in mathematics should take MATH 403. 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.

**MATH 403 Introduction to Abstract Algebra (3)** *Prerequisites: MATH 240 and MATH 241, or equivalent. Credit will be granted for only one of the following: MATH 402 or MATH 403.* Integers; groups, rings, integral domains, fields.

**MATH 404 Field Theory (3)** *Prerequisite: MATH 403.* Algebraic and transcendental elements, Galois theory, constructions with straight-edge and compass, solutions of equations of low degrees, insolubility of the Quintic, Sylow theorems, fundamental theorem of finite Abelian groups.

**MATH 405 Linear Algebra (3)** *Prerequisite: MATH 240 or MATH 461.* An abstract treatment of finite dimensional vector spaces. Linear transformations and their invariants.

**MATH 406 Introduction to Number Theory (3)** *Prerequisite: MATH 141 or permission of department.* Integers, divisibility, prime numbers, unique factorization, congruences, quadratic reciprocity, Diophantine equations and arithmetic functions.

**MATH 410 Advanced Calculus I (3)** *Prerequisites: MATH 240 and MATH 241 with a grade of C or better. Not open to students who have completed MATH 250.* First semester of a year course. Subjects covered during the year are: sequences and series of numbers, continuity and differentiability of real valued functions of one variable, the Riemann integral, sequences of functions, and power series. Functions of several variables including partial derivatives, multiple integrals, line and surface integrals. The implicit function theorem.

**MATH 411 Advanced Calculus II (3)** *Prerequisite: MATH 410.* Not open to students who have completed MATH 250 and MATH 251. Continuation of MATH 410.

**MATH 414 Differential Equations (3)** *Prerequisites: MATH 410; and MATH 240 or equivalent.* Existence and uniqueness theorems for initial value problems. Linear theory: fundamental matrix solutions, variation of constants formula, Floquet theory for periodic linear systems. Asymptotic orbital and Lyapunov stability with phase plane diagrams. Boundary value theory and series solutions.

**MATH 415 Introduction to Partial Differential Equations (3)** *Prerequisites: MATH 246; and (MATH 411 or MATH 251). MATH 411 and MATH 415 may be taken concurrently. Credit will be granted for only one of the following: MATH 415 or MATH 462.* First order equations, linear second order equations in two variables, one dimensional wave equation and the method of separation of variables, and other topics such as harmonic functions, the heat equation, and the wave equation in space.

**MATH 417 Introduction to Fourier Analysis (3)** *Prerequisite: MATH 410.* Fourier series. Fourier and Laplace transforms.

**MATH 430 Euclidean and Non-Euclidean Geometries (3)** *Prerequisite: MATH 141.* 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.

**MATH 432 Introduction to Point Set Topology (3)** *Prerequisite: MATH 410 or equivalent.* Connectedness, compactness, transformations, homomorphisms; application of these concepts to various spaces, with particular attention to the Euclidean plane.

**MATH 436 Differential Geometry of Curves and Surfaces I (3)** *Prerequisites: MATH 241; and either MATH 240 or MATH 461.* 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.

**MATH 437 Differential Geometry of Curves and Surfaces II (3)** *Prerequisite: MATH 436.* Differential forms, the Euler characteristic, Gauss-Bonnet theorem, the fundamental group; an outline of the topological classification of compact surfaces, vector fields, geodesics and Jacobi fields; classical calculus of variations, global differential geometry of surfaces, and elementary Riemann surface theory.

**MATH 445 Elementary Mathematical Logic (3)** *Prerequisite: MATH 141. Credit will be granted for only one of the following: MATH 445 or MATH 450/CMSC 450.* Elementary development of propositional and predicate logic, including semantics and deductive systems and with a discussion of completeness, incompleteness and the decision problem.

**MATH 446 Axiomatic Set Theory (3)** *Prerequisite: MATH 403 or MATH 410.* 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, König's theorem, properties of regular, singular, and inaccessible cardinals.

**MATH 447 Introduction to Mathematical Logic (3)** *Prerequisite: MATH 403 or MATH 410.* Formal propositional logic, completeness, independence, decidability of the system, formal quantificational logic, first-order axiomatic theories, extended Gödel completeness theorem, Löwenheim-Skolem theorem, model-theoretical applications.

**MATH 450 Logic for Computer Science (3)** *Prerequisites: (CMSC 251 and MATH 141) (with grade of C or better). Also offered as CMSC 450. Credit will be granted for only one of the following: MATH 445 or MATH 450/CMSC 450.* Elementary development of propositional and first-order logic accessible to the advanced undergraduate computer science student, including the resolution method in propositional logic and Herbrand's Unsatisfiability Theorem in first-order logic. Included are the concepts of truth, interpretation, validity, provability, soundness, completeness, incompleteness, decidability and semi-decidability.

**MATH 452 Introduction to Dynamics and Chaos (3)** *Prerequisite: MATH 246.* 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.

**MATH 461 Linear Algebra for Scientists and Engineers (3)** *Prerequisites: MATH 141 and one MATH/STAT course for which MATH 141 is a prerequisite. This course cannot be used toward the upper level math requirements for MATH/STAT majors. Credit will be granted for only one of the following: MATH 240, MATH 400 or MATH 461.* Basic concepts of linear algebra. This course is similar to MATH 240, but with more extensive coverage of the topics needed in applied linear algebra: change of basis, complex eigenvalues, diagonalization, the Jordan canonical form.

**MATH 462 Partial Differential Equations for Scientists and Engineers (3)** *Prerequisites: MATH 241; and MATH 246. Credit will be granted for only one of the following: MATH 462 or MATH 415.* 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.

**MATH 463 Complex Variables for Scientists and Engineers (3)** *Prerequisite: MATH 241 or equivalent.* 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.

**MATH 464 Transform Methods for Scientists and Engineers (3)** *Prerequisites: MATH 246; and MATH 463.* Fourier series, Fourier

and Laplace transforms. Evaluation of the complex inversion integral by the theory of residues. Applications to ordinary and partial differential equations of mathematical physics: solutions using transforms and separation of variables. Additional topics such as Bessel functions and calculus of variations.

**MATH 472 Methods and Models in Applied Mathematics I (3)** *Prerequisite: (MATH 241; and MATH 246; and MATH 240; and PHYS 161 or PHYS 171) or permission of department. Recommended: one of: MATH 410, MATH 414, MATH 415, MATH 462, MATH 463 or PHYS 262, PHYS 273. Also offered as MAPL 472. Credit will be granted for only one of the following: MATH 472 and MAPL 472.* Mathematical models in fluid dynamics and elasticity, both linear and non-linear partial differential equations, variational characterizations in eigenvalue problems, numerical algorithms. Additional optional topics as time permits. Some examples are Hamiltonian systems, Maxwell's equations, non-linear programming.

**MATH 473 Methods and Models in Applied Mathematics II (3)** *Prerequisite: MATH 472 or permission of department. Also offered as MAPL 473. Credit will be granted for only one of the following: MATH 473 and MAPL 473.* Continuation of the two semester sequence MATH 472 and MATH 473.

**MATH 475 Combinatorics and Graph Theory (3)** *Prerequisites: MATH 240; and MATH 241. Also offered as CMSC 475. Credit will be granted for only one of the following: MATH 475 or CMSC 475.* 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.

**MATH 478 Selected Topics For Teachers of Mathematics (1-3)** *Prerequisite: one year of college mathematics or permission of department. (This course cannot be used toward the upper level math requirements for MATH/STAT majors).*

**MATH 498 Selected Topics in Mathematics (1-9)** *Honors students register for reading courses under this number. Repeatable to 9 credits if content differs.* Topics of special interest to advanced undergraduate students will be offered occasionally under the general guidance of the departmental committee on undergraduate studies.

**MATH 499 Honors Seminar (2)** *Prerequisite: permission of department. Not open to graduate students. Formerly MATH 398.* Faculty supervised reports by students on mathematical literature. Both oral and written presentation on special topics of current interest.

## MEES—Marine, Estuarine, Environmental Sciences

**MEES 440 Essentials of Toxicology (2)** *Prerequisite: BCHM 261 or BCHM 461.* Principles involved in the assessment of responses of organisms to toxic chemicals, including systemic and organ toxicology, carcinogenesis, teratogenesis, and consideration of the effects of major groups of toxicants.

**MEES 498 Topics in Marine-Estuarine-Environmental Sciences (1-4)** Lecture and/or laboratory series organized to study a selected area of marine-estuarine-environmental sciences not otherwise considered in formal courses.

## METO—Meteorology

**METO 123 Causes and Implications of Global Change (3)** *Also offered as GEOG 123 and GEOL 123, and PBIO 123. Credit will be granted for only one of the following: GEOG 123, GEOL 123, METO 123, or PBIO 123.* This course offers a unique experience in integrating physical, chemical, geological, and biological sciences with geographical, economic, sociological, and political knowledge skills toward a better understanding of global change. Review of environmental science relating to weather and climate change, acid precipitation, ozone holes, global warming, and impacts on biology, agriculture, and human behavior. Study of the natural, long-term variability of the global environment, and what influence mankind may have in perturbing it from its natural evolution. Concepts of how physical, biological, and human behavioral systems interact, and the repercussions which may follow from human endeavors. The manner in which to approach decision and policy making related to issues of global change.

**METO 200 Introduction to Meteorology (3)** *Prerequisites: PHYS 161 or equivalent, and CHEM 103.* Broad survey of the state of knowledge and problems of atmospheric science. Origin and structure of the atmosphere, meteorological observations, weather maps, forecasting, satellites, energetics, wind, general circulation, storms, severe weather, climate change, air pollution, and weather modification.

**METO 400 The Atmosphere (3)** *Prerequisites: CHEM 103; and MATH 241; and MATH 246; and PHYS 263.* The atmosphere and its weather and climate systems. Composition of the atmosphere,

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energy sources and sinks, winds, storms, global circulation. The application of basic classical physics, chemistry, and mathematics to the study of the atmosphere.

**METO 401 Global Environment (3)** *Prerequisite: METO 400.* The global weather and climate system; the natural variability of the atmosphere-ocean-biosphere. Potential human effects: greenhouse effects, deforestation, acid rain, ozone depletion, nuclear winter. Social, political and economic effects of changes in global environment. Policy options.

**METO 434 Air Pollution (3)** *Prerequisites: (CHEM 113 and MATH 241) or permission of department.* Production, transformation, transport and removal of air pollutants. The problems of photochemical smog, the greenhouse effect, stratospheric ozone, acid rain, and visibility. Analytical techniques for gases and particles.

**METO 499 Special Problems in Atmospheric Science (1-3)** *Prerequisite: permission of department. Repeatable to 6 credits.* Research or special study in the field of meteorology and the atmospheric and oceanic sciences.

### MICB—Microbiology

The following courses may involve the use of animals. Students who are concerned about the use of animals in teaching have the responsibility to contact the instructor, prior to course enrollment, to determine whether animals are to be used in the course, whether class exercises involving animals are optional or required and what alternatives, if any, are available.

**MICB 100 Microbes and Society (4)** *Three hours of lecture and two hours of laboratory per week. Credit will be granted for only one of the following: MICB 100 or MICB 200.* Introduction to the historical, societal and conceptual aspects of microbiology and biotechnology.

**MICB 200 General Microbiology (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisite: BIOL 105. Credit will be granted for only one of the following: MICB 100 or MICB 200.* Fundamental concepts in morphology, physiology, genetics, immunology, ecology, and pathogenic microbiology. Applications of microbiology to medicine, the food industry and biotechnology.

**MICB 379 Honors Research (1-4)** *Prerequisite: admission to departmental honors program. Repeatable to 8 credits if content differs.* Student should consult Microbiology program guidelines. Research project carried out under guidance of faculty advisor.

**MICB 388 Special Topics in Microbiology (1-4)** *Prerequisite: 8 credits in microbiology.* Presentation and discussion of special subjects in the field of microbiology. A maximum of four credit hours of MICB 388 may be applied to a major in microbiology.

**MICB 399 Microbiological Problems (3)** *Prerequisites: 16 credits in microbiology and permission of department.* This course is arranged to provide qualified majors in microbiology and majors in applied fields an opportunity to pursue specific microbiological problems under the supervision of a member of the department.

**MICB 400 Systematic Microbiology (2)** *Prerequisite: 8 credits in microbiology.* History and philosophy of classification. Alpha numerical and molecular genetic taxonomy. Methods used in microbial identification and classification.

**MICB 410 History of Microbiology (1)** *Prerequisite: MICB major.* History and integration of the fundamental discoveries of the science. Modern aspects of abiogenesis, fermentation, and disease causation in relation to early theories.

**MICB 420 Epidemiology and Public Health (2)** *Prerequisite: MICB 200.* History, characteristic features of epidemiology; the important responsibilities of public health; vital statistics.

**MICB 440 Pathogenic Microbiology (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisite: MICB 200.* 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.

**MICB 443 Drug Action and Design (3)** *Prerequisite: CHEM 243 or permission of department. 60 semester hours. Junior standing.* Introductory pharmacology with an emphasis on "magic bullets", novel therapies, and drug design.

**MICB 450 Immunology (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisites: MICB 200 and CHEM 243. Highly recommended: BCHM 461. Credit will be granted for only one of the following: MICB 450 or MICB 451 or ZOOL 455.* Principles of immunology: the immune apparatus, cells, genes and products; immunochemistry; immune functions and disorders. Laboratory methods in the detection and analysis of immune reactions.

**MICB 451 Principles of Immunology (Lecture) (2)** *Two hours of lecture and one hour of discussion/recitation per week.*

*Prerequisites: MICB 200 and CHEM 243. Highly recommended: BCHM 461. Credit will be granted for only one of the following: MICB 450 or MICB 451 or ZOOL 455.* A non-laboratory option of MICB 450. Principles of immunology: the immune apparatus, cells, genes and products; immunochemistry; immune functions and disorders. Includes a scheduled separate discussion session.

**MICB 453 Recombinant DNA Laboratory (3)** *Prerequisite: BIOL 222.* 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.

**MICB 460 General Virology (3)** *Prerequisite: (BIOL 222 and completion of 60 credits) or permission of department.* 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.

**MICB 470 Microbial Physiology (3)** *Prerequisite: MICB 200. Pre- or corequisite: BCHM 462.* 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 chemotaxis. Regulation of bacterial chromosome replication, RNA and protein synthesis. Control of metabolic pathways.

**MICB 480 Microbial Ecology (3)** *Prerequisites: MICB 200; and CHEM 243 or CHEM 245.* Interaction of microorganisms with the environment, other microorganisms and with higher organisms. Roles of microorganisms in the biosphere. Microorganisms and current environmental problems.

**MICB 485 Microbial Genetics (4)** *Two hours of lecture and six hours of laboratory per week. Prerequisites: MICB 200 and BIOL 222. Formerly MICB 380.* 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.

### MUED—Music Education

**MUED 197 Pre-Professional Experiences (1)** *Limited to music education majors.* An orientation into the role of the music teacher in the school and community. Class meets one hour a week for planning and discussion. Students spend one afternoon a week assigned to various music education activities.

**MUED 410 Instrumental Arranging (2)** *Prerequisites: MUSC 250 and permission of department.* Arranging for school bands and orchestras from the elementary through high school levels.

**MUED 411 Instrumental Music: Methods and Materials For the Elementary (3)** *School A* comprehensive study of instructional materials and teaching techniques for beginning instrumental classes—winds, strings and percussion.

**MUED 420 Instrumental Music: Methods, Materials and Administration for (2) Secondary School A** comprehensive study of instructional and program materials, rehearsal techniques and program planning for junior and senior High School bands and orchestras. Organization, scheduling, budgeting and purchasing are included.

**MUED 438 Special Problems in the Teaching of Instrumental Music (2-3)** *Prerequisite: MUSC 113-213 or the equivalent.* A study, through practice on minor instruments, of the problems encountered in public school teaching of orchestral instruments. Literature and teaching materials, minor repairs, and adjustment of instruments are included. The course may be taken for credit three times since one of four groups of instruments: strings, woodwind, brass or percussion will be studied each time the course is offered.

**MUED 450 Music in Early Childhood Education (3)** *Prerequisite: MUSC 155 or equivalent.* Creative experiences in songs and rhythms, correlation of music and everyday teaching with the abilities and development of each level; study of songs and materials; observation and teaching experience with each age level.

**MUED 470 General Concepts For Teaching Music (1)** *Corequisite: MUED 411 or MUED 471.* Basic philosophical, psychological, educational considerations for a total music program K-12: strategies for teaching tonal and rhythmic concepts; evaluation techniques and field experiences in designated schools.

**MUED 471 Methods For Teaching Elementary General Music (3)** A study of curriculum, materials, and teaching techniques for the development of meaningful music experiences which contribute to a sequential musical growth for children in the elementary schools.

**MUED 472 Choral Techniques and Repertoire (2)** *Prerequisites: MUED 470 and MUSC 490.* Rehearsal techniques for developing appropriate diction, tone, production, intonation, phrasing, and interpretation of choral music; examination of a wide variety of repertoire for use by choral performing groups on the elementary and secondary levels.

**MUED 478 Special Topics in Music Education (1-2)** *Prerequisite: MUED 470 or permission of department. Repeatable to 5 credits.* Each topic focuses on a specific aspect of the music instructional program; collectively, the topics cover a wide range of subject matter relevant to today's schools.

**MUED 499 Workshops, Clinics, Institutes (2-6)** Innovative and experimental dimensions of music education will be offered to meet the needs of music teachers and music supervisors and to allow students to individualize their programs. The maximum number credits that may be earned under this course symbol toward any degree is six semester hours; the symbol may be used two or more times until six semester hours have been reached.

### MUSC—School of Music

**MUSC 100 Beginning Class Voice (2)** *Four hours of laboratory per week.* A laboratory course involving a variety of voices and vocal problems. Principles of correct breathing as applied to singing; fundamentals of tone production and diction. Repertoire of folk songs and songs of the Classical and Romantic periods. Development of students' voices.

**MUSC 102 Beginning Class Piano I (2)** *Four hours of laboratory per week.* 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.

**MUSC 103 Beginning Class Piano II (2)** *Four hours of laboratory per week. Prerequisite: MUSC 102 or permission of department.* 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. MUSC 103 is a continuation of MUSC 102; elementary repertoire is begun.

**MUSC 106 Beginning Classical Guitar Class (2)** *Two hours of lecture and five hours of laboratory per week.* Introduction to classical guitar notation, technique, literature and performance. No previous musical experience required.

**MUSC 110 Class Study of String Instruments (2)** *Four hours of laboratory per week. Open only to majors in music education (vocal option).* Basic principles of string playing, and a survey of all string instruments.

**MUSC 111 Class Study of Wind and Percussion Instruments (2)** *Four hours of laboratory per week. Open only to majors in music education (vocal option).* A survey of wind and percussion instruments with emphasis on ensemble training. The student will acquire an adequate playing technique on one instrument and gain an understanding of the acoustical and construction principles of the others.

**MUSC 113 Class Study: Violin (2)** *Four hours of laboratory per week. Open only to majors in music (instrumental option).* A study of the violin with emphasis on ensemble training. The student will acquire an adequate playing technique.

**MUSC 114 Class Study: Cello and Bass (2)** *Four hours of laboratory per week. Open only to majors in music education (instrumental option).* A study of the instruments with emphasis on ensemble training. The student will acquire an adequate playing technique.

**MUSC 116 Class Study: Clarinet (2)** *Four hours of laboratory per week. Open only to majors in music education (instrumental option).* A study of the clarinet with emphasis on ensemble training. The student will acquire an adequate playing technique.

**MUSC 117 Class Study: Flute, Oboe, Bassoon, and Saxophone (2)** *Four hours of laboratory per week. Open only to majors in music education (instrumental option).* A study of the instruments with emphasis on ensemble training. The student will acquire an adequate playing technique on two to four instruments, and an understanding of the acoustical and construction principles of the others.

**MUSC 120 Class Study: Cornet (2)** *Four hours of laboratory per week. Open only to majors in music education (instrumental option).* A study of the cornet with emphasis on ensemble training. The student will acquire an adequate playing technique.

**MUSC 121 Class Study: Horn, Trombone, Euphonium, and Tuba (2)** *Four hours of laboratory per week. Open only to majors in music education (instrumental option).* A study of the instruments

with emphasis on ensemble training. The student will acquire an adequate playing technique on two to four instruments, and an understanding of the acoustical and construction principles of the others.

**MUSC 123 Movement for Singers (1)** Systematic exercises, improvisations and dances in conjunction with artistic vocal expression. Performance and critique of stage department, gestures and recital techniques.

**MUSC 126 Vocal Diction: English and Latin (1)** Augmentation of private voice study. Phonetics and diction for singers of English and Latin vocal literature.

**MUSC 127 Vocal Diction: Italian and Spanish (1)** Augmentation of private voice study. Phonetics and diction for singers of Italian and Spanish vocal literature.

**MUSC 128 Sight Reading For Pianists (2)** Repeatable to 4 credits. A course to give the piano major an opportunity to develop proficiency in sight reading at the keyboard.

**MUSC 129 Ensemble (1)** Three hours of laboratory per week. Rehearsal and performance of selected works for small ensembles of instruments, piano, or small vocal groups. After two registrations in MUSC 129, the student will elect MUSC 229 for two additional semesters and MUSC 329 thereafter.

**MUSC 130 Survey of Music Literature (3)** Three hours of lecture and one hour of laboratory per week. Open to all students except music and music education majors. A study of the principles upon which music is based, and an introduction to the musical repertory performed in America today.

**MUSC 140 Music Fundamentals I (3)** Limited to non-music majors. Introductory theory course. Notation, scales, intervals, triads, rhythm, form, and basic aural skills.

**MUSC 150 Theory of Music I (3)** Prerequisite: departmental audition and entrance examination. For MUSC majors only. A study of basic concepts and skills in tonal melody and harmony through analysis and composition.

**MUSC 151 Theory of Music II (3)** Prerequisite: a grade of C or better in MUSC 150. A continuation of MUSC 150, 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.

**MUSC 155 Fundamentals for the Classroom Teacher (3)** Open to students majoring in pre-early childhood education, pre-elementary education, elementary education, or childhood education; other students take MUSC 150. Credit will be granted for only one of the following: MUSC 150 or MUSC 155. The fundamentals of music theory and practice, related to the needs of the classroom and kindergarten teacher, and organized in accordance with the six-area concept of musical learning.

**MUSC 200 Intermediate Class Voice I (2)** Four hours of laboratory per week. Prerequisite: MUSC 100 or equivalent vocal training. Continuation of MUSC 100, with more advanced repertory for solo voice and small ensembles. A special section for music education majors will include the study of methods and materials for teaching class voice.

**MUSC 202 Intermediate Class Piano I (2)** Four hours of laboratory per week. Prerequisite: MUSC 103 or equivalent piano training. Advanced keyboard techniques. Continuation of skills introduced in MUSC 103. Transposition, modulation, and sight reading; methods of teaching functional piano.

**MUSC 203 Intermediate Class Piano II (2)** Four hours of laboratory per week. Prerequisite: MUSC 202 or equivalent piano training. Advanced keyboard techniques. Continuation of skills introduced in MUSC 202. 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.

**MUSC 210 The Impact of Music on Life (3)** 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.

**MUSC 215 The Art of the Performer (3)** A study of music as recreated and communicated by one or more performers through recital-lecture programs. The soloist, the ensemble performer, the conductor; style, technique, and interpretation; programming, listener, audience, and media. Presentations by Department of Music performance faculty, students, and, when possible, visiting artists. Open to non-music majors.

**MUSC 217 Class Composition I (2)** Prerequisite: MUSC 151 and permission of department. Principles of musical composition and their application to the smaller forms. Original writing in nineteenth and twentieth century musical idioms for various media.

**MUSC 218 Class Composition II (2)** Prerequisite: MUSC 217 and permission of department. Continuation of MUSC 217. May be

repeated for credit, but only one successful attempt may be applied towards baccalaureate degree requirements.

**MUSC 226 Vocal Diction: French (1)** Augmentation of private voice study. Phonetics and diction for singers of French vocal literature.

**MUSC 227 Vocal Diction: German (1)** Augmentation of private voice study. Phonetics and diction for singers of German vocal literature.

**MUSC 228 Accompanying For Pianist (2)** Prerequisite: MUSC 228. Repeatable to 4 credits. A course to give the piano major experience in dealing with the problems of accompanying at an intermediate stage of difficulty. Guidance and instruction in class will be supplemented by extensive experience working as an accompanist in applied studios.

**MUSC 229 Ensemble (1)** Three hours of laboratory per week. Rehearsal and performance of selected works for small ensembles of instruments, piano, or small vocal groups. After two registrations in MUSC 129, the student will elect MUSC 229 for two additional semesters and MUSC 329 thereafter.

**MUSC 230 History of Music I (3)** Prerequisite: MUSC 250 or equivalent. A historical study of western music from Corelli through Beethoven.

**MUSC 248 Selected Topics in Music (1-3)** Prerequisite: permission of School of Music. A maximum of three credits may be applied to music major requirements. Repeatable to 6 credits if content differs. Designed to allow a student of theory or music history to pursue a specialized topic or project under the supervision of a faculty member.

**MUSC 250 Advanced Theory of Music I (4)** Prerequisite: MUSC 151 with a minimum grade of C. 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.

**MUSC 251 Advanced Theory of Music II (4)** Prerequisite: a grade of C or better in MUSC 250. A continuation of MUSC 250, 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.

**MUSC 320 Epic as Song and Saga: Cross-Cultural Perspectives (3)** Prerequisite: MUSC 130 or MUSC 140 or MUSC 210 or permission of department. An examination of oral epic traditions in selected diverse cultural settings. Universal themes and forms of expression are examined and compared through analysis of literary content, musical context, and modes of performance, as documented in texts and field-recorded oral performances.

**MUSC 328 Chamber Music Performance for Pianists (2)** Repeatable to 4 credits. A course to give the piano major experience in dealing with the problems of playing chamber music at a moderately difficult level. Class instruction will center around actual rehearsal and performance situations and will be supplemented by further experience working in chamber ensemble in applied studios.

**MUSC 329 Ensemble (1)** Three hours of laboratory per week. Rehearsal and performance of selected works for small ensembles of instruments, piano, or small vocal groups. After two registrations in MUSC 129, the student will elect MUSC 229 for two additional semesters and MUSC 329 thereafter.

**MUSC 330 History of Music II (3)** Prerequisite: MUSC 250 or equivalent. A historical study of western music from the Romantic era to the present.

**MUSC 331 History of Music III (3)** Prerequisite: MUSC 230 and MUSC 330. A historical study of western music from Antiquity through the Baroque, ending with a review of all periods of music history.

**MUSC 339 Honors in Music (3)** Prerequisite: permission of department. Corequisite: MUSC 349. Repeatable to 6 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.

**MUSC 340 Music Literature Survey I (3)** Prerequisite: MUSC 130 or equivalent. Limited to non-music majors. Masterpieces of the symphonic and operatic repertory including works selected from Bach, Mozart, Beethoven, Brahms, Wagner, Verdi, and Debussy.

**MUSC 341 Music Literature Survey II (3)** Prerequisite: MUSC 130 or equivalent. Limited to non-music majors. Specialized music repertory, including medieval, liturgical drama, Handel trio sonatas, Schubert Lieder, Bartok string quartets, electronic music.

**MUSC 345 Jazz Theory and Improvisation I (3)** Prerequisite: MUSC 251 or permission of department. Jazz theory, notational conventions, improvisation techniques, reading and analysis of music, and performance in small combo format.

**MUSC 346 Jazz Theory and Improvisation II (3)** Prerequisite: MUSC 345 or permission of department. Continuation of MUSC 345 including scoring and transcription.

**MUSC 349 Honors Seminar in Music (1)** Corequisite: MUSC 339. Repeatable to 2 credits. Group discussion of projects undertaken in MUSC 339. Two semesters required.

**MUSC 379 Opera Workshop (2)** 10 hours of laboratory per week. Repeatable to 8 credits. 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.

**MUSC 388 Music Internship (3)** Prerequisite: permission of department. Corequisite: MUSC 389. Repeatable to 6 credits. Pre-professional field work in music.

**MUSC 389 Music Internship Analysis (1)** Corequisite: MUSC 388. Repeatable to 2 credits. Documentation and evaluation of field work experience.

**MUSC 400 Music Pedagogy (3)** Pre- or corequisite: MUSC 418 or a more advanced course in applied music. Conference course. A study of major pedagogical treatises in music, and an evaluation of pedagogical techniques, materials, and procedures.

**MUSC 405 Stage Combat for Singers (1)** One hour of lecture and one hour of laboratory per week. Prerequisites: MUSC 123 and MUSC 611 or permission of Director of Opera. For MUSC majors only. Stage combat techniques for singers with emphasis on safety and aesthetics.

**MUSC 428 Repertoire Coaching of Vocal or Chamber Music (2)** Pre- or corequisite: MUSC 328. A course for piano students who wish to go further than the work offered in MUSC 128, MUSC 228, and MUSC 328 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.

**MUSC 429 Opera Theater (2-3)** 10 hours of laboratory per week. Open to music and non-music majors with permission of department. Repeatable to 12 credits. Advanced techniques of operatic production: preparation, rehearsal, and performance of operatic works from both the traditional and contemporary repertory.

**MUSC 430 American Musical Experience: North America (3)** Prerequisite: successful completion of MUSC 210 or MUSC 130. Many musical styles found in North America portray the ideas and beliefs that characterize our diverse society. Specific problems and issues in American society examined through the American musical experience.

**MUSC 432 Music in World Cultures I (3)** Prerequisite: MUSC 130 or permission of department. Asian musics from Japan to the Arab countries analyzed in terms of musical, social and aesthetic approaches.

**MUSC 433 Music in World Cultures II (3)** Prerequisite: MUSC 130 or permission of department. Music of the Balkans, Africa, South and North America analyzed in terms of musical, social and aesthetic interrelationships.

**MUSC 436 Jazz: Then and Now (3)** Major styles and influential artists of the past 75 years of jazz.

**MUSC 438 Area Studies in Ethnomusicology (3)** Prerequisite: MUSC 432 or MUSC 433 or equivalent. Repeatable to 9 credits if content differs. Advanced study of musics in selected regions of the world.

**MUSC 439 Collegium Musicum (1)** Prerequisite: permission of department. Repeatable to 5 credits. 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.

**MUSC 443 Solo Vocal Literature (3)** Prerequisite: MUSC 330, MUSC 331 or equivalent. 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.

**MUSC 445 Survey of the Opera (3)** Prerequisite: MUSC 330, MUSC 331 or equivalent. A study of the music, librettos and composers of the standard operas.

**MUSC 448 Selected Topics in Music (1-3)** Prerequisite: permission of department. A maximum of three credits may be applied to music major requirements. 56 semester hours. Repeatable to 6 credits if content differs.

**MUSC 450 Musical Form (3)** Prerequisite: MUSC 251. A study of the principles of organization in music with emphasis on

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eighteenth and nineteenth century European music. Reading and analysis of scores exemplifying the musical forms.

**MUSC 451 Analysis of Music (3)** *Prerequisite: MUSC 450 or permission of department.* An advanced course in the analysis of tonal music. Discussion of individual works, with emphasis on their unique characteristics and on the relation of analysis to performance.

**MUSC 452 Keyboard Harmony (2)** *Prerequisite: MUSC 251.* Keyboard performance of musical score for vocal and instrumental ensembles and keyboard realization of basso continuo parts.

**MUSC 453 Class Study of Guitar and Recorder (2)** *Three hours of laboratory per week. Prerequisite: permission of department.* Study and development of instrumental technique, pedagogical practices, and materials relating to group performance.

**MUSC 455 Theory of Jazz (3)** *Prerequisite: MUSC 250 or permission of department. For MUSC majors only.* An aural-theoretical examination of melodic and harmonic function in jazz with emphasis on bebop. "Layered" harmonic analysis combined with melodic analysis of solo transcriptions applied to the creation of small group arrangements of "standard" tunes.

**MUSC 457 Electronic Music Composition (2)** *Prerequisite: MUSC 250 and permission of department.* Theory and practice of electronic music, electronically-generated sound, and its modulation in the voltage-controlled studio.

**MUSC 460 Tonal Counterpoint I (2)** *Prerequisite: MUSC 251 or permission of department.* A course in eighteenth-century contrapuntal techniques, analysis and original composition of two-voice dances, preludes, and inventions.

**MUSC 461 Tonal Counterpoint II (2)** *Prerequisite: MUSC 460.* A continuation of MUSC 460. Analysis and original composition of larger works displaying imitation in more than two voices, including the chorale prelude and fugue.

**MUSC 467 Piano Pedagogy I (3)** A study of major pedagogical treatises in music, and an evaluation of pedagogical techniques, materials, and procedures.

**MUSC 468 Piano Pedagogy II (3)** *Prerequisite: MUSC 467. Repeatable to 6 credits.* Application of the studies begun in MUSC 467 to the actual lesson situation. Evaluation of results.

**MUSC 470 Harmonic and Contrapuntal Practices of the Twentieth Century (2)** *Prerequisite: MUSC 251 or equivalent.* A theoretical and analytical study of twentieth century materials.

**MUSC 471 Contemporary Compositional Techniques (2)** *Prerequisite: MUSC 470 or permission of department.* Continuation of MUSC 470, with emphasis on the analysis of individual works written since 1945.

**MUSC 480 Music in Antiquity and the Middle Ages (3)** Survey of western music from Hellenic times to 1450.

**MUSC 481 Music in the Renaissance (3)** Survey of western music from 1450 to 1600.

**MUSC 482 Music in the Baroque Era (3)** Survey of western music from 1600 to 1750.

**MUSC 483 Music in the Classic Era (3)** Survey of western music from 1750 to 1820.

**MUSC 484 Music in the Romantic Era (3)** Survey of western music from 1820 to 1900.

**MUSC 485 Music in the 20th Century (3)** Survey of western music from 1900 to the present.

**MUSC 486 Orchestration I (2)** *Prerequisite: MUSC 251.* 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.

**MUSC 490 Conducting (2)** *Prerequisite: MUSC 251.* Vocal and instrumental baton techniques.

**MUSC 491 Conducting II (2)** *Prerequisite: MUSC 490 or equivalent.* Baton techniques applied to score reading, rehearsal techniques, tone production, style and interpretation.

**MUSC 492 Keyboard Music I (3)** 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.

**MUSC 493 Keyboard Music II (3)** *Prerequisite: MUSC 492.* 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.

**MUSC 494 Survey of Theory (3)** *Prerequisite: MUSC 251.* A study of the major contributions of music theorists from Greek antiquity through the twentieth century.

**MUSC 499 Independent Studies (2-3)** *Prerequisite: permission of department. May be repeated once for credit.* Independent research on a topic chosen in consultation with the instructor, which may culminate in a paper or appropriate project.

## MUSP—Music Performance

**Undergraduate Music Performance Courses are available in three series:**

**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 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, 103 Freshman Courses.**

**MUSP 202, 203 Sophomore Courses.**

**MUSP 302, 303 Junior Courses.**

**MUSP 402, 403 Senior Courses.**

**Principal Series:** 2 or 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.**

**Major Series:** 2 or 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—piano. 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.

## NFSC—Nutrition and Food Science

The following courses may involve the use of animals. Students who are concerned about the use of animals in teaching have the responsibility to contact the instructor, prior to course enrollment, to determine whether animals are to be used in the course, whether class exercises involving animals are optional or required and what alternatives, if any, are available.

**NFSC 100 Elements of Nutrition (3)** *Formerly NUTR 100.* Fundamentals of human nutrition. Nutrient requirements related to changing individual and family needs.

**NFSC 112 Food: Science and Technology (3)** *Two hours of lecture and one hour of discussion/recitation per week.* Introduction to the realm of food science, food technology and food processing. It

provides 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.

**NFSC 200 Nutrition for Health Services (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: CHEM 104 or CHEM 233; and ZOOL 201 or ZOOL 202 or ZOOL 211; and permission of department. Formerly NUTR 200.* Nutrition related to maintenance of normal health and prevention of disease; nutritional requirements for individuals in different stages of development; current concerns in nutrition for the professional in health services.

**NFSC 250 Science of Food (4)** *Three hours of lecture and three hours of laboratory per week. Prerequisites: NFSC 111; and CHEM 103; and CHEM 113; permission of department. For NFSC majors only. Formerly FOOD 250.* Composition and structure of food with emphasis on chemical, physical, and biological properties, as well as quality characteristics of food products. Food preparation lab with emphasis on the experimental study of food.

**NFSC 315 Nutrition During the Lifecycle (3)** *Prerequisite: NFSC 100 or NFSC 200. Formerly NUTR 315.* 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.

**NFSC 330 Nutritional Biochemistry (3)** *Prerequisites: CHEM 104 or CHEM 233 or CHEM 235; NFSC 100 or NFSC 200. Formerly NUTR 330.* This course is designed to meet the needs of departmental majors in the area of nutritional biochemistry.

**NFSC 335 History of Nutrition (3)** *Prerequisite: course in basic nutrition. Formerly NUTR 335.* The development of knowledge in nutrition, including the biographies of creative nutrition researchers and the nature of the discovery process. The use of hypotheses to focus exploration and the testing and evaluation of important hypotheses in nutrition.

**NFSC 350 Foodservice Operations (5)** *Three hours of lecture and five hours of laboratory per week. Prerequisite: NFSC 250. Pre- or corequisite: MCB 200. Corequisite: BMGT 364. For Dietetics majors only. Formerly FSAD 350.* 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.

**NFSC 380 Methods of Nutritional Assessment (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisite: NFSC 315. Corequisite: BCHM 461. For NFSC majors only.* Methods of assessing human nutritional status of populations and individuals. These methods include dietary, anthropometric, clinical evaluations and biochemical measurements.

**NFSC 398 Seminar (1)** *Formerly FDSC 398.* Presentation and discussion of current literature and research in food science.

**NFSC 399 Special Problems in Food Science (1-3)** *Formerly FDSC 399.* Designed for advanced undergraduates. Specific problems in food science will be assigned.

**NFSC 403 Medicinal and Poisonous Plants (2)** *Prerequisites: BIOL 105 and CHEM 104.* A study of plants important to humans that have medicinal or poisonous properties. Emphasis on plant source, plant description, the active agent and its beneficial or detrimental physiological action and effects.

**NFSC 412 Food Processing Technology (4)** *Three hours of lecture and three hours of laboratory per week. Prerequisites: CHEM 243; and NFSC 431; and NFSC 434; and ENBE 414. Corequisites: NFSC 421 and NFSC 423. Recommended: MATH 220. Formerly FDSC 412.* 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.

**NFSC 421 Food Chemistry (3)** *Prerequisite: BCHM 461. Formerly FDSC 421.* 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.

**NFSC 422 Food Product Research and Development (3)** *One hour of lecture and four hours of laboratory per week. Prerequisite: permission of department. Senior standing. For FDSC majors only. Formerly FDSC 422.* 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 2 to 4 Saturdays during the semester.

**NFSC 423 Food Chemistry Laboratory (2)** *Four hours of laboratory per week. Pre- or corequisite: NFSC 421. Formerly FDSC 423.* 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 NFSC 421.

**NFSC 425 International Nutrition (3)** *Prerequisite: course in basic nutrition. Formerly NUTR 425.* Nutritional status of world population; consequences of malnutrition on health and mental development; and local, national, and international programs for nutritional improvement.

**NFSC 430 Food Microbiology (2)** *Prerequisite: MICB 200 or equivalent. Also offered as ANSC 430. Credit will be granted for only one of the following: NFSC 430 or ANSC 430. Formerly FDSC 430.* 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.

**NFSC 431 Food Quality Control (4)** *Three hours of lecture and two hours of laboratory per week. Formerly FDSC 431.* 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).

**NFSC 434 Food Microbiology Laboratory (2)** *Four hours of laboratory per week. Pre- or corequisite: NFSC 430. Also offered as ANSC 434. Credit will be granted for only one of the following: NFSC 434 or ANSC 434. Formerly FDSC 434.* A study of techniques and procedures used in the microbiological examination of foods.

**NFSC 440 Advanced Human Nutrition (4)** *Four hours of lecture per week. Prerequisites: NFSC 100 or NFSC 200; and BCHM 462; and ZOOL 422. Formerly NUTR 440.* 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.

**NFSC 442 Horticultural Products Processing (3)** *Two hours of lecture and two hours of laboratory per week. Formerly FDSC 442.* Commercial methods of canning, freezing, dehydrating, fermenting, and chemical preservation of fruit and vegetable crops.

**NFSC 450 Food and Nutrient Analysis (3)** *One hour of lecture and four hours of laboratory per week. Prerequisites: NFSC 100 or NFSC 200; and BCHM 461. Formerly NUTR 450.* Methods and practices of the analysis of foods and nutrients. It provides 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.

**NFSC 460 Therapeutic Human Nutrition (4)** *Three hours of lecture and two hours of laboratory per week. Prerequisites: NFSC 380 and NFSC 440. Formerly NUTR 460.* Modifications of the normal adequate diet to meet human nutritional needs in acute and chronic diseases and metabolic disorders.

**NFSC 468 Practicum in Nutrition (1-6)** *Prerequisite: permission of department. Repeatable to 6 credits. Formerly NUTR 468.* Inservice training and practical experience in the application of the principles of normal and/or therapeutic nutrition in an approved community agency, clinical facility or nutrition research laboratory.

**NFSC 470 Community Nutrition (3)** *Two hours of lecture and three hours of discussion/recitation per week. Prerequisites: NFSC 100 or NFSC 200; and NFSC 315. Formerly NUTR 470.* 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, 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.

**NFSC 471 Meat and Meat Processing (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: BCHM 261 or permission of department. Formerly FDSC 471.* Physical and chemical characteristics of meat and meat products, meat processing, methods of testing and product development.

**NFSC 482 Seafood Products Processing (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite: BCHM 261 or permission of department. Formerly FDSC 482.* The principal preservation methods for commercial seafood products with particular reference to the invertebrates. Chemical and microbiological aspects of processing are emphasized.

**NFSC 490 Special Problems in Nutrition (2-3)** *Prerequisites: NFSC 440 and permission of department. Formerly NUTR 490.* Individual selected problems in the area of human nutrition.

**NFSC 491 Issues and Problems in Dietetics (3)** *One hour of lecture and four hours of laboratory per week. Prerequisites: NFSC*

*350 and NFSC 470. Corequisite: NFSC 460. For Dietetics majors only. Senior standing.* 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.

**NFSC 495 Nutrition Research (3)** *Eight hours of laboratory and one hour of discussion/recitation per week. Prerequisites: NFSC 440 and BCHM 462; and BIOM 301 or equivalent. For Nutrition Science majors only. Senior standing.* A capstone course for nutrition sciences majors. Students will apply the theories and concepts of nutrition, life sciences and statistics that have been developed in courses in the major. Provides a guided experience in the design, conduct, analysis and summary of a semester's research experience. Emphasis will be placed on the development of experimental design, statistical evaluation of the data generated by experiments, working cooperatively as a member of a research team and writing of a concise summary of experimental findings.

**NFSC 498 Selected Topics (1-3)** *Prerequisite: permission of department. Formerly FOOD 498, FSAD 498, and NUTR 498. Repeatable to 6 credits if content differs.* Selected current aspects of food.

## NRMT—Natural Resources Management

**NRMT 314 Biology and Management of Finfish (4)** *Two hours of lecture and six hours of laboratory per week. Prerequisite: one year of biology or zoology. Formerly AGRI 314.* Fundamentals of individual and population dynamics; theory and practice of sampling fish populations; management schemes.

**NRMT 389 Internship (3)** *Prerequisite: permission of department. Repeatable to 6 credits. Formerly AGRI 389.* Students are placed in work experiences related to their stated career goals for a minimum of eight hours a week for a semester. Each student must do an in-depth study in some portion of the work experience and produce a special project and report related to this study. A student work log is also required. An evaluation from the external supervisor of the project will be required.

**NRMT 451 Water Quality: Field and Lab Analysis Methods (3)** *Two hours of lecture and three hours of laboratory per week. Prerequisites: CHEM 103 and (CHEM 104 or CHEM 113). Also offered as ENBE 451. Credit will be granted for only one of the following: NRMT 451 or ENBE 451.* A broad range of water quality issues including water supply, wastewater treatment, water problems in developing countries, water borne diseases, point and nonpoint sources of pollution, stream monitoring, ground water, and nutrient cycling.

**NRMT 460 Principles of Wildlife Management (3)** *Three hours of lecture per week. Three Saturday field trips are scheduled. Prerequisite: two semesters of laboratory biology.* Ecological principles and requirements of wildlife as bases 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.

**NRMT 461 Urban Wildlife Management (3)** *Two lectures per week. Two Saturday field trips are scheduled.* 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, reviews of private conservation organizations.

**NRMT 470 Natural Resources Management (4)** *Senior standing. For NRMT majors only.* Field work, and independent research on watersheds. Intensive seminar on resource management planning and report preparation.

**NRMT 479 Tropical Ecology and Resource Management (1-6)** *Prerequisites: (BIOL 106) and (introductory economics course) and (permission of department). Repeatable to 10 credits if content differs.* Tropical ecosystems and issues of human use and impact. Includes lectures which lead up to an off-campus trip in a tropical environment.

**NRMT 487 Conservation of Natural Resources I (3)** *Formerly AEED 487.* Designed primarily for teachers. Study of state's natural resources: soil, water, fisheries, wildlife, forests and minerals: natural resources problems and practices. Extensive field study. Concentration on subject matter. Taken concurrently with NRMT 497 in summer season.

**NRMT 489 Field Experience (1-4)** *Prerequisite: permission of department. Repeatable to 6 credits. Formerly AEED 489.* Planned field experience for both major and non-major students.

**NRMT 497 Conservation of Natural Resources II (3)** *Formerly AEED 497.* Designed primarily for teachers. Study of state's

natural resources: soil, water, fisheries, wildlife, forests and minerals; natural resources problems and practices. Extensive field study. Methods of teaching conservation included. Taken concurrently with NRMT 487 in summer season.

**NRMT 499 Special Problems (3)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs.*

## PBIO—Plant Biology

**PBIO 100 Plant Biology for Non-Science Students (3)** *For non-science majors only. Not open to students who have completed BIOL 105. Formerly BOTN 104.* 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 the College of Life Sciences or the College of Agriculture and Natural Resources.

**PBIO 101 Laboratory in Plant Biology (1)** *Three hours of laboratory per week. Pre- or corequisite: PBIO 100. For non-science majors only. Formerly BOTN 105.* Laboratory investigations for the non-science student into the processes and functions of plants, their evolution, adaptations and ecological roles. This course will not count toward graduation requirements for any student in the College of Life Sciences or the College of Agriculture and Natural Resources.

**PBIO 123 Causes and Implications of Global Change (3)** *Also offered as GEOG 123, GEOL 123, and METO 123. Credit will be granted for only one of the following: PBIO 123, GEOG 123, GEOL 123, or METO 123. Formerly BOTN 123.* Integrating of physical, chemical, geological, and biological sciences with geographical, economic, sociological, and political knowledge skills toward a better understanding of global change. Review of environmental science relating to weather and climate change, acid precipitation, ozone holes, global warming, and impacts on biology, agriculture, and human behavior. Study of the natural, long-term variability of the global environment, and what influence mankind may have in perturbing it from its natural evolution. Concepts of how physical, biological, and human behavioral systems interact, and the repercussions which may follow from human endeavors. The manner in which approach decision and policy making are related to issues of global change.

**PBIO 200 Introductory Plant Biology (4)** *Prerequisite: BIOL 105 or HORT 100 or permission of department. Formerly BOTN 207.* An evolutionary survey of plant life is presented with special emphasis on flowering plants. Particular attention is devoted to structure-function relationships necessary for carrying out life's processes, such as photosynthesis, metabolism, transport, protection, and development.

**PBIO 235 Environmental Science (3)** *Formerly BOTN 211.* Basic ecological principles as they relate to the ecological dilemmas of overpopulation, pollution, increasing consumption of natural resources, and deteriorating land use ethics facing mankind today.

**PBIO 250 Plant Taxonomy (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisite: BIOL 105 or permission of department. Formerly BOTN 212.* An introductory study of plant identification, naming, and classification. Laboratory emphasis on the collection and identification of local vascular plants.

**PBIO 255 Chesapeake: A Living Resource (3)** *Credit will be granted for only one of the following: ZOOL 381 or PBIO 255.* The living resources of the Chesapeake Bay from an ecosystem perspective. Designed for non-science majors, it will acquaint students with the Bay's watershed, its physical environment, and its living organisms, with an emphasis on the connections between these factors. Understanding the relationships between physical, chemical and biological processes will equip students to comprehend and appreciate the remarkable productivity of our estuary, as well as provide them with the knowledge needed to protect the Bay.

**PBIO 328 Selected Topics in Plant Biology (1-3)** *Prerequisite: permission of department. Repeatable to 6 credits if content differs. Formerly BOTN 328.* Lectures, seminars, minicourses and other special instruction in various subjects in plant biology.

**PBIO 365 Introductory Plant Pathology (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisites: BIOL 105 and BIOL 106. Formerly BOTN 321.* An introduction to the causal agents, nature and management of plant diseases.

**PBIO 379 Honors Research Problems in Plant Biology (1-3)** *Prerequisite: twenty credits in botany courses. Open only to honors students in botany. Repeatable to 6 credits if content differs. Formerly BOTN 379.* Research in botany under the direction and close supervision of a member of the faculty.

**PBIO 385 Plants of Economic Importance (3)** *Two hours of lecture and one hour of laboratory per week. Recommended: (PBIO 100 or BIOL 105) or permission of department. Formerly BOTN*

## 200 Approved Courses

375. Botanical characteristics of plants and plant products economically important to human/societies, origin, cultivation, and uses of domesticated plants in different cultures.

**PBIO 398 Seminar (1)** *Prerequisite: major in botany; with permission of department, major in biological science. Repeatable to 2 credits if content differs. Formerly BOTN 398.* Discussion and reading on special topics, current literature, or problems and progress in all phases of botany.

**PBIO 399 Research Problems in Plant Biology (1-3)** *Prerequisite: twenty hours of botany courses and permission of department. Repeatable to 6 credits if content differs. Formerly BOTN 399.* Research and/or integrated reading in botany under the direction and close supervision of a member of the faculty.

**PBIO 400 Cell Biology (4)** *Three hours of lecture and four hours of laboratory per week. Prerequisites: BIOL 222 and CHEM 233 and ZOO 211. Also offered as ZOO 411. Credit will be granted for only one of the following: PBIO 400 or ZOO 411. Formerly BOTN 420.* Molecular and biochemical bases of cellular organization and function in eukaryotes.

**PBIO 405 Plant Genetics and Molecular Biology (3)** *Prerequisite: BIOL 222. Junior standing. Formerly BOTN 414.* The basic principles of genetic analysis and molecular biology of gene structure, expression, and manipulation.

**PBIO 410 Plant Biochemistry (3)** *Prerequisites: PBIO 420; and CHEM 233. Formerly BOTN 484.* Biochemical processes characteristic of plants, including photosynthesis, nitrogen fixation and biosynthesis of plant macromolecules.

**PBIO 415 Plant Biotechnology (2)** *Prerequisites: (PBIO 405 or ZOO 213 or MICB 380 or ANSC 201 or HORT 274) and PBIO 420. Formerly BOTN 483.* Theoretical and applied consideration of current technology for crop improvement, including manipulation of whole plants, tissues, and genes.

**PBIO 420 Plant Physiology (4)** *Three hours of lecture and three hours of laboratory per week. Prerequisites: BIOL 105 and CHEM 103. Formerly BOTN 441.* A survey of the general physiological activities of plants.

**PBIO 425 Plant Structure (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisite: BIOL 105. Formerly BOTN 416.* A survey of the basic structural features of vascular plants, including subcellular organelles, cells, tissues, and organs. Emphasis on structural phenomena as they relate to physiological processes of agricultural importance.

**PBIO 430 Principles of Microscopy (2)** *Prerequisite: PBIO 400 or ZOO 411 or equivalent. Formerly BOTN 456.* An introduction to optical principles that underlie light and electron microscopic image formation. Brightfield, darkfield, phase contrast, differential interference contrast, fluorescence and polarized light microscopy. Comparison of light and electron microscopy. The application of these techniques to problems in biological research.

**PBIO 440 Plant Ecology (3)** *Prerequisite: BIOL 106. Formerly BOTN 462.* The dynamics of populations as affected by environmental factors with special emphasis on the structure and composition of natural plant communities, both terrestrial and aquatic.

**PBIO 441 Plant Ecology Laboratory (2)** *Three hours of laboratory per week. Pre- or corequisite: PBIO 440 or equivalent. Formerly BOTN 464.* Two or three field trips per semester. The application of field and experimental methods to the qualitative and quantitative study of vegetation and ecosystems.

**PBIO 445 Evolutionary Biology of Plants (3)** *Prerequisites: BIOL 106 and BIOL 222. Formerly BOTN 411.* Evolution in plant populations. The pace, pattern, and mechanisms of evolution will be discussed within a genetic and ecological framework. Some emphasis will be placed on processes that are unique to the evolution of plants.

**PBIO 450 Advanced Plant Taxonomy (3)** *Two hours of lecture and one hour of laboratory per week. Prerequisites: PBIO 200; and PBIO 250, or equivalent. Formerly BOTN 405.* A review of the history and principles of plant taxonomy with emphasis on monographic and floristic research. A detailed laboratory review of the families of flowering plants.

**PBIO 455 Ecology of Marsh and Dune Vegetation (2)** *Prerequisite: BIOL 105. Formerly BOTN 463.* An examination of the biology of higher plants in dune and marsh ecosystems.

**PBIO 460 Mycology (4)** *Two hours of lecture and six hours of laboratory per week. Prerequisite: BIOL 105. Formerly BOTN 426.* An introductory course in the biology, morphology and taxonomy of the fungi.

**PBIO 470 Pathogenic Bacteria and Fungi of Plants (4)** *Three hours of lecture and two hours of laboratory per week. Prerequisite: PBIO 365 or permission of department. Formerly BOTN 424.* A survey of the diagnostic properties and biology of plant pathogenic bacteria and fungi.

**PBIO 485 Medicinal and Poisonous Plants (2)** *Prerequisites: BIOL 105 and CHEM 104. Formerly BOTN 403.* A study of plants important to humans that have medicinal or poisonous properties. Emphasis on plant source, plant description, the active agent and its beneficial or detrimental physiological action and effects.

## PHIL—Philosophy

**PHIL 100 Introduction to Philosophy (3)** 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.

**PHIL 101 The Structure of Knowledge (3)** Introduction to the literature, problems, and methods of philosophy through a study of problems concerning knowledge, belief, and evidence. The emphasis is on Western philosophy.

**PHIL 102 Truth and Reality (3)** Literature, problems, and methods of philosophy through study of questions about the nature of what exists, truth, and problems of knowledge. Emphasis on Western philosophy and science.

**PHIL 103 Self and Identity (3)** An introduction to the literature, problems, and methods of philosophy through a study of problems about the self and personal identity. The primary emphasis is on Western philosophy, science and literature.

**PHIL 104 Action and Responsibility (3)** Literature, problems, and methods of philosophy through a study of problems concerning actions, responsibility, and related topics in ethical theory. Emphasis on Western philosophy.

**PHIL 105 God and Cosmos (3)** *Not open to students who have completed PHIL 236.* Literature, problems, and methods of philosophy through a study of problems about God, self, and cosmos, and the relations among them. Emphasis on Western philosophy.

**PHIL 110 Plato's Republic (3)** Plato's Republic as a framework for examining philosophical issues pertaining to art, education, immortality, love, marriage, the mind, morality, the state, and the universe and our knowledge of it. The arguments Plato uses to support his views on these issues, his fusion of these views into a single comprehensive philosophy, and the influence of this philosophy on western thought and culture. Readings from other Platonic dialogues and from secondary material.

**PHIL 140 Contemporary Moral Issues (3)** 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.

**PHIL 143 Business Ethics (3)** Introduction to ethical theories and theories of economic justice and their application to moral problems in business.

**PHIL 170 Introduction to Logic (3)** A general introduction to the discipline of logic. Traditional and modern deductive techniques; informal fallacies.

**PHIL 173 Logic and the English Language I (3)** Basic techniques for analyzing deductive arguments. The uses of these techniques to illuminate the grammar and the logic of English sentences. The capacity of the English language to express logical distinctions. Exercises in analyzing the logical structure of published writings of varied style and content.

**PHIL 174 Logic and the English Language II (3)** *Prerequisite: PHIL 173 or permission of department.* Basic techniques of conceptual analysis and nondeductive reasoning examined against the capacity of the English language for exact expression. Exercises in critical analysis of published writings of varied style and content.

**PHIL 201 Issues in the Philosophy of Life (3)** Philosophical issues concerning what is desirable and what is admirable in human life. The emphasis is on Western philosophy and literature.

**PHIL 206 Chinese Philosophy: Social and Political Thought (3)** An introductory survey of Confucian philosophy and of other Chinese social and political philosophy from ancient times to the present day. The Chou Dynasty (1122-222 BC) and the many schools of thought produced during that period. The reemergence of Confucian philosophy in the Sung Dynasty (960-1279 AD) and developments down to the contemporary period. Contemporary thought in the context of earlier Chinese traditions.

**PHIL 209 Philosophical Issues (3)** *Repeatable to 6 credits if content differs.* An examination of selected philosophical issues of general interest.

**PHIL 233 Philosophy in Literature (3)** Reading and philosophical criticism of fiction, poetry, and drama, dealing with issues of moral, religious, and metaphysical significance.

**PHIL 236 Philosophy of Religion (3)** 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.

**PHIL 243 Philosophy of Rural Life (3)** An examination of traditional and contemporary rural values and philosophies of life, with an emphasis on southern agrarian philosophies. Jefferson, Emerson, Thoreau, Populism, the Country Life Movement, the Vanderbilt Agrarians, and contemporary views.

**PHIL 245 Political and Social Philosophy I (3)** 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.

**PHIL 250 Philosophy of Science I (3)** 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.

**PHIL 256 Philosophy of Biology I (3)** Issues in the discovery and justification of biological theories and models. Focus on cases from twentieth century biology, such as the genetic revolution or evolutionary theory.

**PHIL 271 Symbolic Logic I (3)** *Formerly PHIL 371.* The formal analysis of deductive reasoning providing familiarity with techniques of formal deduction in propositional logic and quantification theory, as well as some knowledge of basic concepts of formal semantics (truth tables, models).

**PHIL 273 Logic for Philosophy (3)** Major concepts underlying the modern formal logic development by Frege and Russell and their importance in contemporary philosophy.

**PHIL 280 Introduction to Cognitive Science (3)** The role of representation and reasoning in cognition considered from the differing perspectives of the cognitive-science disciplines: linguistics, philosophy, neuroscience, psychology and computer science.

**PHIL 308 Studies in Contemporary Philosophy (3)** *Prerequisite: six hours in philosophy. Repeatable to 6 credits if content differs.* Problems, issues, and points of view of current interest in philosophy.

**PHIL 310 Ancient Philosophy (3)** *Prerequisite: six credits in philosophy or classics.* A study of the origins and development of philosophy and science in Ancient Greece, focusing on the pre-Socratics, Socrates, Plato, and Aristotle.

**PHIL 320 Modern Philosophy (3)** *Prerequisite: six credits in philosophy.* A study of major philosophical issues of the 16th, 17th, and 18th centuries through an examination of such philosophers as Descartes, Newton, Hume, and Kant.

**PHIL 326 Twentieth Century Analytic Philosophy (3)** *Prerequisite: six credits in philosophy. Recommended: PHIL 320.* A study of major issues in twentieth century analytic philosophy through an examination of such philosophers as Frege, Russell, Carnap, Moore, and Wittgenstein.

**PHIL 328 Studies in the History of Philosophy (3)** *Prerequisite: six hours of philosophy. Repeatable to 6 credits if content differs.* Problems, issues, and points of view in the history of philosophy.

**PHIL 331 Philosophy of Art (3)** *Prerequisite: one course in philosophy or two courses in the creative arts.* Concepts central to thought about art, including the concept of the fine arts both in its historical development and in its present problematic situation.

**PHIL 332 Philosophy of Beauty (3)** *Prerequisites: two courses in philosophy, literature, or the arts.* Philosophical theories, historical and contemporary, of beauty, sublimity, and other aesthetic qualities, of aesthetic experience, and of aesthetic judgment.

**PHIL 334 Philosophy of Music (3)** *Prerequisite: one course in philosophy or music.* The nature, meaning, and purpose of music. Analysis of the concepts of creativity, form, expression, and representation as they relate to music. Theories of music listening and of musical evaluation. Readings from philosophers, composers, critics, and psychologists.

**PHIL 340 Making Decisions (3)** *Prerequisite: three credits in philosophy.* An examination of various approaches to decision making in personal, professional, and public life. Conflict resolution, the logic of decision, moral aspects of decision making, and standard biases in judgment.

**PHIL 341 Introduction to Ethical Theory (3)** *Prerequisite: one course in PHIL. Not open to students who have completed PHIL 142. Formerly PHIL 142.* A critical examination of classical and contemporary systems of ethics, such as those of Aristotle, Kant, Mill, and Rawls.

**PHIL 342 Moral Problems in Medicine (3)** *Prerequisite: PHIL 100, PHIL 140, or permission of department.* A critical examination of the moral dimensions of decision-making in health related contexts. Readings are drawn from philosophical, medical, and other sources.

**PHIL 344 Persons (3)** *Prerequisite: one course in philosophy or permission of department.* Demands of moral theories on the notion of a person regarding identity, consciousness, and freedom.

**PHIL 346 Introduction to Virtue Ethics (3)** *Prerequisite: three hours in philosophy.* Ethical traditions that stress virtue and the good life, rather than moral rules and obligations. Readings in such authors as Plato, Aristotle, the Stoics, Spinoza, and Nietzsche.

**PHIL 360 Philosophy of Language (3)** *Prerequisite: PHIL 170, PHIL 173, or PHIL 271.* An inquiry into the nature and function of language and other forms of symbolism.

**PHIL 380 Philosophy of Psychology: Introduction (3)** *Prerequisite: one course in philosophy or permission of department. Not open to students who have completed PHIL 465. Formerly PHIL 465.* Dualism, behaviorism, functionalism and basic ideas of the computational-representational theory of thought.

**PHIL 385 Philosophy and Computers (3)** *Prerequisite: one course in logic or computer science or satisfaction of junior level English composition requirement or permission of department.* Philosophical issues concerning computers. Non-quantitative treatment of major results in computation theory regarding absolute limits on computers. Fundamental problems concerning computers used as models of human intelligence.

**PHIL 399 Senior Seminar (3)** *Prerequisites: 6 courses of PHIL and permission of department. Repeatable to 6 credits if content differs.* Research in selected topics, with seminar presentation and group discussion.

**PHIL 407 Gay and Lesbian Philosophy (3)** An examination in historical and social context of personal, cultural, and political aspects of gay and lesbian life, paying particular attention to conceptual, ontological, epistemological, and social justice issues.

**PHIL 408 Topics in Contemporary Philosophy (3)** *Prerequisite: PHIL 320. Repeatable if content differs.* An intensive examination of contemporary problems and issues. Source material will be selected from recent books and articles.

**PHIL 412 The Philosophy of Plato (3)** *Prerequisite: six credits in philosophy.* A critical study of selected dialogues.

**PHIL 414 The Philosophy of Aristotle (3)** *Prerequisite: six credits in philosophy.* A critical study of selected portions of Aristotle's writings.

**PHIL 416 Medieval Philosophy (3)** *Prerequisite: six credits in philosophy.* A study of philosophical thought from the fourth to the fourteenth centuries. Readings selected from Christian, Islamic, and Jewish thinkers.

**PHIL 422 The British Empiricists (3)** *Prerequisite: six credits in philosophy.* A critical study of selected writings on one or more of the British Empiricists.

**PHIL 423 The Philosophy of Kant (3)** *Prerequisite: six credits in philosophy.* A critical study of selected portions of Kant's writings.

**PHIL 427 Wittgenstein (3)** *Prerequisites: two courses in philosophy or permission of department.* The early and late works of Wittgenstein: atomism, logic, and the picture theory in the *Tractatus*; roles, meaning, criteria, and the nature of mental states in the *Philosophical Investigations* and other posthumous writings.

**PHIL 428 Topics in the History of Philosophy (3)** *Prerequisites: PHIL 310 and PHIL 320; or permission of department. Repeatable if content differs.*

**PHIL 431 Aesthetic Theory (3)** *Prerequisite: six credits in philosophy or permission of department.* Study of the theory of the aesthetic as a mode of apprehending the world and of the theory of criticism, its conceptual tools and intellectual presuppositions.

**PHIL 433 Issues in Jewish Ethics and Law (3)** *Prerequisite: course in philosophy or course in Jewish studies (excluding Hebrew language) or permission of department. Also offered as JWST 451. Credit will be granted for only one of the following: PHIL 433 or HEBR 451 or JWST 451.* Philosophical and meta-legal questions concerning the nature of Jewish law and its relation to morality.

**PHIL 438 Topics in Philosophical Theology (3)** *Prerequisite: PHIL 236 or consent of instructor.* An examination of a basic issue discussed in theological writings, with readings drawn from both classical and contemporary theologians and philosophers. May be repeated to a maximum of six credits when the topics are different.

**PHIL 440 Contemporary Ethical Theory (3)** *Prerequisite: PHIL 341.* Contemporary problems having to do with the meaning of the

principal concepts of ethics and with the nature of moral reasoning.

**PHIL 441 History of Ethics: Hobbes to the Present (3)** *Prerequisite: one course in ethics.* The history of ethical thought from the seventeenth century to the present, including such philosophers as Hobbes, Butler, Hume, Kant, Bentham, Mill, Bradley, Sidgwick, Moore, and Stevenson.

**PHIL 442 Normative Ethical Theory (3)** *Prerequisite: PHIL 341.* A consideration of some of the main normative ethical theories.

**PHIL 445 Contemporary Political Philosophy (3)** *Prerequisite: three credits in philosophy or political theory or permission of department. Sophomore standing.* Major trends in contemporary political philosophy: liberal, libertarian, communitarian, socialist, feminist.

**PHIL 446 Law, Morality, and War (3)** *Prerequisite: GVPT 300, GVPT 401, PHIL 341, or permission of department. Also offered as GVPT 403.* An exploration of fundamental moral and legal issues concerning war.

**PHIL 447 Philosophy of Law (3)** *Prerequisite: one course in philosophy.* Examination of fundamental concepts related to law, e.g., legal systems, law and morality, justice, legal reasoning, responsibility.

**PHIL 450 Scientific Thought I (3)** *Prerequisite: one course in philosophy or a major in science.* The development of science, its philosophical interpretations and implications, and views of its methods, from the ancients through Newton and Leibniz.

**PHIL 451 Scientific Thought II (3)** *Prerequisite: one course in philosophy or a major in science.* The development of science, its philosophical interpretations and implications, and views of its methods, from the death of Newton to the early twentieth century.

**PHIL 452 Philosophy of Physics (3)** *Prerequisite: three credits in philosophy or three credits in physics.* Implications of 20th century physics for such problems as operationalism, the structure and purpose of scientific theories, the meaning of "probability", the basis of geometrical knowledge, the nature of space and time, the Copenhagen interpretation of quantum mechanics, the nature and limits of measurement. Emphasis on the interaction between physics and philosophy.

**PHIL 453 Philosophy of Science II (3)** *Prerequisite: PHIL 250, an upper-level course in philosophy, or a major in science.* 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.

**PHIL 455 Philosophy of the Social Sciences (3)** *Prerequisite: PHIL 250, six hours in a social science, or permission of department.* A consideration of philosophical issues arising in the social sciences, with particular emphasis on issues of practical methodological concern to social scientists.

**PHIL 456 Philosophy of Biology II (3)** *Prerequisite: PHIL 250 or PHIL 256 or a Life Science major or permission of department.* Questions about concepts, reasoning, explanation, etc., in biology, and their relations to those of other areas of science. Case studies of selected aspects of the history of biology, especially in the twentieth century.

**PHIL 458 Topics in the Philosophy of Science (3)** *Prerequisite: PHIL 250 or permission of department; when the topic for a given semester demands, additional philosophical or scientific prerequisites may be required by the instructor. Repeatable to 6 credits if content differs.* A detailed examination of a particular topic or problem in philosophy of science.

**PHIL 461 Theory of Meaning (3)** *Prerequisite: six credits in philosophy.* Theories about the meaning of linguistic expressions, including such topics as sense and reference, intentionality and necessity, and possible-world semantics, through an examination of such writers as Mill, Frege, Wittgenstein, Quine, and Kripke.

**PHIL 462 Theory of Knowledge (3)** *Prerequisite: six credits in philosophy.* Some central topics in the theory of knowledge, such as perception, memory, knowledge, and belief, skepticism, other minds, truth, and the problems of induction.

**PHIL 464 Metaphysics (3)** *Prerequisite: six credits in philosophy.* A study of some central metaphysical concepts such as substance, identity, relations, causality, and time, and of the nature of metaphysical thinking.

**PHIL 466 Philosophy of Mind (3)** *Prerequisite: six credits in philosophy.* An inquiry into the nature of mind through the analysis of such concepts as consciousness, thought, sensation, emotion, and desire. Consideration of mind-brain identity thesis.

**PHIL 468 Topics in Philosophy of Language and Logic (3)** *Prerequisite: one course in symbolic logic or permission of department. Repeatable to 9 credits if content differs.* Problems in

philosophy of language and/or philosophy of logic.

**PHIL 471 Symbolic Logic II (3)** *Prerequisite: PHIL 271 or permission of department.* Axiomatic development of the propositional calculus and the first-order functional calculus, including the deduction theorem, independence of axioms, consistency, and completeness.

**PHIL 472 Philosophy of Mathematics (3)** *Prerequisite: PHIL 271 or permission of department.* A study of results in foundations of mathematics and of philosophical views of the nature of mathematics and of mathematical knowledge.

**PHIL 474 Induction and Probability (3)** *Prerequisite: permission of department.* A study of inferential forms, with emphasis on the logical structure underlying such inductive procedures as estimating and hypothesis-testing. Decision-theoretic rules relating to induction will be considered, as well as classic theories of probability and induction.

**PHIL 478 Topics in Symbolic Logic (3)** *Prerequisite: PHIL 471. Repeatable if content differs.*

**PHIL 480 Philosophy of Psychology: Knowledge and Reasoning (3)** *Prerequisite: PHIL 380 or graduate status or permission of department.* Cognitive science approaches to traditional problems in epistemology: rationality, reliability, computational models of belief revision.

**PHIL 481 Philosophy of Psychology: Representation (3)** *Prerequisite: PHIL 380 or graduate status or permission of department.* Semantics and representations within computational framework: intentionality, explicit vs. implicit representation, syntax vs. semantics of thought, connectionist approaches, images, classical vs. prototype theories of concepts.

**PHIL 482 Philosophy of Psychology: Subjectivity (3)** *Prerequisite: PHIL 380 or graduate status or permission of department.* The nature of subjectivity: problems of "point of view," the "qualities" or "feel" of things, emotions, consciousness-whether these phenomena can be captured by a computational theory of mind.

**PHIL 485 Philosophy of Neuroscience (3)** *Prerequisite: (PHIL 250, or PHIL 380, or PHIL 455, or PHIL 456) or permission of department.* Philosophical and methodological issues relating to brain science, including: the place of neuroscience in cognitive science, the nature of mental representation and processing in brains, bounded-resonance models in neuroanatomy and neurophysiology.

**PHIL 487 Computer Science for Cognitive Studies (3)** *Also offered as LING 487. Credit will be granted for only one of the following: PHIL 487 or LING 487.* List processing and discrete mathematics. Preparation for the study of artificial intelligence and other mathematically oriented branches of cognitive studies. Intended for students of linguistics, philosophy, and psychology. LISP computer language, graphs and trees, the concept of computational complexity, search algorithms.

**PHIL 488 Topics in Philosophy of Cognitive Studies (3)** *Prerequisite: one course in philosophy or permission of department. Repeatable to 9 credits if content differs.* Examination of a particular topic or problem in philosophy of cognitive studies.

**PHIL 498 Topical Investigations (1-3)**

## PHYS—Physics

**PHYS 101 Contemporary Physics-Revolutions in Physics (3)** *Prerequisite: high school algebra through algebra 2 with trigonometry; (or MATH 113 or MATH 115). Not open to students who have completed PHYS 111 or PHYS 112.* For non-science students who are interested in the evolution of scientific thought and its present day significance. Historical, philosophic, experimental and theoretical aspects of physics are presented. Topics in mechanics, relativity, electricity and magnetism, and nuclear physics are covered.

**PHYS 102 Physics of Music (3)** *Prerequisite: high school algebra. Credit not applicable towards the minimum requirements for a major in physics and astronomy.* 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.

**PHYS 103 Physics of Music Laboratory (1)** *Two hours of laboratory per week. Pre- or corequisite: PHYS 102. Credit not applicable towards the minimum requirements for a major in physics and astronomy.* 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.

**PHYS 106 Light, Perception, Photography, and Visual Phenomena (3)** *Credit not applicable towards the minimum requirements for a major in physics and astronomy.* Intended for the general student, this course will cover topics in optics which

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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.

**PHYS 107 Light, Perception, Photography and Visual Phenomena Laboratory (1)** Two hours of laboratory per week. Pre- or corequisite: PHYS 106. Credit not applicable towards the minimum requirements for a major in physics and astronomy. Optional laboratory to accompany PHYS 106. Laboratory experiments include geometrical optics (lenses, cameras, eye), optical instruments (telescope, binoculars), photography, perception, color phenomena, and wave phenomena.

**PHYS 111 Physics in the Modern World (3)** The first semester of 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.

**PHYS 112 Physics in the Modern World (3)** Prerequisite: PHYS 111 or equivalent. The second semester of 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.

**PHYS 117 Introduction to Physics (4)** Three hours of lecture and two hours of laboratory per week. Prerequisite: qualification to enter MATH 110. Intended for students majoring in neither the physical nor biological sciences. A study of the development of some of the basic ideas of physics science.

**PHYS 121 Fundamentals of Physics I (4)** Three hours of lecture, two hours of laboratory, and one hour of discussion/recitation per week. Prerequisite: previous course work in trigonometry or MATH 115. 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 PHYS 122, this generally satisfies the minimum requirement of medical and dental schools.

**PHYS 122 Fundamentals of Physics II (4)** Three hours of lecture, two hours of laboratory, and one hour of discussion/recitation per week. Prerequisite: PHYS 121 or equivalent. A continuation of PHYS 121, which together with it, generally satisfies the minimum requirement of medical and dental schools.

**PHYS 141 Principles of Physics (4)** Three hours of lecture, two hours of laboratory, and one hour of discussion/recitation per week. Corequisite: MATH 141. Credit will not be granted for PHYS 171 and PHYS 161 or PHYS 141 or former PHYS 191. 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.

**PHYS 142 Principles of Physics (4)** Prerequisite: PHYS 141 or equivalent. Credit will be granted for only one of the following: PHYS 142, PHYS 262, PHYS 272, or former PHYS 192. A continuation of PHYS 141 covering waves, electricity and magnetism, optics and modern physics.

**PHYS 161 General Physics: Mechanics and Particle Dynamics (3)** Three hours of lecture and one hour of discussion/recitation per week. Pre- or corequisite: MATH 141. Credit will not be granted for PHYS 171 and PHYS 161 or PHYS 141 or former PHYS 191. 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.

**PHYS 170 Professional Physics Seminar (1)** Corequisite: MATH 140. Recommended: high school physics. 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.

**PHYS 171 Introductory Physics: Mechanics (3)** Prerequisite: MATH 140 and a high school physics course or permission of department. Corequisite: MATH 141. Credit will not be granted for PHYS 171 and PHYS 161 or PHYS 141 or former PHYS 191. First semester of a three semester sequence for physics majors and those desiring a rigorous preparation in the physical sciences: kinematics, Newton's laws, energy and work, linear and angular momenta, rigid bodies, gravitation and planetary motion.

**PHYS 221 General Physics For Science Teachers I (4)** Three hours of lecture, two hours of laboratory, and one hour of discussion/recitation per week. Prerequisite: a high school physics course. Pre- or corequisite: MATH 140 or MATH 220. The first part of a two-semester sequence in physics, stressing physical insight, for prospective secondary school science and mathematics teachers.

**PHYS 222 General Physics for Science Teachers II (4)** Three hours of lecture, two hours of laboratory, and one hour of discussion/recitation per week. Prerequisite: PHYS 221. A continuation of PHYS 221.

**PHYS 262 General Physics: Vibrations, Waves, Heat, Electricity and Magnetism (4)** Three hours of lecture, three hours of laboratory, and one hour of discussion/recitation per week. Prerequisite: PHYS 161. Corequisite: PHYS 262A. Credit will not be granted for PHYS 272 and PHYS 142 or former PHYS 192 or PHYS 262. Second semester of a three-semester calculus-based general physics course. Vibrations, waves, fluids; heat, kinetic theory, and thermodynamics; electrostatics, circuits, and magnetism. PHYS 262A is the lab for this course.

**PHYS 263 General Physics: Electrodynamics, Light, Relativity and Modern (4) Physics** Three hours of lecture, three hours of laboratory, and one hour of discussion/recitation per week. Prerequisite: PHYS 262. Corequisite: PHYS 263A. Credit will not be granted for PHYS 273 and PHYS 263 or former PHYS 293. Third semester of a three-semester calculus-based general physics course. Electrodynamics, Maxwell's equations, and electromagnetic waves; geometrical optics; interference and diffractions; special theory of relativity; and modern physics. PHYS 263A is the lab for this course.

**PHYS 272 Introductory Physics: Vibrations, Waves, Heat, Fluids, Optics, (3) Light** Prerequisites: PHYS 171 and MATH 141. Corequisites: PHYS 275 and (MATH 241 or MATH 240). Credit will be granted for only one of the following: PHYS 272 and PHYS 142 or former PHYS 192 or PHYS 262. Second semester of a three semester sequence intended for physics majors and those desiring a rigorous preparation in the physical sciences: vibrations, waves, heat, fluids, optics, light.

**PHYS 273 Introductory Physics: Electrodynamics and Relativity (3)** Prerequisites: PHYS 272, PHYS 275 and (MATH 240 or MATH 241). Corequisites: PHYS 276 and (MATH 240 or MATH 241). Credit will not be granted for PHYS 273 and PHYS 263 or former PHYS 293. Third semester of a three-semester sequence intended for physics majors and those desiring a rigorous preparation in the physical sciences: electrostatics, Maxwell's equations, special relativity.

**PHYS 275 Experimental Physics I: Mechanics and Thermodynamics (1)** Prerequisite: PHYS 171 or PHYS 191. Two-three hour laboratory-lecture per week. Credit will not be granted for more than two of the following courses: PHYS 275, PHYS 195, PHYS 196. First course in the three semester introductory sequence pertaining to the methods and rationale of experimental physics. Intended for physics majors and science and engineering students who desire a more rigorous approach. Experiments chosen from the areas of classical mechanics, vibrations and waves, and thermodynamics.

**PHYS 276 Experimental Physics II: Electricity and Magnetism (2)** Four hours of laboratory per week. Prerequisites: PHYS 272 and PHYS 275. Credit will be granted for only one of the following: PHYS 276 or former PHYS 295. Second course in the three semester introductory sequence. Methods and rationale of experimental physics. Experiments chosen from the fields of electricity and magnetism including electrostatics, magnetostatics, magnetic induction, AC circuits.

**PHYS 299 Special Problems in Physics (1-6)** Prerequisite: permission of department. May be taken no more than twice. Maximum of eight credits applicable to B.S. degree program. Research or special study to complement courses taken elsewhere which are not fully equivalent to those in departmental requirements. Credit according to work done.

**PHYS 301 Intermediate Theoretical Physics (3)** Prerequisite: PHYS 142 and MATH 241. Students interested should seek advice of department before enrolling. Intended for those not yet prepared for PHYS 410. Selected topics in mechanics, electricity and magnetism.

**PHYS 305 Physics Shop Techniques (1)** Three hours of laboratory per week. Prerequisite: PHYS 395 or permission of department. Machine tools, design and construction of laboratory equipment.

**PHYS 318 Topics in Contemporary Physics (3)** Prerequisite: PHYS 122 and/or PHYS 112 or permission of department. 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.

**PHYS 374 Intermediate Theoretical Methods (4)** Three hours of lecture and one hour of discussion/recitation per week. Prerequisites: PHYS 273 and MATH 246. Corequisite: MATH 240. Introduces or reviews areas of mathematics that are regularly used in upper level and graduate courses in physics, including important areas from complex variables, Fourier analysis, partial differential equations and eigenvalue problems. These methods will be studied in the context of relevant physics applications. A current standard symbolic manipulation program will be introduced and its appropriate use in theoretical analyses will be taught.

**PHYS 375 Experimental Physics III: Electromagnetic Waves, Optics and Modern (2) Physics** Four hours of laboratory per week. Prerequisites: PHYS 273 and PHYS 276. Credit will be granted for only one of the following: PHYS 375 or former PHYS 296. Third course in the three-semester introductory sequence. Methods and rationale of experimental physics. Experiments chosen from the

areas of electromagnetic waves, optics and modern physics.

**PHYS 389 Undergraduate Thesis Research (1-6)** Prerequisite: permission of department. For PHYS majors only. Repeatable to 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.

**PHYS 395 Advanced Experiments (3)** Prerequisite: PHYS 375. For PHYS majors only. 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.

**PHYS 398 Independent Studies Seminar (1-16)** Credit according to work done. Enrollment is limited to students admitted to the independent studies program in physics.

**PHYS 399 Special Problems in Physics (1-3)** Two hours laboratory work per week for each credit. Prerequisite: PHYS 395 and permission of department. One to three credits may be taken concurrently each semester. Selected advanced experiments. (Will be given with sufficient demand.)

**PHYS 406 Optics (3)** Prerequisite: (PHYS 263 or PHYS 273 or PHYS 301); and MATH 240. Geometrical optics, optical instruments, wave motion, interference and diffraction, and other phenomena in physical optics.

**PHYS 407 Sound (3)** Prerequisite: PHYS 142 or PHYS 263 or PHYS 273. Pre- or corequisite: MATH 246. Basic concepts of sound production and its applications.

**PHYS 410 Elements of Theoretical Physics: Mechanics (4)** Prerequisite: (PHYS 263 or PHYS 273 or PHYS 301); and MATH 241. Corequisite: MATH 240. Theoretical foundations of mechanics with extensive application of the methods. Various mathematical tools of theoretical physics.

**PHYS 411 Elements of Theoretical Physics: Electricity and Magnetism (4)** Prerequisite: (PHYS 263 or PHYS 273 or PHYS 301); and MATH 240 and MATH 241. Foundations of electromagnetic theory, with extensive applications of the methods. Thorough treatment of wave properties of solutions of Maxwell's equations.

**PHYS 412 Kinetic Theory of Gases (3)** Prerequisite: PHYS 301 or PHYS 410; and MATH 240. Dynamics of gas particles, Maxwell-Boltzmann distribution, diffusion, Brownian motion, transport.

**PHYS 414 Introduction to Thermodynamics and Statistical Mechanics (3)** Prerequisites: (PHYS 301 or equivalent), (PHYS 420 or PHYS 421 or equivalent), and MATH 241. Introduction to basic concepts in thermodynamics and statistical mechanics.

**PHYS 420 Principles of Modern Physics (3)** Prerequisite: (PHYS 263 or PHYS 273 or PHYS 301); and MATH 241. Credit will be granted for only one of the following: PHYS 420 or PHYS 421. A survey of atomic and nuclear phenomena and the main trends in modern physics. Appropriate for students in engineering and other physical sciences.

**PHYS 421 Introduction to Modern Physics (3)** Prerequisite: (PHYS 263 or PHYS 273 or PHYS 301); and MATH 241, including some knowledge of ordinary differential equations. Credit will be granted for only one of the following: PHYS 420 or PHYS 421. Special relativity and origins of the quantum theory. Development of wave mechanics including angular momentum and the hydrogen spectrum.

**PHYS 422 Modern Physics (4)** Prerequisite: PHYS 421. Use of quantum mechanics in a discussion of a variety of physical phenomena and systems, including atomic spectra, radioactivity, solid state phenomena, and the properties of elementary particles.

**PHYS 426 Mathematica for Scientists and Engineers (3)** Prerequisites: (PHYS 263 or PHYS 273) and MATH 241. Provides a working knowledge of the powerful symbolic, numerical, and graphical tools provided by Mathematica for problem solving in science and engineering, and the ability to use functional programming, pattern matching, and rule sets for symbolic and numerical computations. Intended for science and engineering students who are currently taking advanced undergraduate or graduate courses in their field.

**PHYS 428 Physics Capstone Research (2-4)** Prerequisite: permission of instructor. Senior standing. For PHYS majors only. Repeatable to 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 PHYS 499).

**PHYS 429 Atomic and Nuclear Physics Laboratory (3)** Prerequisite: PHYS 395. Classical experiments in atomic physics and more sophisticated experiments in current techniques in nuclear physics.

**PHYS 431 Properties of Matter (3)** *Prerequisite: PHYS 301; or (PHYS 410 or PHYS 411); and (PHYS 420 or PHYS 421).* Introduction to solid state physics. Electro-magnetic, thermal, and elastic properties of metals, semiconductors, insulators and superconductors.

**PHYS 441 Nuclear Physics (3)** *Prerequisite: PHYS 301; or (PHYS 410 and PHYS 411); and (PHYS 420 or PHYS 421).* An introduction to nuclear physics at the pre-quantum-mechanics level. Properties of nuclei; radioactivity; nuclear systematics; nuclear moment; the Shell model, interaction of charged particles and gamma rays with matter; nuclear detectors; accelerators; nuclear reactions; beta decay; high energy phenomena.

**PHYS 443 Neutron Reactor Physics (3)** *Prerequisite: PHYS 420 or PHYS 421 or consent of instructor.* Various related topics in neutron reactor physics.

**PHYS 451 Introduction to Elementary Particles (3)** *Prerequisite: PHYS 422.* Properties of elementary particles, production and detection of particles, relativistic kinematics, invariance principles and conservation laws.

**PHYS 461 Introduction to Fluid Dynamics (3)** *Prerequisite: PHYS 301; or (PHYS 410 and PHYS 411); or (ENES 221 and ENEE 380).* Kinematics of fluid flow, properties of incompressible fluids, complex variable methods of analysis, wave motions.

**PHYS 463 Introduction to Plasma Physics (3)** *Prerequisite: PHYS 301; or (PHYS 410 and PHYS 411); or (ENES 221 and ENEE 380).* Students without the electricity and magnetism prerequisite, but having a familiarity with Maxwell's equations, should check with the instructor. Orbit theory, magneto-hydrodynamics, plasma heating and stability, waves and transport processes.

**PHYS 465 Modern Optics (3)** *Prerequisite: PHYS 410; and PHYS 411; and PHYS 420 or PHYS 421.* Designed for students with a background in fundamental optics. Topics in modern optics such as coherence, holography, principles of laser action, electron optics, and non-linear optics.

**PHYS 471 Introduction to Atmospheric and Space Physics (3)** *Prerequisite: PHYS 301; or (PHYS 410 and PHYS 411); and (PHYS 420 or PHYS 421).* Motions of charged particles in magnetic fields, aspects of plasma physics related to cosmic rays and radiation belts, atomic phenomena in the atmosphere, thermodynamics and dynamics of the atmosphere.

**PHYS 483 Biophysics and Theoretical Biology (3)** Designed for advanced and mature students who may have only minimal knowledge of biological processes but are well grounded in physics. Areas in bioscience where physics, biophysical chemistry, and mathematical analysis fuse to provide definition for biologic statics and dynamics.

**PHYS 485 Electronic Circuits (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisite: PHYS 395. Corequisite: PHYS 301 or PHYS 411.* 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.

**PHYS 487 Particle Accelerators, Physical and Engineering Principles (3)** *Prerequisites: PHYS 410; and PHYS 411; and PHYS 420 or PHYS 421. Also offered as ENEE 487.* Sources of charged particles; methods of acceleration and focusing of electron and ion beams in electromagnetic fields; basic theory, design, and engineering principles of particle accelerators.

**PHYS 490 History of Modern Physics (3)** *Prerequisite: PHYS 420 or PHYS 421 or equivalent.* Primarily for senior physics majors and first year graduate students. A survey of major discoveries and trends in 20th century physics, including the relations of physics to other sciences, philosophy of science, technology and society.

**PHYS 499 Special Problems in Physics (1-16)** *For PHYS majors only.* Research or special study. Credit according to work done.

## PORT—Portuguese

**PORT 101 Elementary Portuguese (4)** *One hour of laboratory and four hours of discussion/recitation per week.* Introduction to basic structures, with emphasis upon audio-lingual skills. Leads to PORT 102.

**PORT 102 Elementary Portuguese (4)** *One hour of laboratory and four hours of discussion/recitation per week. Prerequisite: PORT 101.* Completion of basic structures with increasing emphasis upon reading skill, reinforced by conversation.

**PORT 203 Intermediate Portuguese (4)** *One hour of laboratory and four hours of discussion/recitation per week. Prerequisite: PORT 102.* Extensive reading, conversation and composition.

**PORT 205 Intermediate Conversation (3)** *Prerequisite: PORT 203 or permission of department.* Development of oral skills in Portuguese. Intensive conversation on contemporary issues.

**PORT 223 Portuguese Culture (3)** Political, social, intellectual, and literary forces shaping culture of contemporary Portugal from the formation of the country to the present. In English.

**PORT 224 Brazilian Culture (3)** Pluralistic formation of Brazilian culture, based on European, African and Indian contributions. Lectures, discussions, slides, video, and film presentations. In English.

**PORT 225 The Cultures of Portuguese-Speaking Africa (3)** Cultures of the Portuguese speaking countries of Angola, Cape Verde, Sao Tome e Principe, Guinea-Bissau and Mozambique. Special attention to the development of national cultures in multicultural societies and to the role of women. Conducted in English.

**PORT 231 Introduction to the Literatures of the Portuguese Language (3)** *Prerequisite: PORT 205 or permission of department.* Combines studies of Brazilian and Portuguese literatures, along with the examination of literary trends, concepts and terms to texts and excerpts of longer works, chosen for their cultural, historical and stylistic interest. Taught in Portuguese.

**PORT 234 Issues in Latin American Studies I (3)** *Also offered as SPAN 234. Credit will be granted for only one of the following: PORT 234 or SPAN 234.* An interdisciplinary course that studies the major issues in Latin America and the Caribbean. These issues include Latin America's "cultural mosaic," migration and urbanization, cultures of democratization and the role of religions.

**PORT 235 Issues in Latin American Studies II (3)** *Also offered as SPAN 235. Credit will be granted for only one of the following: PORT 235 or SPAN 235.* Studies the major issues shaping Latin American and Caribbean societies. These issues include the changing constructions of race, ethnicity, gender and class, as well as expressions of popular culture and revolutionary practices. A continuation of PORT/SPAN 234, but completion of 234 is not a prerequisite.

**PORT 311 Advanced Grammar and Composition (3)** *Prerequisite: PORT 205.* Advanced aspects of contemporary grammatical usage. Techniques of writing compositions, descriptions, and commercial and personal letters.

**PORT 320 Survey of Portuguese Literature (3)** *Prerequisite: PORT 220.* Portuguese poetry, fiction and drama from the twelfth century to the present.

**PORT 321 Survey of Brazilian Literature (3)** *Prerequisite: PORT 221.* Selected literary texts from the period of formation through nineteenth century romanticism to twentieth century.

**PORT 322 African Literature of Portuguese Expression (3)** *Prerequisite: PORT 203. Recommended: PORT 205 and PORT 225.* Representative literary texts (poetry, essay and fiction) from the African nations of Angola, Mozambique, Cape Verde, Guinea-Bissau and Sao Tome e Principe including discussion of acculturated literary discourse, role of literature in the development of national consciousness and use of oral tradition.

**PORT 350 History of the Portuguese Language (3)** *Prerequisite: (PORT 220 or PORT 221) or permission of department.* Evolution of the Portuguese language from its formation to present days; differences between Continental, African and Brazilian usages.

**PORT 378 Brazilian Cinema (in Translation) (3)** *Junior standing.* The study of Brazilian film from the late 1950s to the present with a special view to the relationship between cinema and social changes. Taught in English.

**PORT 399 Independent Study in Portuguese (1-3)** *Prerequisite: permission of department. Repeatable to 3 credits.* Specific readings in literature under the supervision of a faculty member of the department.

**PORT 405 Portuguese for Spanish Speakers (3)** *Formerly PORT 121.* Intensive basic grammar, reading and auditory comprehension. Native or acquired fluency in Spanish required.

**PORT 408 Special Topics in Portuguese Literature (3)** *Prerequisite: PORT 221. Repeatable to 6 credits if content differs.* Major themes and literary developments from the late 18th century to the present.

**PORT 409 Special Topics in Brazilian Literature (3-6)** Major themes and literary development from the late eighteenth century to the present. Specific topic to be announced each time the course is offered.

**PORT 422 Cross-Cultural Approaches to Contemporary Luso-Brazilian Societies (3)** *Prerequisites: (PORT 205 or permission of department) and (PORT 223 or PORT 224 or PORT 225).* Analysis of cross-cultural interactions in international business in contemporary Luso-Brazilian societies.

**PORT 470 Modernism in Brazilian Prose Fiction (3)** *Prerequisite: permission of department.* Prose of the Modernist movement in Brazil from 1922, including literary, sociological and historical dimensions.

**PORT 476 Africa in Brazil (3)** *Not open to students who have completed PORT 478A.* Cultural expressions resulting from the African presence in Brazil from the sixteenth century to the present, including literature, oral traditions, religion, music, dance, and food.

**PORT 478 Themes and Movements of Luso-Brazilian Literature in Translation (3)** *Repeatable to 6 credits if content differs.* 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.

**PORT 480 Machado de Assis (3)** *Prerequisite: permission of department.* Fiction of Machado de Assis covering his romantic and realistic periods.

## PSYC—Psychology

The following courses may involve the use of animals. Students who are concerned about the use of animals in teaching have the responsibility to contact the instructor, prior to course enrollment, to determine whether animals are to be used in the course, whether class exercises involving animals are optional or required and what alternatives, if any, are available.

**PSYC 100 Introduction to Psychology (3)** 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.

**PSYC 108 Honors Seminar (3)**

**PSYC 200 Statistical Methods in Psychology (3)** *Prerequisite: PSYC 100; and MATH 111 or MATH 140 or MATH 220.* A basic introduction to quantitative methods used in psychological research.

**PSYC 206 Developmental Biopsychology (3)** *Prerequisite: PSYC 100.* Biological basis of behavioral development in relation to genetic, constitutional, anatomical, physiological, and environmental factors. Emphasis upon both phylogenetic and ontogenetic research findings in biological psychology.

**PSYC 221 Social Psychology (3)** *Prerequisite: PSYC 100.* The influence of social factors on the individual and on interpersonal behavior. Includes topics such as conformity, attitude change, person perception, interpersonal attraction, and group behavior.

**PSYC 235 Psychology of Adjustment (3)** *Prerequisite: PSYC 100.* Theory and research on the psychology of personal adjustment in everyday life, with an emphasis on self-concept, emotions, self-control, interpersonal relations, and stress.

**PSYC 300 Introduction to Methods of Psychological Research-Honors (3)** *Prerequisite: PSYC 200 and permission of the Honors Program Director. Formerly PSYC 201.* Various methods of inquiry in psychology; research questions, differences between correlational and experimental research, what to observe, how to measure observations, the role of theory in psychological research, and the interface between ethics and methodology. Observations of on-going research projects will be required.

**PSYC 301 Biological Basis of Behavior (3)** *Prerequisites: BIOL 105 and PSYC 100.* An introduction to the anatomical structures and physiological processes that determine behavior. After a study of the basic functioning of the nervous system, the course will examine the acquisition and processing of sensory information, the neural control of movement, and the biological bases of complex behaviors such as sleep, learning, memory, sex, language, and addiction.

**PSYC 309 Special Topics in Psychology (3)** *Prerequisite: PSYC 100. Repeatable to 6 credits if content differs.* Topics of current interest which represent extensions of or additions to topics covered in more general topical courses.

**PSYC 310 Perception (3)** *Prerequisite: PSYC 100 or permission of department. Not open to students who have completed PSYC 410.* 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.

**PSYC 330 Child Psychopathology (3)** *Prerequisite: PSYC 100; and PSYC 355 or equivalent.* Etiology, diagnosis, prevention and treatment of emotional disorders of childhood and adolescence.

**PSYC 332 Psychology of Human Sexuality (3)** *Prerequisite: PSYC 100.* 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.

**PSYC 334 Psychology of Interpersonal Relationships (3)** *Prerequisite: PSYC 100.* Research, theory and their practical applications pertaining to the development, maintenance and

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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).

**PSYC 336 Psychology of Women (3)** *Prerequisite: PSYC 100. Also offered as WMST 336. Credit will be granted for only one of the following: PSYC 336 or WMST 336.* A survey of the biology, life-span development, socialization, personality, mental health, and special issues of women.

**PSYC 337 Introduction to Community Psychology (3)** *Prerequisite: PSYC 100.* Survey and critical examination of the effects of social process and social structure in community life on individual mental health. Includes theoretical models in community psychology.

**PSYC 341 Introduction to Memory and Cognition (3)** *Prerequisite: PSYC 100.* An introduction to the basic models, methods of research, and findings in memory, problem-solving, and language and their applications.

**PSYC 353 Adult Psychopathology (3)** *Prerequisite: PSYC 100. Credit will be granted for only one of the following: PSYC 353 and PSYC 331 or PSYC 431.* The nature, diagnosis, etiology, and treatment of mental disorders among adults.

**PSYC 354 Cross-Cultural Psychology (3)** *Prerequisite: PSYC 100 plus 3 credits in psychology or permission of department.* Cultural components in theory and research in personality, social, and community psychology. Interplay of individual, ethnic, and cultural factors in psychosocial growth and well-being, cross-cultural and cross-ethnic communication, and counseling and psychotherapeutic interactions.

**PSYC 355 Child Psychology (3)** *Prerequisite: PSYC 100. Not open to students who have completed PSYC 333 or PSYC 433.* 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.

**PSYC 356 Psychology of Adolescence (3)** *Prerequisite: PSYC 355 or permission of department.* A description of adolescent development based on research and theory interrelating psychological, intellectual, and social changes during the teen years and the systems dealing with those changes.

**PSYC 357 Psychology of Adulthood and Aging (3)** *Prerequisite: PSYC 100.* Theory, research, and implications of developmental stability and change in physiological, intellectual, and interpersonal functioning in the social context from early adulthood through the aging years.

**PSYC 361 Survey of Industrial and Organizational Psychology (3)** *Prerequisite: PSYC 100.* 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), and productivity in the work place (performance appraisal, absenteeism, turnover). The role that the larger environment plays in influencing work behaviors and work attitudes.

**PSYC 400 Experimental Psychology: Learning and Motivation (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisites: PSYC 200; completion of the departmentally required English, math and science supporting course sequence; and permission of department.* The experimental analysis of behavior, with emphasis on conditioning, learning and motivational processes. Experiments on the behavior of animals.

**PSYC 401 Biological Bases of Behavior Laboratory (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisites: BIOL 105; and PSYC 200 or equivalent with permission of instructor; and PSYC 301 or equivalent.* A laboratory course to introduce students to some of the basic physiological and anatomical techniques of contemporary neuroscience. Exercises look at specific neurons or groups of neurons and how they control such simple behaviors as swimming, prey capture, and species recognition. The lab exercises use living invertebrates and cold-blooded vertebrates.

**PSYC 402 Physiological Psychology (3)** *Prerequisite: PSYC 206 or PSYC 301. Credit will be granted for only one of the following: ZOO 323 or PSYC 402.* Research on the physiological basis of human behavior, including considerations of sensory phenomena, motor coordination, emotion, drives, and the neurological basis of learning.

**PSYC 403 Animal Behavior (3)** *Prerequisite: PSYC 206 or PSYC 301.* Social interactions, learning, sensory processes, motivation, and experimental methods, with a major emphasis on mammals.

**PSYC 404 Introduction to Behavioral Pharmacology (3)** *Prerequisites: PSYC 200 and (PSYC 206 or PSYC 301 or PSYC 400).* 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.

**PSYC 405 Applied Behavior Analysis (3)** *Prerequisites: PSYC 200 and PSYC 301.* Research literature in the application of operant and respondent conditioning principles to human behavior. Approaches to behavior problems in school, home and professional settings.

**PSYC 410 Experimental Psychology: Sensory Processes I (4)** *Three hours of lecture and two hours of laboratory per week. Prerequisites: PSYC 200; and completion of the English, math and science supporting course sequence; and permission of department. A student who has completed PSYC 310 must have permission of the instructor in order to register for PSYC 410.* A systematic survey of the content, models, and methodology of sensory and perceptual research.

**PSYC 415 History of Psychology (3)** *Prerequisite: twelve credits in psychology including PSYC 200 or permission of department.* Origins of psychology in philosophy and biology, and the development of psychology as a science in the nineteenth and twentieth centuries. Consideration of current theoretical perspectives and experiments in relation to the enduring problems of psychology, and of the role of culture, science, and technology in the development of psychological ideas.

**PSYC 420 Experimental Psychology: Social Processes I (4)** *Two hours of lecture and four hours of laboratory per week. Prerequisite: PSYC 200; and PSYC 221; and completion of the departmentally required English, math, and science supporting course sequence; and permission of department.* A laboratory course to provide a basic understanding of experimental method in social psychology and experience in conducting research on social processes.

**PSYC 421 Experimental Psychology: Social Processes II (4)** *Prerequisite: PSYC 420. Two hours of lecture and four hours of laboratory per week.* An advanced laboratory course providing intensive training in experimental work in social psychology and the opportunity to design and carry out original research on social processes.

**PSYC 423 Advanced Social Psychology (3)** *Prerequisite: PSYC 420, or permission of department.* A systematic review of research and points of view in regard to major problems in the field of social psychology.

**PSYC 424 Communication and Persuasion (3)** *Prerequisites: PSYC 200; and PSYC 221.* Effect of social communication upon behavior and attitudes. Theory and research concerning attitude change and social influence.

**PSYC 432 Introduction to Counseling Psychology (3)** *Prerequisite: nine hours in psychology including PSYC 200.* Analysis of research and intervention strategies developed and used by counseling psychologists. Historical and current trends in content and methodology.

**PSYC 433 Analysis of Helping Relationships (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: PSYC 200; (and PSYC 235 or PSYC 334 or PSYC 435 or PSYC 432).* Theories and research strategies regarding effective helping relationships. Basic components of helping relationships and how to conduct a research project evaluating helping behavior and its impact on others.

**PSYC 434 Severe Mental Disorders: Etiology and Treatment (3)** *Prerequisites: PSYC 200, and PSYC 301, and PSYC 353, or permission of department.* Examines multiple perspectives on severe mental illnesses such as schizophrenia and the major affective disorders. Integrates the biological findings with the human experience of these illnesses, their cultural and socio-political aspects, and their psychological, pharmacological, and social-service treatments. Opportunity is provided for interacting with persons suffering from these illnesses.

**PSYC 435 Personality Theories (3)** *Prerequisite: PSYC 100; and PSYC 200 or equivalent.* Major theories of personality and research methods and findings relevant to those theories.

**PSYC 436 Introduction to Clinical Psychology (3)** *Prerequisite: PSYC 200 or equivalent.* Critical analysis of clinical psychology, with particular emphasis on current developments and trends.

**PSYC 440 Experimental Psychology: Cognitive Processes (4)** *Three hours of lecture and two hours of laboratory per week. Prerequisites: PSYC 100; and PSYC 200 or a statistics course from an approved departmental list; and completion of the departmentally required English, math and science supporting course sequence; and permission of department.* A survey of the content, models, and methods in cognitive psychology with an emphasis on auditory and visual pattern recognition, information processing, attention, memory, learning, problem solving, and language.

**PSYC 442 Psychology of Language (3)** *Prerequisite: PSYC 200; and PSYC 341 or PSYC 440, or permission of department.* Introductory survey of topics in psycholinguistic research, theory and methodology. Major emphasis on the contribution of linguistic theory to the psychological study of language behavior and cognition. Linguistic theory, biological bases of language, and speech, grammars, phonetics and phonological performance,

speech perception and production, psychological studies of syntax and semantics, language and cognitive development, language comprehension and thought.

**PSYC 443 Thinking and Problem Solving (3)** *Prerequisites: PSYC 200; and (PSYC 341 or PSYC 440) or permission of department.* Historical development, current theory and data, and research methods in problem solving. Formal problem solving theory and computer models of thinking and human problem-solving behavior. The uses of strategies to improve students' own thinking processes and problem-solving behavior.

**PSYC 444 Cognitive Structure in Perception (3)** *Prerequisite: PSYC 200; and (PSYC 341 or PSYC 440) or permission of department.* Perception as an information extraction and pattern recognition process. Complex form and space perception and pattern recognition of speech. Review of early studies of form and pattern perception which support information processing state or cascade models of perceptual capacities; studies on development and the roles of learning and attention.

**PSYC 450 Field Research in Organizational Psychology (4)** *Two hours of lecture and two hours of laboratory per week. Prerequisites: PSYC 100, PSYC 200 and completion of required English, math, science sequence. Recommended: PSYC 361. For PSYC majors only.* Methods of field research applicable to organizational settings are examined, including field experiments and quasi-experiments, observation, interviewing, surveys, content analysis, and various forms of qualitative inquiry.

**PSYC 451 Principles of Psychological Testing (3)** *Prerequisite: PSYC 200 or equivalent.* Basic concepts and theories of psychological assessment including test development. Also discussed are social, legal, cultural, and ethical considerations in testing and commonly used tests.

**PSYC 452 Psychology of Individual Differences (3)** *Prerequisite: PSYC 200.* Problems, theories, and research related to psychological differences among individuals and groups.

**PSYC 455 Life-Span Cognitive Development (3)** *Prerequisites: PSYC 200 and (PSYC 355 or PSYC 341 or PSYC 440).* Theory and research in cognition from a life-span developmental perspective including memory, reasoning, attention, spatial cognition, and conceptual organization, and discussions of implications of current research for a variety of educational interventions.

**PSYC 456 Research Methods in Developmental Psychology (3)** *Prerequisites: PSYC 200 and (PSYC 355 or PSYC 356 or PSYC 357).* A presentation of major research designs used in developmental psychology and of the methodology used in developmental research, such as observational research, program evaluation, and laboratory experimentation.

**PSYC 457 Cultural Context of Psychological Development (3)** *Prerequisite: (PSYC 355, or PSYC 356, or PSYC 357,) or permission of department.* An examination of whether important differences or similarities exist among and within cultures in the way people develop psychological competencies in the period from birth through adolescence.

**PSYC 458 Applied Developmental Psychology (3)** *Prerequisite: PSYC 200 and (PSYC 355, or PSYC 356, or PSYC 357). Repeatable to 6 credits if content differs.* An examination of a topic in developmental psychology which has been examined in the laboratory and is central to developmental theories. Extension of these analyses to practical and social issues in the daily life of the developing individual. Topics will vary from semester to semester.

**PSYC 460 Psychological Foundations of Personnel Selection and Training (3)** *Prerequisite: PSYC 200 or equivalent.* 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.

**PSYC 462 Engineering Psychology and Training Models (3)** *Prerequisite: PSYC 200 or equivalent; and PSYC 361 or permission of department. For PSYC majors only.* An examination of theories and research regarding human performance capabilities and skills (information processing, decision-making, environmental constraints, automation), training procedures (traditional methods, programmed learning, computer-assisted instruction) and models and procedures for evaluating training programs in industry, education, and service organizations.

**PSYC 463 Psychology of Motivation and Attitudes in Organizational Settings (3)** *Prerequisites: PSYC 200 and PSYC 361.* Theories, research and practice regarding the assessment, understanding, and prediction of motivation at work. Theories of, and the assessment and consequences of, various work-related attitudes. An integration of theory, research, and practice.

**PSYC 464 Psychology of Leaders in Work Organizations (3)** *Prerequisite: PSYC 361 or equivalent.* 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.

**PSYC 465 Psychology of Organizational Processes (3)**  
*Prerequisites:* PSYC 200 and PSYC 361 or their equivalents. Theories of interpersonal, intra- and inter-group relations, with emphasis on issues of conflict, competition, cooperation and the role of power in organizations. Organizational diagnosis and intervention.

**PSYC 466 Environmental and Ecological Psychology (3)**  
*Prerequisite:* PSYC 200. An examination of measurement, description, and impact of the physical and social environments that affect various aspects of behavior in school, at work, and during leisure.

**PSYC 468 Field Experience and Special Assignments in Honors (1-3)**  
*Prerequisite:* permission of department as well as supervisor and honors faculty. Repeatable to 6 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.

**PSYC 469 Honors Thesis Proposal Preparation (1-3)**  
*Prerequisite:* Honors thesis supervisor's approval. Repeatable to 3 credits. Development of honors thesis proposal by preliminary research and literature review. Presentation of formal proposal to the thesis committee.

**PSYC 478 Independent Study in Psychology (1-3)**  
*Prerequisite:* permission of both department and instructor in the form of a written agreement signed by the student and the faculty mentor. The student must have completed 9 hours in psychology with at least a 3.0 G.P.A. in psychology and a 2.8 overall G.P.A. Students may not accumulate more than a total of 9 credits in PSYC 478 and PSYC 479 without permission of the Chair of the Department of Psychology or the Psychology Undergraduate Committee. Integrated reading under direction leading to the preparation of an adequately documented report on a special topic.

**PSYC 479 Special Research Problems in Psychology (1-3)**  
*Prerequisite:* permission of both department and instructor in the form of a written agreement signed by the student and the faculty mentor. The student must have completed 9 hours in psychology with at least a 3.0 G.P.A. in psychology and a 2.8 overall G.P.A. Repeatable to a maximum of 9 credits unless there is a waiver from the Psychology Undergraduate Committee. Research and data collection under individual faculty supervision, leading to a written research report.

**PSYC 488 Advanced Psychology I (Honors) (3)**  
*Prerequisite:* PSYC 200 and permission of department. Seminar covering topics in sensation, perception, learning, and motivation.

**PSYC 489 Senior Seminar (3)**  
*Prerequisite:* PSYC 100. Treatment of a specialized topic in psychology.

**PSYC 498 Advanced Psychology II (Honors) (3)**  
*Prerequisite:* PSYC 488H or permission of department. Seminar covering topics in measurement, social processes, developmental processes and other subject matter of current interest.

**PSYC 499 Honors Thesis Research (3)**  
*Prerequisite:* PSYC 469 and permission of thesis advisor.

## RUSS—Russian

**RUSS 101 Elementary Russian I (5)** Two hours of lecture and six hours of laboratory per week. Not open to native speakers of Russian. Elements of grammar, pronunciation, conversation and reading; exercises in translation.

**RUSS 102 Elementary Russian II (5)** Two hours of lecture and six hours of laboratory per week. *Prerequisite:* RUSS 101. Not open to native speakers of Russian. Continuation of RUSS 101. Elements of grammar, pronunciation, and conversation; exercises in translation.

**RUSS 201 Intermediate Russian I (4)** Two hours of lecture and four hours of laboratory per week. *Prerequisite:* RUSS 102. Not open to native speakers of Russian. Continuation of RUSS 102. For students planning to continue the study of Russian. Review and expansion of grammar knowledge, conversation and reading skills; exercises in translation. Note: this new RUSS 201 has no relation to the old SLAV 201, which is to be eliminated.

**RUSS 202 Intermediate Russian II (4)** Two hours of lecture and four hours of laboratory per week. *Prerequisite:* RUSS 201. Not open to native speakers of Russian. Continuation of RUSS 201. Review and expansion of grammar knowledge, conversation and reading skills. Exercises in translation.

**RUSS 210 Structural Description of Russian (3)** *Pre- or corequisite:* RUSS 201 or equivalent. An introductory linguistic course designed to order and supplement students' knowledge of the sound system and the inflectional system of the verb. A practical component on reading skills also focuses on the verb and

methods of developing vocabulary.

**RUSS 211 Applied Russian Phonetics (3)** *Prerequisite:* RUSS 102. Not open to native speakers of Russian. Pronunciation; the sounds and intonational patterns of Russian in contrast with those of English.

**RUSS 221 Masterworks of Russian Literature I (3)** Introduction to the classics of Russian literature in translation, beginning with Pushkin in the early 19th century and concluding with works of Dostoevsky and Tolstoy in the later part of that century.

**RUSS 222 Masterworks of Russian Literature II (3)** Introduction to the classics of Russian literature in translation, beginning with the end of the nineteenth century and concluding with contemporary works.

**RUSS 281 Russian Language and Pre-Revolutionary Culture (3)** *Not open to native speakers of Russian.* 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).

**RUSS 282 Contemporary Russian Culture (3)** Russia of the post-Communist era. An exploration of the cultural implications of the disintegration of the former Soviet Union. Also included is a brief introduction to the Russian language: alphabet, elementary reading and survival skills for the first time traveller. Course format includes a combination of lectures, group discussions, videos, and optional field trips.

**RUSS 298 Special Topics in Russian Language and Literature (3)**  
Repeatable to 6 credits if content differs.

**RUSS 301 Advanced Russian I (3)** *Prerequisite:* RUSS 202 or equivalent. Advanced training in written Russian communicative structures.

**RUSS 302 Advanced Russian II (3)** *Prerequisite:* RUSS 301. Advanced training in written Russian communicative structures.

**RUSS 303 Russian Conversation: Functional Skills (3)**  
*Prerequisite:* RUSS 202 or equivalent. Intended for students who do not anticipate having the opportunity to study in the Soviet Union. Skills for daily life (both function and etiquette) and argumentation (rhetoric).

**RUSS 307 Commercial Russian I (3)** *Prerequisite:* RUSS 202 or equivalent. Designed to give introductory knowledge of correct commercial Russian including letters, business forms, contracts, and agreements.

**RUSS 321 Survey of Russian Literature I (3)** *Prerequisite:* RUSS 202 or equivalent. The first half of a survey of Russian literature.

**RUSS 322 Survey of Russian Literature II (3)** *Prerequisite:* RUSS 321 or equivalent. The second half of a survey of Russian literature.

**RUSS 327 Old Russian Literature in Translation (3)**  
*Recommended:* RUSS 221. Old Russian literature of the 11th-17th centuries for the general student. Selected texts will be read in translation, with analysis in terms of genre and historical setting.

**RUSS 328 19th Century Russian Literature in Translation (3)**  
Repeatable to 6 credits if content differs. Development of Russian literary thought in the Russian novel and short prose of the 19th century. Influence of western literatures and philosophies.

**RUSS 329 Soviet Literature in Translation (3)** Repeatable to 6 credits if content differs. Russian literature since 1917, both as a continuation of prerevolutionary traditions and as a reflection of Soviet ideology.

**RUSS 381 Russian Civilization (in Russian) I (3)** *Prerequisite:* RUSS 202. A historical survey of Russian civilization emphasizing architecture, painting, sculpture, music, ballet and the theater to the beginning of the 19th century pointing out the inter-relationship of all with literary movements. Taught in Russian.

**RUSS 382 Russian Civilization (in Russian) II (3)** *Prerequisite:* RUSS 202. A historical survey of Russian civilization emphasizing architecture, painting, sculpture, music, ballet, and the theater, from the beginning of the 19th century to the present pointing out the inter-relationships of all with literary movements. Taught in Russian.

**RUSS 398 Selected Topics in Russian Language and Literature (3)** Repeatable to 6 credits if content differs.

**RUSS 401 Advanced Russian Composition (3)** *Prerequisite:* RUSS 302.

**RUSS 402 Practicum in Written Russian (3)** *Prerequisite:* RUSS 401 or equivalent. Designed to improve comprehension of functional varieties of written Russian and develop ability to present in written form concise syntheses of source texts.

**RUSS 403 Russian Conversation: Advanced Skills (3)**  
*Prerequisite:* RUSS 303 or equivalent. Advanced spoken production of high-level, abstract language.

**RUSS 404 Practicum in Spoken Russian (3)** *Prerequisite:* RUSS 403 or equivalent. To improve comprehension of rapidly spoken Russian of various functional styles and to develop ability to synthesize orally the content of spoken material.

**RUSS 405 Russian-English Translation I (3)** *Pre- or corequisite:* RUSS 302 or equivalent. Introduction to the principles of translation of a particular genre,—typically diplomatic, business, or literary.

**RUSS 406 Russian-English Translation II (3)** *Prerequisite:* RUSS 405. Continuation of RUSS 405.

**RUSS 407 Commercial Russian II (3)** *Prerequisite:* RUSS 307. Continuation of RUSS 307 focusing in the more difficult and complex Russian business documents and Russian business ministries.

**RUSS 409 Selected Topics in Russian Language Study (3)**  
*Prerequisite:* permission of department. Repeatable to 6 credits if content differs. Presentation of a topic in Russian language study.

**RUSS 410 Applied Russian Linguistics (3)** The nature of applied linguistics and its contributions to the effective teaching of foreign languages. Comparative study of English and Russian, with emphasis upon points of divergence. Analysis, evaluation and construction of related drills.

**RUSS 411 Linguistic Analysis of Russian I (3)** *Prerequisites:* RUSS 210; and LING 200. *Pre- or corequisite:* RUSS 301. 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.

**RUSS 412 Linguistic Analysis of Russian II (3)** *Prerequisite:* RUSS 411. Continuation of RUSS 411. The syntax of the complete sentence, semantics.

**RUSS 431 Russian Literature of the 19th Century I (3)**

**RUSS 432 Russian Literature of the 19th Century II (3)**

**RUSS 433 Russian Literature of the 20th Century (3)**

**RUSS 434 Soviet Russian Literature (3)**

**RUSS 439 Selected Topics in Russian Literature (3)** *Prerequisite:* permission of department. Repeatable to 6 credits if content differs. Presentation of a topic in Russian literature.

**RUSS 473 Recent History of the Russian Language (3)**  
*Prerequisite:* RUSS 210 or equivalent. Linguistic interpretation of Russian texts from the late 18th century to the present.

## SLAV—Slavic

**SLAV 469 Selected Topics in Slavic Studies (3)** *Prerequisite:* permission of department. Repeatable to 6 credits if content differs. Presentation of a topic in Slavic studies.

**SLAV 475 Old Church Slavonic (3)** Introduction to the language of the oldest recorded Slavic documents. Historical presentation of phonology, morphology, and syntax; reading of texts.

**SLAV 479 Selected Topics in Slavic Linguistics (3)** *Prerequisite:* permission of department. Repeatable to 6 credits if content differs. Presentation of a topic in Slavic linguistics.

**SLAV 499 Directed Study (1-3)** *Prerequisite:* permission of department. For advanced students. Repeatable to 6 credits if content differs.

## SOCY—Sociology

**SOCY 100 Introduction to Sociology (3)** The fundamental concepts and principles of sociology. Includes consideration of culture, patterns of social interaction, norms, values, social institutions, stratification, and social change.

**SOCY 105 Introduction to Contemporary Social Problems (3)** An examination of contemporary social problems through sociological perspectives; ways in which social problems are part of the organization of society; a detailed study of selected social problems including social conflict and social inequality.

**SOCY 109 Freshman Seminar (3)** This freshman seminar focuses on the long-standing debate over world population growth. Students will study the demographic sources of rapid population growth as well as the consequences of growth for the environment, food and water resources, health and nutrition, economic development and other related topics.

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**SOCY 120 Urban Sociology (3)** Urban growth and expansion: characteristics of city populations; urban institutions and personality patterns; relations of city and country.

**SOCY 201 Introductory Statistics for Sociology (4)** *Three hours of lecture and two hours of laboratory per week. Prerequisite: SOCY 100 and MATH 111 or equivalent. Not open to students who have completed BMGT 231, ENEE 324, or STAT 400. Credit will be granted for only one of the following: AREC 484, BIOM 301, BMGT 230, CNEC 400, ECON 321, EDMS 451, GEOG 305, GVPT 422, PSYC 200, SOCY 201, URSP 350, or TEXT 400.* Elementary descriptive and inferential statistics. Construction and percentage of bivariate contingency tables; frequency distributions and graphic presentations; measures of central tendency and dispersion; parametric and nonparametric measures of association and correlation; regression; probability; hypothesis testing; the normal, binomial and chi-square distributions; point and interval estimates.

**SOCY 202 Introduction to Research Methods in Sociology (4)** *Prerequisite: SOCY 201.* The underlying logic, major strategies, specific techniques and skills of sociological research. Research design, measurement, data collection, sampling, field research experiments, surveys, index and scale construction, data analysis, interpretation and report writing.

**SOCY 203 Sociological Theory (3)** *Prerequisite: SOCY 100.* Development of the science of sociology; historical backgrounds; recent theories of society. Required of all sociology majors.

**SOCY 227 Introduction to the Study of Deviance (3)** *Credit will be granted for only one of the following: SOCY 227 or SOCY 327. Formerly SOCY 327.* An introduction to the sociological study of deviant behavior, covering such topics as mental illness, sexual deviance, and the use of drugs.

**SOCY 230 Sociological Social Psychology (3)** Social psychology of groups such as committees, teams, clubs, sects, social movements, crowds and publics. Origin of the social self; role behavior, inter-group and intragroup relations.

**SOCY 241 Inequality in American Society (3)** *Credit will be granted for only one of the following: SOCY 241 or SOCY 341. Formerly SOCY 341.* The sociological study of the status and treatment of the poor, minorities, the aged, women, deviant subcommunities and the physical handicapped. The dynamics of inequality; its social production, politics, future and ideological bases, Utopian communities, efforts to eliminate inequality.

**SOCY 243 Sociology of Marriage and Family (3)** *Credit will be granted for only one of the following: SOCY 243 or SOCY 343. Formerly SOCY 343.* Demographic trends in family and marriage, childbearing, divorce; sociological theories of mate selection, marital interaction, and marital dissolution. Contemporary controversial issues, such as the relationship of unmarried couples, alternative marriage forms, abortion, and violence in the family.

**SOCY 300 American Society (3)** The social structure and organization of American society with special reference to recent social change. A sociological perspective on urban and other population trends; the character structure, values and ideology of Americans-social movements and changes in work, family life and recreation.

**SOCY 305 Scarcity and Modern Society (3)** *Prerequisite: 3 credits of sociology.* Resource depletion and the deterioration of the environment. Relationship to life styles, individual consumer choices, cultural values, and institutional failures. Projection of the future course of American society on the basis of the analysis of scarcity, theories of social change, current trends, social movements, government actions, and the futurist literature.

**SOCY 325 The Sociology of Gender (3)** *Prerequisite: 3 credits of sociology. Also offered as WMST 325. Credit will be granted for only one of the following: SOCY 325 or WMST 325.* Institutional bases of gender roles and gender inequality, cultural perspectives on gender, gender socialization, feminism, and gender-role change. Emphasis on contemporary American society.

**SOCY 331 Work, Bureaucracy, and Industry (3)** *Prerequisite: 3 credits of sociology.* A sociological approach to the world of work, occupational careers, and personal experiences in the bureaucratic organizations of modern industrial society.

**SOCY 333 Technology and Society (3)** *Prerequisite: 3 credits of sociology.* Impact of technology on agriculture, the industrial revolution, politics, economics, and health, education and welfare, as these affect changes in social organizations. The development of small cities, the better utilization of energy, the use of wealth and abundance and its relation to the division of labor, and the role of technology in shaping of new forms of political and economic organizations.

**SOCY 350 Social Field Training (1-3)** *Prerequisites: 12 credits of sociology and permission of department. Formerly SOCY 359.* Enrollment restricted to available placements. Supervised field experience in an agency for a program of in-service training. Group meetings, individual conferences and written program reports will be a required part of the course.

**SOCY 380 Honors Independent Reading in Sociology (3)** *Prerequisite: permission of department. Formerly SOCY 378.* This course permits sociology honors 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.

**SOCY 381 Honors Independent Research in Sociology (3)** *Prerequisite: SOCY 380. Formerly SOCY 388.* 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.

**SOCY 383 Honors Thesis Research (3)** *Prerequisite: SOCY 381. Formerly SOCY 389.* Student research under the direction of a member of the sociology faculty, culminating in the presentation and defense of a thesis reporting the research.

**SOCY 398 Special Topics in Sociology (1-3)** *Prerequisite: 3 credits of sociology. Repeatable to 6 credits if content differs.* Topics of special interest to both sociology majors and non-majors.

**SOCY 399 Independent Study in Sociology (1-6)** *Prerequisite: 12 credits of sociology and permission of department. Repeatable to 6 credits if content differs.* 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 SOCY 386 and SOCY 399 combined.

**SOCY 401 Intermediate Statistics for Sociologists (4)** *Three hours of lecture and two hours of laboratory per week. Prerequisite: SOCY 201 or equivalent or permission of department. Not open to students who have completed ENEE 324, BMGT 231, or STAT 400.* Issues in the use of significance tests in sociology, one and two-way analysis of variance, elements of multiple regression and correlation, techniques for the analysis of nominal and ordinal data.

**SOCY 402 Intermediate Procedures For Data Collection (3)** *Prerequisite: SOCY 202 or equivalent or permission of department.* An intermediate survey of the major research methods used by sociologists, including survey research, experimentation, observation, archival research, and in-depth interviewing. The selection of an appropriate research method, with analysis of the strengths and weaknesses of various methods, practical issues, data collection and preparation, and analytical techniques.

**SOCY 403 Intermediate Sociological Theory (3)** *Prerequisite: SOCY 203 or permission of department.* Major theoretical approaches, including functionalism conflict, symbolic interactionism, and their implicit methods of logic illustrated by case studies. Original works of major theorists in historical perspective.

**SOCY 404 Methods of Quantitative Analysis (4)** *Three hours of lecture and two hours of laboratory per week. Prerequisite: (SOCY 202 or equivalent) or permission of department.* Analysis of sociological data through the use of statistical packages such as SPSS, BMDP or SAS. Emphasis is on the use of multivariate statistical techniques.

**SOCY 410 Social Demography (3)** *Prerequisite: 6 credits of sociology or permission of department.* Types of demographic analysis; demographic data; population characteristics; migration; mortality; fertility; population theories; world population growth; population policy.

**SOCY 411 Demographic Techniques (3)** *Prerequisite: SOCY 201 or equivalent and SOCY 410 or permission of department.* Basic techniques for analyzing population structure and demographic processes, including fertility, mortality and migration.

**SOCY 412 Family Demography (3)** *Prerequisite: SOCY 410. Formerly SOCY 312.* 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.

**SOCY 424 Sociology of Race Relations (3)** *Prerequisite: 6 credits in sociology or permission of department.* Analysis of race-related issues, with a primary focus on American society. The historical emergence, development, and institutionalization of racism; the impact of racism on its victims; and racially based conflict.

**SOCY 425 Gender Roles and Social Institutions (3)** *Prerequisite: 6 credits of sociology or permission of department.* 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.

**SOCY 426 Sociology of Religion (3)** *Prerequisite: 6 credits of sociology or permission of department.* Varieties and sources of religious experience. Religious institutions and the role of religion in social life.

**SOCY 427 Deviant Behavior (3)** *Prerequisite: 6 credits of sociology or permission of department.* Current theories of the genesis and distribution of deviant behavior, and their implications for a general theory of deviant behavior. Definitions of deviance, labeling theory, secondary deviance.

**SOCY 430 Sociology of Personality (3)** *Prerequisite: 6 credits of sociology or permission of department.* Development of human nature and personality in contemporary social life; processes of socialization; attitudes, individual differences and social behavior.

**SOCY 431 Formal and Complex Organizations (3)** *Prerequisite: 6 credits of sociology or permission of department.* The study of functioning and control in the operation of bureaucracies such as corporations and in large-scale organizations such as military, religious and educational hierarchies. Forms of recruitment, internal mobility and organizational personality. Relations between large-scale organizations and with the larger society.

**SOCY 432 Collective Behavior (3)** *Prerequisite: 6 credits of sociology or permission of department.* Unlike most sociology courses which focus on structured groups, this course examines instances of transient behavior: crowds, disasters, hysterical contagion, revolution, and social movements, including American Utopian experiments.

**SOCY 433 Social Control (3)** *Prerequisite: 6 credits of sociology or permission of department.* Forms, mechanism, and techniques of group influence on human behavior; problems of social control in contemporary society.

**SOCY 440 Sociology of the Self-Concept (3)** *Prerequisite: 6 credits of sociology or permission of department.* The nature of the self-concept and the social forces that mold it. Major sociological, psychological, and psycho-analytic theories of the self-concept. Self-concept motives, mechanisms of self-defense, and the nature of a healthy self-concept. Empirical research dealing with the bearing of social interaction, social structure, social context and social institutions on the self-concept.

**SOCY 441 Social Stratification and Inequality (3)** *Prerequisite: 6 credits of sociology or permission of department. 56 semester hours. Junior standing. Credit will be granted for only one of the following: SOCY 241 or SOCY 441.* 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.

**SOCY 443 The Family and Society (3)** *Prerequisite: 6 credits of sociology or permission of department.* Study of the family as a social institution; its biological and cultural foundations, historic development, changing structures, and functions, the interaction of marriage and parenthood, disorganizing and reorganizing factors in present day trends.

**SOCY 445 Sociology of the Arts (3)** *Prerequisite: 6 credits of sociology or permission of department.* Functions of the arts as a social institution. Social role of the artist. Recruitment to and organizational structure of artistic professions. Art forms and social characteristics of audiences. Changing technology and changing social values as reflected in artistic expression.

**SOCY 447 Small Group Analysis (3)** *Prerequisite: SOCY 201 or equivalent or permission of department.* Analysis of small group structures and dynamics. Review of research on small groups in real life settings and in laboratories. Presentation of techniques used in small groups.

**SOCY 457 Sociology of Law (3)** *Prerequisite: 6 credits of sociology or permission of department.* Social, political, and cultural sources of legal norms and concepts (such as property, privacy, contract, institution, and liability), as well as the role of law in interpersonal and intergroup dispute resolution. Emphasis on civil law.

**SOCY 460 Sociology of Work (3)** *Prerequisite: 6 credits of sociology or permission of department.* Analysis of the American work world with special attention to the impact of social change and occupational conflicts on the individual worker. Professionalization, career patterns, problems of minority groups and the future of work.

**SOCY 462 Industrial Sociology (3)** *Prerequisite: 6 credits of sociology or permission of department.* The sociology of human relations in American industry and business. Complex industrial and business organization as social systems. Social relationships within and between industry, business, community and society.

**SOCY 464 Military Sociology (3)** *Prerequisite: 6 credits of sociology or permission of department.* Social change and the growth of military institutions. Complex formal military organizations. Military service as an occupation or profession. The sociology of military life. Relations between military institutions, civilian communities and society.

**SOCY 465 The Sociology of War (3)** *Prerequisite: 6 credits of sociology or permission of department.* The origin and development of armed forces as institutions, the social causes, operations and results of war as social conflict; the relations of

peace and war and revolution in contemporary civilizations.

**SOCY 466 Sociology of Politics (3)** *Prerequisite: 6 credits of sociology or permission of department.* An introduction to the sociology of political phenomena. Consideration of the basic concepts and major findings in the field; the relationship of the polity to other institutional orders of the society; the relationship of political activity in America to the theory of democracy.

**SOCY 467 Sociology of Education (3)** *Prerequisite: 6 credits of sociology or permission of department.* Sociological analysis of educational institutions and their relation to society: goals and functions, the mechanisms of social control, and the impacts of stratification and social change. Study of the school as a formal organization, and the roles and subcultures of teachers and students.

**SOCY 470 Rural-Urban Relations (3)** *Prerequisite: 6 credits of sociology or permission of department.* The ecology of population and the forces making for change in rural and urban life; migration, decentralization and regionalism as methods of studying individual and national issues. Applied field problems.

**SOCY 473 The City (3)** *Prerequisite: 6 credits of sociology or permission of department.* The rise of urban civilization and metropolitan regions; ecological process and structure; the city as a center of dominance; social problems, control and planning.

**SOCY 474 Soviet Ethnic Issues (3)** *Prerequisite: 6 credits of sociology or permission of department.* Ethnic processes and issues in the Soviet Union. The major ethnic groups in the U.S.S.R. cultural, political, religious, economic, and other aspects of Soviet ethnicity.

**SOCY 498 Selected Topics in Sociology (1-3)** *Prerequisite: 6 credits of sociology or permission of department. Repeatable to 6 credits.* Topics of special interest to advanced undergraduates in sociology. Such courses will be offered in response to student request and faculty interest.

## SPAN—Spanish

The language of instruction in all courses is Spanish unless otherwise noted.

**SPAN 101 Elementary Spanish I (4)** *Four hours of discussion/recitation per week. Prerequisite: No previous Spanish; high school level 1 Spanish with grade of A or B; high school level 2 Spanish with a grade of C or below. Not open to native/fluent speakers of Spanish.* Introduction to the functions and structures of the Spanish language, with emphasis on the four skills of listening, speaking, reading and writing.

**SPAN 102 Elementary Spanish II (4)** *Four hours of discussion/recitation per week. Prerequisite: SPAN 101 at UMCP or equivalent. Not open to native/fluent speakers of Spanish.* Further study of the functions and structures of the Spanish language, with emphasis on the four skills of listening, speaking, reading and writing.

**SPAN 103 Review of Elementary Spanish (4)** *Not open to students who have completed higher level Spanish language classes.* An intensive beginning course in Spanish language skills: guided practice in reading and writing, understanding the spoken language and conversation, to enable the student to move more quickly to advanced courses.

**SPAN 125 Spanish Civilization: From Kingdoms to Nationalities (3)** Introduction to the cultural heritage of the Spanish people, their traditions, customs, arts and literature, with special emphasis on the interrelationship of social and literary history.

**SPAN 201 Intermediate Spanish (4)** *Prerequisite: SPAN 102 or SPAN 103 at UMCP or high school level 3 Spanish with a grade of A or B or high school level 4 Spanish with a C or below. Not open to native/fluent speakers of Spanish. Formerly SPAN 203.* Continued development of the functions and structures of the Spanish language with emphasis on the four skills of listening, speaking, reading, and writing.

**SPAN 202 Intermediate Grammar and Composition (3)** *Prerequisite: SPAN 201 or high school level 4 or 5 with a grade of A or B or permission of department. Corequisite: SPAN 207 and/or SPAN 211. Not open to native/fluent speakers of Spanish. Formerly SPAN 204.* An in-depth study and analysis of selected grammatical topics with emphasis on composition, writing and reading.

**SPAN 206 Review of Oral and Written Spanish for Native Speakers Educated (3) in the United States** *Prerequisite: native or near native knowledge of oral Spanish and no formal education in Spanish.* Review of oral and written Spanish for students who have native or near-native ability in Spanish, but have never studied it in a formal setting.

**SPAN 207 Reading and Writing in Spanish (3)** *Prerequisites: SPAN 201. Pre- or corequisite: SPAN 202, or permission of department.* 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 SPAN 202.

**SPAN 211 Intermediate Conversation (3)** *Prerequisite: SPAN 201 or permission of department. Not open to native/fluent speakers of Spanish. Formerly SPAN 205.* Development of listening and speaking skills in Spanish. Opportunity to develop oral fluency, improve pronunciation and increase vocabulary. Individual and/or group oral presentations.

**SPAN 221 Introduction to Literature (3)** *Prerequisite: Spanish high school level 5 or above or SPAN 202 or permission of department.* Selected readings in various genres in Spanish and Latin American literature. Discussion and written reports in Spanish. May be substituted for SPAN 207 with permission of department.

**SPAN 222 Cultural Difference in Contemporary Latin America (3)** 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.

**SPAN 223 United States Latino Culture (3)** *45 semester hours.* Survey of the diverse historical, political, and economic issues contributing to the formation of U.S. Latino culture(s) and communities. Representative Latino cultural texts—literary, artistic, musical, film, and performances—will be studied and discussed. In English.

**SPAN 224 Violence and Resistance in the Americas (3)** 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. All readings are in English. No Spanish is required.

**SPAN 234 Issues in Latin American Studies I (3)** *Also offered as PORT 234. Credit will be granted for only one of the following: SPAN 234 or PORT 234.* An interdisciplinary course that studies the major issues in Latin America and the Caribbean. These issues include Latin America's "cultural mosaic," migration and urbanization, cultures of democratization and the role of religions.

**SPAN 235 Issues in Latin American Studies II (3)** *Also offered as PORT 235. Credit will be granted for only one of the following: SPAN 235 or PORT 235.* Studies the major issues shaping Latin American and Caribbean societies. These issues include the changing constructions of race, ethnicity, gender and class, as well as expressions of popular culture and revolutionary practices. A continuation of SPAN/PORT 234, but completion of 234 is not a prerequisite.

**SPAN 301 Advanced Grammar and Composition I (3)** *Prerequisite: SPAN 202. Recommended: SPAN 207.* Practice of complex grammatical structures through reading and writing of compositions and essays. Specific lexical, syntactic, rhetorical, and stylistic devices will be highlighted.

**SPAN 302 Advanced Grammar and Composition II (3)** *Prerequisite: SPAN 301.* Practice in and writing of different types of compositions and essays, including narrations, descriptions, and persuasive writing. Review of problematic syntactical structures.

**SPAN 306 Spanish II for Native Speakers (3)** *Prerequisites: native or near-native knowledge of oral Spanish and little or no formal education in Spanish and SPAN 206 or permission of department.* 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.

**SPAN 310 Spanish Phonetics (3)** *Prerequisite: SPAN 202 or permission of department.* Descriptive study of the Spanish sound system. Practice in phonetic perception, transcription, and articulation. Particular attention to sentence phonetics; juncture, rhythm, stress, pitch.

**SPAN 311 Advanced Conversation I (3)** *Prerequisite: SPAN 202 or SPAN 211 or permission of department. Not open to native/fluent speakers of Spanish.* Further development of listening and speaking skills in Spanish. Opportunity to develop oral fluency improve pronunciation and increase vocabulary. Individual and/or group oral presentations.

**SPAN 312 Advanced Conversation II (3)** *Prerequisites: SPAN 202 and SPAN 211 or SPAN 311 or permission of department. Not open to native/fluent speakers of Spanish.* 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.

**SPAN 314 Daily Life in Mexico : An Intercultural Approach (1)** *For students in UMS Study Abroad program in Mexico City.* Cultural differences between life in the United States and Mexico.

**SPAN 315 Commercial Spanish I (3)** *Prerequisite: SPAN 301 or permission of department.* 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 business environments.

**SPAN 316 Practicum in Translation I (3)** *Prerequisite: SPAN 301 and permission of department.* Translation of non-literary, non-technical texts into Spanish and/or English.

**SPAN 317 Translation II (3)** *Prerequisite: SPAN 316 or permission of department.* Translation of non-literary, non-technical texts into Spanish and/or English.

**SPAN 318 Translation of Technical Texts (3)** *Prerequisites: SPAN 317 or permission of department. Repeatable to 6 credits if content differs.* Translation of technical and specialized texts in various fields (e.g. medicine, law, international affairs, social work, journalism, technology) into Spanish and/or English.

**SPAN 321 Survey of Spanish Literature I (3)** *Prerequisite: SPAN 301 or permission of department.* Overview of the history of Spanish literature from the 12th through the 17th century.

**SPAN 322 Survey of Spanish Literature II (3)** *Prerequisite: SPAN 301 or permission of department.* Overview of the history of Spanish literature from the 18th century to the present.

**SPAN 323 Survey of Latin-American Literature I (3)** *Prerequisite: SPAN 301 or permission of department.* Overview of the history of Latin American literature from the Pre-Columbian era through the 18th century.

**SPAN 324 Survey of Latin-American Literature II (3)** *Prerequisite: SPAN 301 or permission of department.* Overview of the history of Latin American literature from the 19th century to the present.

**SPAN 325 Spanish Civilization I (3)** *Prerequisite: SPAN 301 or permission of department.* Spanish civilization from the pre-Spanish cultures through the Spanish golden age with emphasis on cultural, social, and artistic aspects.

**SPAN 326 Spanish Civilization II (3)** *Prerequisite: SPAN 301 or permission of department.* Spanish civilization from the 18th century to the present day with emphasis on cultural, social, and artistic aspects.

**SPAN 346 Latin American Civilization I (3)** *Prerequisite: SPAN 301 or permission of department.* Cultural heritage of the Latin American peoples from the pre-Columbian period to independence.

**SPAN 347 Latin American Civilization II (3)** *Prerequisite: SPAN 301 or permission of department.* Cultural heritage of the Latin American peoples from independence to the present.

**SPAN 356 Literary Translation I (3)** *Prerequisite: SPAN 317 or permission of department.* Translation of literary texts into Spanish and/or English: narrative.

**SPAN 357 Literary Translation II (3)** *Prerequisite: SPAN 317 or permission of department.* A continuation of SPAN 356. Translation of literary texts into Spanish and/or English: dialogue and other forms.

**SPAN 399 Independent Study in Spanish (1-3)** *Prerequisite: permission of department. Repeatable to 3 credits.* Specific readings in literature or a translation project under the supervision of a faculty member of the department.

**SPAN 401 Advanced Composition I (3)** *Prerequisite: SPAN 302 or permission of department.* Compositions and essays with emphasis on stylistics, idiomatic and syntactic structures. Organization and writing of research papers.

**SPAN 402 Advanced Composition II (3)** *Prerequisite: SPAN 401 or permission of department.* Compositions and essays with emphasis on stylistics, idiomatic and syntactic structures. Organization and writing of research papers.

**SPAN 408 Great Themes of the Hispanic Literatures (3)** Pervading themes in the literature of Spain or Spanish-America. Each theme will be announced when the course is offered.

**SPAN 409 Great Themes of the Hispanic Literatures (3)** Pervading themes in the literature of Spain or Spanish-America. Each theme will be announced when the course is offered.

**SPAN 410 Literature of the Middle Ages (3)** Spanish literary history from the eleventh through the fifteenth century. Reading of representative texts. This course covers until the year 1350.

**SPAN 411 Literature of the Middle Ages (3)** Spanish literary history from the eleventh through the fifteenth century. Reading of representative texts. This course covers from 1350 to 1500.

**SPAN 413 Libro de Buen Amor (3)** Literary traditions in the Libro de buen amor.

**SPAN 414 La Celestina (3)** Literary and cultural traditions in La Celestina.

**SPAN 415 Commercial Spanish II (3)** *Prerequisite: SPAN 315 or permission of department.* Sophomore standing. Business

## 208 Approved Courses

Spanish terminology, vocabulary and practices. 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.

**SPAN 416 Practicum in Translation V (3)** *Prerequisite: SPAN 357 or permission of department.* Translation of complete literary texts from Spanish into English. Presentation and comparison of special problems encountered in individual projects.

**SPAN 417 Practicum in Translation VI (3)** *Prerequisite: SPAN 416 or permission of department.* Translation of complete literary texts from Spanish into English. Evaluation of different versions of the original. Problems of interpretation, literary structure and analysis.

**SPAN 418 Hispanic Literature in Translation (3)** *Repeatable to 6 credits if content differs.*

**SPAN 420 Poetry of the 16th Century (3)** *Prerequisite: SPAN 321 or equivalent.* Selected readings and literary analysis.

**SPAN 421 Prose of the 16th Century (3)** *Prerequisite: SPAN 321 or equivalent.* Selected readings and literary analysis.

**SPAN 422 Cross-Cultural Communication (3)** *Prerequisite: (SPAN 325 and SPAN 326) or (SPAN 346 and SPAN 347) or permission of department. Junior standing.* Focuses on the relationship of language and culture of those operating in world markets. Particular attention will be given to cross-cultural communication, linguistic systems, and culture specific perceptions of the Hispanic world.

**SPAN 424 Drama of the Sixteenth Century (3)** From the earliest autos and pasos, the development of Spanish drama anterior to Lope de Vega, including Cervantes.

**SPAN 430 Cervantes: Don Quijote (3)** *Prerequisite: SPAN 321 or equivalent.*

**SPAN 431 Cervantes: Novelas Ejemplares and Entremeses (3)** *Prerequisite: SPAN 321 or equivalent.*

**SPAN 432 Colonial Latin American Literature (3)** Examines the key themes, writers, literary movements, and cultural debates of the colonial period.

**SPAN 433 Women and Culture in Colonial Latin America (3)** 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.

**SPAN 434 Poetry of the 17th Century (3)** *Prerequisite: SPAN 321 or equivalent.* Selected readings, literary analysis, and discussion of the outstanding poetry of the period, in the light of the historical background.

**SPAN 435 Prose of the 17th Century (3)** *Prerequisite: SPAN 321 or equivalent.* Selected readings, literary analysis, and discussion of the outstanding prose of the period, in the light of the historical background.

**SPAN 436 Drama of the Seventeenth Century (3)** *Prerequisite: SPAN 321.* Devoted to Lope de Vega, dramatic theory and the Spanish stage.

**SPAN 437 Drama of the Seventeenth Century (3)** Drama after Lope de Vega to Calderon de la Barca and the decline of the Spanish theater.

**SPAN 440 Literature of the Eighteenth Century (3)** Traditionalism, Neo-Classicism, and Pre-Romanticism in prose, poetry, and the theater; esthetics and poetics of the enlightenment.

**SPAN 448 Special Topics in Latin American Civilization (3)** *Repeatable to 6 credits if content differs.* Intensive independent study of a selected topic related to Latin American civilization.

**SPAN 449 Special Topics in Spanish Civilization (3)** *Repeatable to 6 credits if content differs.* An intensive study of a selected topic related to Spanish civilization.

**SPAN 452 The Romantic Movement in Spain (3)** Poetry, prose and drama of the Romantic and Post-Romantic periods.

**SPAN 454 Nineteenth Century Fiction (3)** Significant novels of the nineteenth century.

**SPAN 456 Nineteenth Century Drama and Poetry (3)** Significant dramas and poetry of the Realist Period.

**SPAN 460 The Generation of 1898 and Its Successors (3)** Authors and works of all genres of the generation of 1898 and those of the immediately succeeding generation.

**SPAN 461 The Generation of 1898 and Its Successors (3)** Authors and works of all genres of the generation of 1898 and those of the immediately succeeding generation.

**SPAN 462 Twentieth Century Drama (3)** Significant plays of the twentieth century.

**SPAN 464 Contemporary Spanish Poetry (3)** Spanish poetry from the generation of 1927 to the present.

**SPAN 466 The Contemporary Spanish Novel (3)** The novel and the short story from 1940 to the present.

**SPAN 468 Modernism and Post-Modernism in Spain and Spanish-America (3)** *Repeatable to 9 credits if content differs.* A study of the most important works and authors of both movements in Spain and Spanish-America.

**SPAN 469 Modernism and Post-Modernism in Spain and Spanish-America (3)** *Repeatable to 9 credits if content differs.* A study of the most important works and authors of both movements in Spain and Spanish-America.

**SPAN 470 United States Latino Literature (3)** *Recommended: SPAN 323 or SPAN 324.* Introduction to U.S. Latino literature through exploration of narrative, poetry, and drama by Chicano, Nuyorican, and Cuban American writers. Discussion of sociohistorical issues involved in construction of Latino cultural identity in literature.

**SPAN 471 U.S. Latino Prose Fiction (3)** *Recommended: SPAN 323 or SPAN 324; SPAN 470.* Introduction to U.S. Latino fiction through study of short stories and novels by contemporary Chicano, Nuyorican, Cuban-American, and Dominican-American writers. Exploration of relationship between narrative techniques and thematic content, along with relevant sociohistorical issues.

**SPAN 473 U.S. Latino Drama (3)** *Recommended: SPAN 323 or SPAN 324; SPAN 470.* Introduction to U.S. Latino Drama through study of recent plays by Chicano, Nuyorican, and Cuban-American writers. Exploration of key elements of form and style, including techniques through which social, historical, and political issues are represented.

**SPAN 479 Honors Thesis (3-6)** *Prerequisite: admittance to honors program in Spanish and Portuguese Department. Repeatable to 6 credits if content differs.* Researching and writing an honors thesis under the direction of a professor.

**SPAN 480 Spanish-American Essay (3)** A study of the socio-political contents and aesthetic qualities of representative works from the colonial to the contemporary period.

**SPAN 481 Spanish American Essay (3)** A study of the socio-political contents and aesthetic qualities of representative works from the colonial to the contemporary period, with emphasis on the essay of the twentieth century.

**SPAN 488 Spanish-American Fiction (3)** Representative novels and/or short stories from the Wars of Independence to the present or close analysis of major contemporary works. Subject will be announced each time course is offered.

**SPAN 489 Spanish-American Fiction (3)** Representative novels and/or short stories from the Wars of Independence to the present or close analysis of major contemporary works. Subject will be announced each time course is offered.

**SPAN 491 Honors Reading Course: Poetry (3)** Supervised reading to be taken by students admitted to the honors program or upon consultation with the instructor.

**SPAN 492 Honors Reading Course: Novel (3)** Supervised reading to be taken by students admitted to the honors program or upon consultation with the instructor.

**SPAN 493 Honors Reading Course: Drama (3)** Supervised reading to be taken by students admitted to the honors program or upon consultation with the instructor.

**SPAN 495 Honors Reading (3)** *Prerequisite: admittance to Spanish and Portuguese Honors or permission of department.* Supervised reading.

**SPAN 498 Spanish-American Poetry (3)** Main trends, authors and works from the conquest to Ruben Dario.

## SPCH—Speech

**SPCH 100 Foundations of Speech Communication (3)** *Not open to students who have completed SPCH 107. Credit will be granted for only one of the following: SPCH 100 or SPCH 107.* Prerequisite for advanced speech courses. A study of oral communication principles, including verbal and nonverbal language, listening, group dynamics, and public speaking. Emphasis in this course is upon the application of these principles to contemporary problems and upon the preparation of different types of oral discourse.

**SPCH 107 Speech Communication: Principles and Practice (3)** *Not open to students who have completed SPCH 100. Credit will be granted for only one of the following: SPCH 100 or SPCH 107.* A study of and practice in oral communication, including principles

of interviewing, group discussion, listening, informative briefings, and persuasive speeches.

**SPCH 125 Introduction to Interpersonal Communication (3)** Concepts of interpersonal communication including perception, language and meaning, nonverbal communication, listening and feedback.

**SPCH 170 Foundations of Listening (3)** Role, process, and levels of listening behavior and the development of listening skills.

**SPCH 200 Advanced Public Speaking (3)** *Prerequisite: SPCH 100 or SPCH 107 or permission of department.* Rhetorical principles and models of speech composition in conjunction with the preparation and presentation of specific forms of public speaking.

**SPCH 220 Small Group Discussion (3)** Principles, methods and types of interaction occurring in small groups with an emphasis on group discussion and decision-making.

**SPCH 230 Argumentation and Debate (3)** A study of the fundamental principles of reasoning, analysis, and evidence preparation of debate briefs and presentation of standard academic debate.

**SPCH 250 Introduction to Speech Communication Inquiry (3)** An introduction to the field of speech communication. Definitions, models, and contexts of communication; rhetorical theory and rhetorical criticism of discourse.

**SPCH 324 Communication and Gender (3)** The creation of images of male and female, and masculine and feminine, through communication, the differences in male and female communication behaviors and styles, and the implications of those images and styles for male-female transactions.

**SPCH 330 Argumentation and Public Policy (3)** Contemporary theories of argumentation with special emphasis on methods of formulating and critiquing public policy argument.

**SPCH 340 Communicating the Narrative (3)** The role of narratives in communicating messages and development of strategies to effectively communicate the narrative form through storytelling, oral reading, and anecdotes.

**SPCH 360 The Rhetoric of Black America (3)** An historical-critical survey of the rhetoric of Black Americans from the colonial period to the present.

**SPCH 383 Urban Communication (3)** A study of communication variations in the urban setting with emphasis on communication problems encountered in ethnic relations. Strategies for improving communication.

**SPCH 399 Honors Thesis (3)** *Nine hours of laboratory per week. Prerequisite: permission of department. For SPCH majors only. Repeatable to 6 credits.*

**SPCH 400 Research Methods in Speech Communication (3)** *Prerequisites: SPCH 250 and an introductory course in statistics.* Philosophy of scientific method; role of theory; research ethics; empirical research methods (measurement, sampling, design, analysis).

**SPCH 401 Interpreting Strategic Discourse (3)** Principles and approaches for practical analysis of discourse designed to shape audience opinion.

**SPCH 402 Communication Theory and Process (3)** *Recommended: SPCH 250.* Philosophical and conceptual analysis of speech communication theories.

**SPCH 420 Theories of Group Discussion (3)** Current theory, research and techniques regarding small group process. Group dynamics, leadership and decision-making.

**SPCH 423 Communication Processes in Conferences (3)** Group participation in conferences, methods of problem solving, semantic aspects of language, and the function of conferences in business, industry and government settings.

**SPCH 424 Communication in Complex Organizations (3)** Structure and function of communication within organizations: organizational climate and culture, information flow, networks and role relationships.

**SPCH 425 Negotiation and Conflict Management (3)** Role of communication in shaping negotiation and conflict processes and outcomes.

**SPCH 435 Theories of Interpersonal Communication (3)** *Prerequisite: SPCH 400 or permission of department.* Major theoretical approaches and research trends in the study of interpersonal communication.

**SPCH 453 The Power of Discourse in American Life (3)** The potential of language forms and strategic discourse to create, perpetuate, and alter patterns of political and cultural behavior. The influence of contemporary political and cultural discourse on public understanding, public policy, and day-to-day life.

**SPCH 455 Speechwriting (3)** The study of message strategies in order to research and develop effective speech texts appropriate to speakers and their audiences in various public contexts.

**SPCH 460 Public Life in American Communities, 1634-1900 (3)** 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.

**SPCH 461 Voices of Public Leadership in the Twentieth Century (3)** 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.

**SPCH 469 The Discourse of Social Movements (3-6)** Recommended: *SPCH 401. Junior standing. Repeatable to 6 credits if content differs.* Study of key social movements that have influenced American social and political life. In alternate years the Civil Rights Movement and the Rhetoric of Women's Suffrage and Abolitionism. Consideration of how groups excluded from or marginalized in American political life affect social change.

**SPCH 470 Listening (3)** The principles of listening behavior.

**SPCH 471 Public Communication Campaigns (3)** Prerequisite: *SPCH 200 or permission of department.* Diffusion theory and its implications for public communication campaigns.

**SPCH 472 Nonverbal Communication (3)** Nonverbal communication in human interaction theory and research on proxemics, kinesics and paralanguage as expression of relationship, affect and orientation within and across cultures.

**SPCH 475 Persuasion (3)** Bases of persuasion with emphasis on recent experimental developments in persuasion.

**SPCH 476 Language, Communication, and Action (3)** The nature of communication as symbolic action. Topics include language, meaning, intention, understanding, and consequences of communication.

**SPCH 477 Discourse Analysis (3)** Concepts of textual and discourse analysis applied to speech situations.

**SPCH 478 Speech Communication Colloquium (1)** Repeatable to 4 credits. Current trends and issues in the field of speech communication, stressing recent research methods. Recommended for senior and graduate student majors and minors in speech communication.

**SPCH 482 Intercultural Communication (3)** The major variables of communication in an intercultural context: cultural, racial and national differences; stereotypes; values; cultural assumptions; and verbal and nonverbal channels.

**SPCH 489 Topical Research (1-3)** Prerequisite: *permission of department. Repeatable to 6 credits.* Individualized research projects conducted with a faculty sponsor.

**SPCH 498 Seminar (3)** Prerequisite: *permission of instructor.* Senior standing. Present-day speech research.

## STAT—Statistics and Probability

**STAT 100 Elementary Statistics and Probability (3)** Prerequisite: *permission of Math Department based on satisfactory score on Math placement exam or MATH 110 or MATH 115. Not open to students who have completed MATH 111 or any MATH or STAT course with a prerequisite of MATH 141. Credit will be granted for only one of the following: MATH 111 or STAT 100.* 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.

**STAT 400 Applied Probability and Statistics I (3)** Prerequisite: *MATH 141. Not acceptable toward graduate degrees in STAT, MAPL, or MATH. Credit will be granted for only one of the following: STAT 400 or ENEE 324.* Random variables, standard distributions, moments, law of large numbers and central limit theorem. Sampling methods, estimation of parameters, testing of hypotheses.

**STAT 401 Applied Probability and Statistics II (3)** Prerequisite: *STAT 400.* 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. (Not acceptable toward graduate degrees in STAT, MAPL, or MATH.)

**STAT 410 Introduction to Probability Theory (3)** Prerequisite: *MATH 240; and MATH 241.* Probability and its properties. Random variables and distribution functions in one and several dimensions. Moments. Characteristic functions. Limit theorems.

**STAT 411 Introduction to Stochastic Processes (3)** Prerequisite: *STAT 400.* Elementary stochastic processes. Renewal process, random walks, branching process, discrete Markov chains, first passage times, Markov chains with a continuous parameter, birth and death processes. Stationary processes.

**STAT 420 Introduction to Statistics (3)** Prerequisite: *STAT 410 or equivalent.* Point estimation, sufficiency, completeness, Cramer-Rao inequality, maximum likelihood. Confidence intervals for parameters of normal distribution. Hypotheses testing, most powerful tests, likelihood ratio tests. Chi-square tests, analysis of variance, regression, correlation. Nonparametric methods.

**STAT 440 Sampling Theory (3)** Prerequisite: *STAT 401 or STAT 420.* Simple random sampling. Sampling for proportions. Estimation of sample size. Sampling with varying probabilities. Sampling: stratified, systematic, cluster, double, sequential, incomplete.

**STAT 450 Regression and Analysis of Variance (3)** Prerequisite: *STAT 401 or STAT 420.* One, two, three and four-way layouts in analysis of variance, fixed effects models, linear regression in several variables, Gauss-Markov Theorem, multiple regression analysis, experimental designs.

**STAT 464 Introduction to Biostatistics (3)** Prerequisite: *one semester of calculus. 56 semester hours. Junior standing.* 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. Not acceptable for credit towards degrees in mathematics or statistics.

**STAT 498 Selected Topics in Statistics (1-6)** Prerequisite: *permission of department. Repeatable to 16 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.

## SURV—Survey Methodology

**SURV 410 Introduction to Probability Theory (3)** Prerequisite: *MATH 240; and MATH 241 or permission of department. Credit will be granted for only one of the following: SURV 410 or STAT 410.* Probability and its properties. Random variables and distribution functions in one and several dimensions. Moments, characteristic functions, and limit theorems.

**SURV 420 Introduction to Statistics (3)** Prerequisite: *SURV 410 or STAT 410. Not open to students who have completed STAT 420.* Mathematical statistics, presenting point estimation, sufficiency, completeness, Cramer-Rao inequality, maximum likelihood, confidence intervals for parameters of normal distributions, chi-square tests, analysis of variance, regression, correlation, and nonparametric methods.

**SURV 440 Sampling Theory (3)** Prerequisite: *STAT 401 or STAT 420. Not open to students who have completed STAT 440.* 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.

## THET—Theatre

**THET 110 Introduction to the Theatre (3)** Introduction to the people of the theatre; actors, directors, designers and backstage personnel. The core and characteristics of a play script; theatrical forms and styles; and theatre history.

**THET 111 Making Theatre: Art and Scholarship (3)** Prerequisite: *THET 110 or permission of department.* Systematic introduction to the tools and techniques used by theatre practitioners.

**THET 120 Acting I (3)** Two hours of lecture and two hours of laboratory per week. Prerequisite: *THET 110 or permission of department.* Basic principles of acting techniques. Exercises structured to develop the student's concentration, imagination, sense and emotional memory. Textual analysis, character analysis and scene study; and the application of these techniques to character portrayal through performance of short scenes.

**THET 170 Stagecraft (3)** A survey of the fundamentals of theatrical productions, with emphasis in the construction of scenery. Practice work on University Theatre and experimental theatre productions.

**THET 185 Makeup (2)** The theory and practice of stage makeup covering character analysis, facial anatomy, application of makeup and period styles in theatrical makeup.

**THET 195 Gender and Performance (3)** Recommended: *THET 110 and THET 111.* Intersections between recent research on gender and public performance through history, including theatre, film, and television.

**THET 221 Speech For the Stage (3)** Prerequisites: *THET 120 and by audition and permission of department.* Development of the vocal techniques required for theatrical production including projection, resonance, and character voices. The study and acquisition of the diction of the American stage.

**THET 273 Scenographic Techniques (3)** Prerequisite: *THET 170 and permission of department.* An analysis of the graphic approaches used in various stages of planning and execution of a design for the theatre. Study of drafting techniques and presentational conventions, unique to the theatre.

**THET 290 American Theatre 1750 to 1890 (3)** Formerly *THET 310.* Tracing the evolution of the American theatre from the beginning, through 1890, aligning this theatre with the major shifts and movements of American society itself, and arriving at the uniquely American theatre and culture.

**THET 291 American Theatre 1890-Present (3)** Formerly *THET 310.* Tracing the evolution of the American theatre during the twentieth century, aligning this theatre with the major shifts and movements of American society itself, and arriving at the uniquely American theatre and culture of today.

**THET 320 Acting II (3)** Prerequisites: *THET 111; and THET 120; and by audition and permission of department.* Continuation of *THET 120.* Emphasis on the fundamentals of acting: personalization, objectives, and characterization.

**THET 330 Play Directing I (3)** Prerequisites: *THET 111 and THET 120 and THET 170 and permission of department.* A lecture-laboratory course dealing with the techniques of coordination, 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.

**THET 350 American Musical Comedy (3)** The evolution of musical comedy through opera to early American extravaganzas and minstrels to the musicals of the 1920's and 1930's. The development and highlights of the form since 1940. The function and form of the libretto, music and lyrics, and the roles of the creative personnel of a musical production. Workshops in performance skills.

**THET 372 Stage Property Design (3)** Prerequisite: *THET 170 or permission of department.* Materials and techniques for the design and execution of stage properties with special emphasis on period research, special materials, and special effects.

**THET 375 Scenic Design I (3)** Prerequisite: *THET 273 or permission of department.* A study of design theory and style. Methods and techniques of coordination on all elements of scenic design for theatre.

**THET 390 Clothing and Culture (3)** Formerly *TEXT 345.* The development of ancient and non-western forms of dress, including Greek, Roman, Early European, Middle Eastern, Far Eastern, and African costume. Emphasis on clothing as an expression of culture and as an indicator of cultural change.

**THET 420 Acting III (3)** Prerequisites: *THET 221 and THET 320 and by audition and permission of department.* Exploration and application of the techniques necessary for the preparation and performance of Shakespeare and other drama.

**THET 421 Movement for Actors (3)** Prerequisite: *permission of department.* Studies and intensive exercises to aid the acting student in understanding physical and emotional energy flow, body placement, alignment and body image. The physical aspects of character.

**THET 425 Acting IV, Advanced Scene Study (3)** Two hours of lecture and two hours of laboratory per week. Prerequisites: *THET 420, and by audition, and permission of department.* Course seeks to bring together the work of previous performance courses and help the student discover a personal process in creating character in various genre of plays.

**THET 429 Actor's Studio (1-3)** Prerequisite: *permission of department. Repeatable to 6 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.

**THET 430 Play Directing II (3)** Prerequisite: *THET 330 or permission of department.* Discussion of the preparation procedures and rehearsal practices necessary for the presentation of a variety of theatrical styles and forms. Emphasis on

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understanding the relationship between the director, the actor, the script and the audience. A series of student directed scenes supplemented by attendance at theatre productions.

**THET 440 Directing for the Screen (3)** *Prerequisite:* THET 330. The director's role in using the camera to interpret scenes visually, in directing actors and in being fundamentally responsible for all aspects of production.

**THET 451 Musical Comedy Workshop (3)** *Prerequisites:* audition and permission of department. Development of the ability to move, act and express through the media of lyric and music.

**THET 460 Theatre Management I (3)** *Prerequisites:* THET 111 or permission of department. The practical tools of theatre management: production philosophies, selecting and balancing a season, tickets and operations, budgeting, graphic arts production, advertising, publicity and other promotional devices.

**THET 461 Theatre Management II (3)** *Prerequisites:* THET 110 and THET 111 or permission of department. Case studies, discussions, lectures and projects concerning advanced theatre management decision making and administration, including such areas as personnel relations, contract negotiations, theatrical unions, fund raising, touring, audience development and public relations.

**THET 471 Scenic Design II (3)** *Prerequisite:* THET 375 and permission of department. Study of styles and techniques in scenic design. Emphasis on individual projects and multi-use theatres.

**THET 473 Scene Painting (3)** *Prerequisite:* THET 170 or permission of department. Scene painting techniques and materials. Three-dimensional realistic scenery and non-realistic two-dimensional projects.

**THET 474 Stage Management (3)** *Prerequisite:* permission of department. Intensive practical study of the techniques and procedures for stage management.

**THET 475 Period Style for the Theatre: Fashion and Decor (3)** *Prerequisites:* THET 170 and permission of department. A study of environmental decor, historic ornament and fashion through the ages and their practical application for theatrical production.

**THET 476 Lighting Design I (3)** *Prerequisite:* THET 273 or permission of department. A study of the theories of electrification, instruments, design, color, and control for the stage. Practical work on productions.

**THET 477 Lighting Design II (3)** *Prerequisites:* THET 476; and permission of department. Advanced products in lighting design, theoretical and practical intensive study of script analysis and design process.

**THET 479 Theater Workshop (1-3)** *Prerequisite:* THET 476 and permission of department. Repeatable to 6 credits if content differs. Supervised participation in the areas of scenic design, properties, costuming or wardrobe, lighting, technical theatre, stage management, and sound.

**THET 480 Stage Costume History and Design I (3)** 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.

**THET 481 Stage Costume History and Design II (3)** *One hour of lecture and six hours of laboratory per week. Prerequisites:* THET 480; and permission of department. An advanced study of costume design and interpretation leading to understanding and facility in design of stylized productions. Emphasis on design for musical comedy, dance theatre, opera and various non-traditional forms of theatre production.

**THET 484 Rendering for the Theatre (3)** *Two hours of lecture and two hours of laboratory per week. Prerequisite:* permission of department. Study in rendering techniques and graphics skills for theatrical design presentation. The course is designed for the student to develop rendering and drawing skills which will result in a portfolio of their work for presentation.

**THET 486 Stage Costume Construction I (3)** *Prerequisite:* permission of department. 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.

**THET 487 Stage Costume Construction II (3)** *Prerequisite:* THET 486 or permission of department. Study and practical experience in the construction of stage costumes, props and accessories. Pattern development by draping, millinery, crafts and pattern developing through draping.

**THET 490 History of the Theatre: Classical Antiquity to Mid-Seventeenth (3) Century** *Prerequisites:* THET 110 and THET 111 or permission of department. Evolution of the theatre from primitive origins, through the early Renaissance with emphasis on

playwrights and plays, theatre architecture and decor, and significant personalities. Extensive use of graphic material, play reading, related theatre-going.

**THET 491 History of the Theatre: Late Seventeenth to Mid-Nineteenth Century (3)** *Prerequisite:* THET 490. Trends in drama and theatrical production from the late Renaissance to Ibsen.

**THET 492 History of Theatre: Late Nineteenth Century to the Present (3)** *Prerequisite:* THET 111 or permission of department. Trends in drama and theatrical production from Ibsen to the present.

**THET 495 History of Theatrical Theory and Criticism (3)** The development of theatrical theory and criticism from the Greeks to the modern theorists. The philosophical basis of theatre as an art form. Important theorists and the practical application of their theories in either play scripts or theatrical productions. Required attendance at selected live theatre productions.

**THET 496 African-American Women Filmmakers (3)** *Also offered as WMST 496. Credit will be granted for only one of the following:* THET 496 or WMST 496. 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.

**THET 497 Non-Traditional Theatre (3)**

**THET 499 Independent Study (1-3)** *Prerequisite:* permission of department. Repeatable to 6 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.

## UMEI—Maryland English Institute

**UMEI 001 English as a Foreign Language: Beginning (12)** *25 hours of discussion/recitation per week.* 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.

**UMEI 002 English as a Foreign Language: Intermediate I (12)** *25 hours of discussion/recitation per week.* 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.

**UMEI 003 English as a Foreign Language: Intermediate II (12)** *25 hours of discussion/recitation per week.* 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.

**UMEI 004 English as a Foreign Language: Intermediate III (12)** *25 hours of discussion/recitation per week.* 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.

**UMEI 005 Advanced English as a Foreign Language (6)** *12 hours of discussion/recitation per week.* 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 with special emphasis on research skills and use of the University library. 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.

**UMEI 006 English Pronunciation (1)** *Three hours of discussion/recitation per week.* Individualized class for the non-native speaker of English. Diagnosis of individual pronunciation problems. Practice in the correct pronunciation of English sounds and improvement of ability to speak English with proper stress and intonation patterns. 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.

**UMEI 007 Advanced Writing for International Students (3)** *Open to graduate students only. Special fee. This course does not carry credit towards any degree at the University and does not count in the retention plan.* A writing skills course for the non-native speaker of English with a good command of spoken English.

**UMEI 008 Advanced Oral Communication Skills (1)** *Four hours of discussion/recitation per week. Prerequisite:* permission of department. For advanced non-native speakers of English. Practice in speaking skills relevant to the academic situation. Improvement of speaking skills for various classroom activities such as participating in discussions, making appointments with professors, asking for information and presenting oral reports. 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.

## UNIV—World Courses

**UNIV 118 Topics in Creativity (3)** *Two hours of lecture and one hour of discussion/recitation per week. Repeatable to 3 credits if content differs.* Interdisciplinary course team taught by faculty from different disciplines. Study of creative personalities in a variety of fields. The fields included may vary from semester to semester. Intended for freshmen.

**UNIV 128 Topics in Contemporary Science (3)** *Two hours of lecture and one hour of discussion/recitation per week. Repeatable to 3 credits if content differs.* Interdisciplinary course team taught by faculty from different disciplines. Introduction to the broad subject of scientific origins and their relationships to the fundamental questions of our own existence.

**UNIV 138 Topics in the Environment (3)** *Two hours of lecture and one hour of discussion/recitation per week. Repeatable to 3 credits if content differs.* Study of the interplay of engineering, the environment, and people in the context of technological changes.

## URSP—Urban Studies and Planning

**URSP 100 Introduction to Urban Studies and Planning (3)** *Formerly URBS 100.* Contemporary urban patterns, trends and problems. Major urban issues, such as: population change, the economy, land use, housing, neighborhood development, fiscal and unemployment crises, and social, environmental, and political controversies of metropolitan areas. International urbanization patterns and policies.

**URSP 320 Planning and the Contemporary City (3)** *Prerequisite:* URSP 240. *Credit will be granted for only one of the following:* URSP 320, URBS 220, or URBS 320. *Formerly URBS 320.* A survey of major social, economic, technological and environmental factors influencing the current form of the United States city and the well being of its inhabitants. Emphasis on understanding ways of analyzing urban issues and evaluating alternative planning and policy options.

**URSP 372 Diversity and the City (3)** 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.

**URSP 397 Honors Independent Reading (3)** *Prerequisite:* admission to honors program in URSP or other departments. *Formerly URBS 397.* Directed reading in contemporary urban studies.

**URSP 399 Independent Study (1-3)** *Prerequisite:* one URSP course and permission of department. *Junior standing. Repeatable to 6 credits if content differs. Formerly URBS 399.* Directed research and study of selected aspects of urban affairs.

**URSP 410 The Development of the American City (3)** *Prerequisite:* permission of department. *Formerly URBS 410.* History of urban policy and city planning in the U.S. Response to changing definitions of urban problems and political issues. Changes in technology, interests, and theories of planners and policy makers.

**URSP 465 Urban Life and Change: International Perspective (3)** *Prerequisite:* completion of two CORE Behavioral and Social Sciences courses. Using a comparative approach, this course explores the diversity and similarity in patterns of urbanization, urban life, and urban change throughout the world. Variations are considered at the urban and sub-urban levels; special attention is given to urban areas in less-industrialized countries.

**URSP 488 Selected Topics in Urban Studies and Planning (1-3)** *Prerequisite:* permission of department. *Repeatable to 6 credits if content differs. Formerly URBS 488.* Topics of special interest to advanced urban studies students.

**URSP 498 Honors Seminar (3)** *Prerequisite:* admission to honors program in URSP and other departments. *Junior standing. Repeatable to 6 credits if content differs. Formerly URBS 498.*

Individual reading and research, and group discussion dealing with selected major contemporary urban issues.

**URSP 499 Honors Thesis (3-6)** *Prerequisite: admissions to honors program in URSP or other departments. Formerly URBS 499.* Individual reading and research, and the writing of an original paper on an urban topic of the student's choice under the guidance of a faculty member.

## WMST—Women's Studies

**WMST 200 Introduction to Women's Studies: Women and Society (3)** *Prerequisite: ENGL 101 or equivalent.* An interdisciplinary study of the status, roles, and experiences of women in society. Sources from a variety of fields such as literature, psychology, history, and anthropology, focusing on the writings of women.

**WMST 210 Women in America to 1880 (3)** *Also offered as HIST 210.* Credit will be granted for only one of the following: WMST 210 or HIST 210. An examination of the economic, family, and political roles of colonial, slave, immigrant and frontier women in America from pre-industrial colonial period through the early stages of nineteenth century industrialization and urbanization.

**WMST 211 Women in America Since 1880 (3)** *Also offered as HIST 211.* Credit will be granted for only one of the following: WMST 211 or HIST 211. 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.

**WMST 212 Women in Western Europe 1750-Present (3)** *Also offered as HIST 212.* Credit will be granted for only one of the following: WMST 212 or HIST 212. 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.

**WMST 241 Women Writers of French Expression in Translation (3)** *Also offered as FREN 241.* Credit will be granted for only one of the following: WMST 241 or FREN 241. Works and ideas of 20th century women writers of French in Canada, Africa, the Caribbean, and France. Taught in English.

**WMST 250 Introduction to Women's Studies: Women, Art and Culture (3)** *Prerequisite: ENGL 101 or equivalent.* An examination of women's creative powers as expressed in selected examples of music, film, art, drama, poetry, fiction, and other literature. Explores women's creativity in relation to families, religion, education, ethnicity, class, sexuality, and within a cultural tradition shaped by women.

**WMST 255 Introduction to Literature by Women (3)** *Also offered as ENGL 250.* Credit will be granted for only one of the following: WMST 255 or ENGL 250. Images of women in literature by and about women.

**WMST 275 World Literature by Women (3)** *Also offered as CMLT 275.* Credit will be granted for only one of the following: WMST 275 or CMLT 275. Comparative study of selected works by women writers of several countries, exploring points of intersection and divergence in women's literary representations.

**WMST 281 Women in German Literature and Society (3)** *Also offered as GERM 281.* Credit will be granted for only one of the following: WMST 281 or GERM 281. A study of changing literary images and social roles of women from the beginning of the 19th century to the present.

**WMST 298 Special Topics in Women's Studies (1-3)** *Repeatable to 6 credits if content differs.*

**WMST 300 Feminist Reconceptualizations of Knowledge (3)** *Prerequisite: permission of department. For WMST majors only. Formerly WMST 490.* An examination of how interdisciplinary study of women and gender has generated new questions, challenged traditional methodologies and offered insights on the ways we come to learn, know, and teach; and an exploration of the impact of feminist thinking on various disciplines.

**WMST 313 Women and Science (3)** *Prerequisite: one science course. Also offered as ZOOL 313.* Credit will be granted for only one of the following: WMST 313 or ZOOL 313. Participation in and contribution of women to the sciences. Influence of self-images and societal expectations on women's participation, intersection of scholarship with science.

**WMST 320 Women in Classical Antiquity (3)** *Also offered as CLAS 320.* Credit will be granted for only one of the following: WMST 320 or CLAS 320. 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.

**WMST 325 The Sociology of Gender (3)** *Prerequisite: 3 credits of sociology. Also offered as SOCY 325.* Credit will be granted for only one of the following: WMST 325 or SOCY 325. Institutional bases of gender roles and gender inequality, cultural perspectives on gender, gender socialization, feminism, and gender-role change. Emphasis on contemporary American society.

**WMST 326 Biology of Reproduction (3)** *Prerequisite: BIOL 105 or permission of department. Also offered as ZOOL 326.* Credit will be granted for only one of the following: WMST 326 or ZOOL 326. 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.

**WMST 336 Psychology of Women (3)** *Prerequisite: PSYC 100. Also offered as PSYC 336.* Credit will be granted for only one of the following: WMST 336 or PSYC 336. A study of the biology, lifespan development, socialization, personality, mental health, and special issues of women.

**WMST 348 Literary Works by Women (3)** *Prerequisite: two lower-level English courses, at least one in literature; or permission of department. Repeatable to 6 credits if content differs. Also offered as ENGL 348.* Credit will be granted for only one of the following: WMST 348 or ENGL 348. The context, form, style and meaning of literary works by women.

**WMST 350 Feminist Pedagogy (6)** *Prerequisite: permission of department.* General application of feminist methodology to teaching and communication skills, teaching strategies, motivation, classroom dynamics and knowledge of students' development and learning styles.

**WMST 360 Caribbean Women (3)** 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.

**WMST 380 Feminist Analysis of the Workplace (6)** *Prerequisite: permission of department.* An examination of the world of work from a feminist perspective through theory and experience. Designed to provide students with experiences in work situations that have social, economic, educational and/or political impact on women's lives. Students will develop the skill to theoretically analyze their experience and practically implement feminist models in the workplace.

**WMST 400 Theories of Feminism (3)** *Prerequisite: WMST 200 or WMST 250.* A study of the multiplicity of feminist theories which have been developed to explain women's position in the family, the workplace, and society. Major feminist writings are considered in the context of their historical moment and in the context of the intellectual traditions to which they relate.

**WMST 408 Literature by Women Before 1800 (3)** *Prerequisite: two English courses in literature or permission of department. Repeatable to 9 credits if content differs. Also offered as ENGL 408.* Credit will be granted for only one of the following: WMST 408 or ENGL 408. Selected writings by women in the medieval and early modern era.

**WMST 410 Women of the African Diaspora (3)** 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.

**WMST 420 Asian American Women: The Social Construction of Gender (3)** 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 within the lives of Asian American women.

**WMST 430 Gender Issues in Families (3)** *Prerequisite: SOCY 100 or SOCY 105 or PSYC 100. Also offered as FMST 430.* Credit will be granted for only one of the following: WMST 430 or FMST 430. The development of historical, cultural, developmental and psychosocial aspects of masculinity and femininity with the context of contemporary families and the implications for interpersonal relations.

**WMST 436 The Legal Status of Women (3)** *Prerequisite: GVPT 231. Also offered as GVPT 436.* Credit will be granted for only one of the following: WMST 436 or GVPT 436. An examination of judicial interpretation and application of common, statutory, and constitutional law as these affect the status of women in American society.

**WMST 444 Feminist Critical Theory (3)** *Prerequisite: ENGL 250 or WMST 200 or WMST 250. Also offered as ENGL 444.* Credit will be granted for only one of the following: WMST 444 or ENGL 444. Issues in contemporary feminist thought that have particular relevance to textual studies, such as theories of language, literature, culture, interpretation, and identity.

**WMST 448 Literature by Women of Color (3)** *Prerequisite: two English courses in literature or permission of department. Repeatable to 9 credits if content differs. Also offered as ENGL 448.* Credit will be granted for only one of the following: WMST 448 or ENGL 448. Literature by women of color in the United States, Britain, and in colonial and post-colonial countries.

**WMST 452 Women in the Media (3)** *Also offered as JOUR 452.* Credit will be granted for only one of the following: WMST 452 or JOUR 452. Participation and portrayal of women in the mass media from colonial to contemporary times.

**WMST 458 Literature by Women After 1800 (3)** *Prerequisite: two English courses in literature or permission of department. Repeatable to 9 credits if content differs. Also offered as ENGL 458.* Credit will be granted for only one of the following: WMST 458 or ENGL 458. Selected writings by women after 1800.

**WMST 466 Feminist Perspectives on Women in Art (3)** *Also offered as ARTH 466.* Credit will be granted for only one of the following: WMST 466 or ARTH 466. Principal focus on European and American women artists of the 19th and 20th centuries, in the context of the new scholarship on women.

**WMST 468 Selected Topics in Women's History (3)** *Repeatable to 6 credits if content differs. Also offered as HIST 458.* Credit will be granted for only one of the following: WMST 468 or HIST 458.

**WMST 471 Women's Health (3)** *Also offered as HLTH 471.* Credit will be granted for only one of the following: WMST 471 or HLTH 471. 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.

**WMST 488 Senior Seminar (3)** *Prerequisite: permission of department. Repeatable to 9 credits if content differs.* Seminar for advanced majors in women's studies or other students with appropriate preparation. Interdisciplinary topics will vary each semester.

**WMST 492 History of the American Sportswoman: Institutions and Issues (3)** *Prerequisite: KNES 293. Also offered as KNES 492.* Credit will be granted for only one of the following: WMST 492 or KNES 492. Women's involvement in and contributions to America's sporting culture, especially in the 19th and 20th centuries. Pursued in depth are the interactions among historical perceptions of women's bodies, women's roles, responsibilities, and potential and their sporting lives. Also the effects of role stereotyping and opportunities for and directions taken in developing sport organizations, and other issues affecting women's involvement in institutional sport. Examines gender as a system of relations in the sport nexus.

**WMST 493 Jewish Women in International Perspective (3)** *Prerequisite: one course in Women's Studies, preferably WMST 200 or WMST 250. Also offered as JWST 492.* Credit will be granted for only one of the following: WMST 493 or JWST 492. Using memoirs, essays, poetry, short stories, films, music and the visual arts, course will interrogate what it means/has meant to define oneself as a Jewish woman across lines of difference. Focus is largely on the secular dimensions of Jewish women's lives but will also explore the implications of Jew law and religious practices for Jewish women. Our perspective will be international, including Ashkenazi and Sephardi women.

**WMST 494 Lesbian Communities and Differences (3)** *Prerequisite: one course in Women's Studies, preferably WMST 200 or WMST 250.* The meanings of lesbian communities across many lines of difference. Using lesbian-feminists of the 1970s as a starting point, we will look both back and forward in history, tracing changes and exploring the meanings of these in their social and historical contexts.

**WMST 496 African-American Women Filmmakers (3)** *Also offered as THET 496.* Credit will be granted for only one of the following: WMST 496 or THET 496. 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.

**WMST 498 Advanced Special Topics in Women's Studies (3)** *Prerequisite: permission of department. Repeatable to 9 credits if content differs.*

**WMST 499 Independent Study (1-3)** *Prerequisite: Three credits in women's studies courses and permission of department.* 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.

## ZOOL—Zoology

The following courses may involve the use of animals. Students who are concerned about the use of animals in teaching have the responsibility to contact the instructor, prior to course enrollment, to determine whether animals are to be used in the

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course, whether class exercises involving animals are optional or required and what alternatives, if any, are available. The Zoology department enforces course prerequisites. Students who do not meet the course prerequisites will be administratively dropped from the course.

**ZOOL 181 Life in the Oceans (3)** Prerequisite: an introductory course in biological principles. Consideration of major groups of animals and plants in various marine environments and humanity's potential uses and misuses of the ocean. Not accepted for credit towards the zoology major.

**ZOOL 201 Human Anatomy and Physiology I (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: BIOL 105 or equivalent. Anatomy and physiology of the skeletal, muscular, neural, endocrine, and sensory systems. Not accepted as credit toward the zoology major.

**ZOOL 202 Human Anatomy and Physiology II (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: ZOOL 201 or permission of department. Anatomy and physiology of the cardiovascular, respiratory, immune, digestive, urinary and reproductive systems. Not accepted as credit toward the zoology major.

**ZOOL 210 Animal Diversity (4)** Three hours of lecture and three hours of laboratory per week. Prerequisite: BIOL 106. Comparative study of the diversity of animal form and function, including analysis of structures and mechanisms which different organisms utilize to cope with similar requirements of life.

**ZOOL 211 Cell Biology and Physiology (4)** Three hours of lecture and three hours of laboratory per week. Prerequisites: BIOL 105; and CHEM 103. 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.

**ZOOL 299 Supplemental Study in Zoology (1-3)** Prerequisite: permission of department. Repeatable to 6 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.

**ZOOL 301 Biological Issues and Scientific Evidence (3)** Prerequisite: BIOL 105. Scientific inquiry in biology as exemplified by topics such as Mendelian and molecular genetics. Implications of genetical research for society. The use of DNA fingerprinting in court; scientific vs. alternative medicine; evolution vs. creationism. Not for biology majors.

**ZOOL 308 Honors Seminar (1)** Prerequisite: participation in zoology department honors program. Repeatable to 4 credits. Guided discussion of topics of current interest.

**ZOOL 309 Honors Independent Study (1-4)** Prerequisite: participation in the zoology department honors program. Repeatable to 12 credits. Study of classical material by way of guided independent study and laboratory experiments.

**ZOOL 312 The Biology of Conservation and Extinction (3)** Prerequisite: BIOL 106. Ecology, evolutionary biology and paleontology will be applied to the study of conservation, species invasions and extinction.

**ZOOL 313 Women and Science (3)** Prerequisite: one science course. Also offered as WMST 313. Credit will be granted for only one of the following: ZOOL 313 or WMST 313. Participation in and contribution of women to the sciences. Influence of self-images and societal expectations on women's participation, intersection of scholarship with science. ZOOL 313 is not accepted for credit for any major in the Life Sciences.

**ZOOL 318 Honors Research (1-2)** Prerequisite: participation in the zoology department honors program. Repeatable to 8 credits. A laboratory research problem; required each semester during honors participation and culminating in a honors thesis.

**ZOOL 319 Special Problems in Zoology (1-4)** Prerequisite: a major in zoology or biological sciences, a minimum of 3.0 GPA in the biological sciences. Repeatable to 8 credits if content differs. Research or integrated reading in zoology.

**ZOOL 322 Eukaryotic Genetics Laboratory (2)** Three hours of laboratory and one hour of discussion/recitation per week. Prerequisite: BIOL 222 or equivalent. Also offered as BIOL 322. Credit will be granted for only one of the following: ZOOL 213, BIOL 322 or ZOOL 322. Experiments using lower and higher eukaryotes will be done by the students. Exercises will apply the genetic concepts underlying Mendelian and chromosomal theory of heredity; gene-environment interactions and the induction and detection of mutations. Major emphasis will be on the analysis and interpretation of data as well as clarity and completeness of the laboratory records.

**ZOOL 326 Biology of Reproduction (3)** Prerequisite: BIOL 105 or permission of department. Also offered as WMST 326. Credit will be granted for only one of the following: ZOOL 326 or WMST 326. 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.

**ZOOL 328 Selected Topics in Zoology (1-4)** Repeatable to 6 credits if content differs. Lectures, seminars, mini-courses and other special instruction in various zoological subjects.

**ZOOL 329 Instructional Assistance Practicum (1-2)** Prerequisite: permission of department. Repeatable to 3 credits if content differs. Students serve as instructional assistants in selected undergraduate zoology courses. Roles and responsibilities are determined on a course-specific basis, and approved by the Director of Undergraduate Studies, Zoology Department. Credit cannot be applied to the requirements of any biological sciences major.

**ZOOL 346 Human Genetics and Society (3)** Prerequisite: two college courses in the natural sciences and/or mathematics. For non-biological science students seeking an understanding of genetics, especially as it relates to humans and the decisions they may have to make as individuals and members of society. Study of genes, their mutation and transmittal, and the effect of recent discoveries on present and future generations. Not accepted for credit towards the zoology or general biological sciences and general biological sciences majors.

**ZOOL 360 Principles of Animal Behavior (3)** Two hours of lecture and one hour of discussion/recitation per week. Prerequisites: BIOL 105 and BIOL 106 and BIOL 222. 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.

**ZOOL 368 Laboratory Techniques in Behavioral Endocrinology (2-4)** One hour of lecture and six hours of laboratory per week. Pre- or corequisite: ZOOL 326 or permission of department. Repeatable to 4 credits if content differs. Techniques for analyzing physiological bases of behavior under lab and semi-natural conditions including handling and rearing of animals, surgical techniques and direct, video, and computer-assisted behavioral observations.

**ZOOL 375 Biological Oceanography (3)** Prerequisites: BIOL 106 and ZOOL 210. Fundamentals of biological processes in the world's oceans; emphasizes ecology of marine organisms and how ocean chemistry and ocean circulation influence biological processes such as production, dispersal, and food chain dynamics.

**ZOOL 381 Natural History of the Chesapeake Bay (3)** Three lectures per week and at least one Saturday field trip. Prerequisite: a course in biological sciences or permission of department. 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.

**ZOOL 382 Chesapeake Bay Laboratory (2)** One hour of lecture, two hours of laboratory, and eight hours of fieldwork per week. Pre- or corequisite: ZOOL 381. Junior standing. A laboratory and field experience of the watershed and Chesapeake Bay biota. Laboratories will be used to identify the biota collected by students on Thursday and Saturday field trips to a wide variety of collecting sites available along the 200 mile length of the Chesapeake Bay.

**ZOOL 384 Aquatic Biology (4)** Two hours of lecture and six hours of laboratory per week. Prerequisites: BIOL 106, and ZOOL 210. Formerly ZOOL 480. Basic concepts of freshwater and marine biology. Relationship of animals to their environment.

**ZOOL 390 Vertebrate Zoology (3)** Prerequisites: BIOL 106 and ZOOL 210 or permission of department. An introduction to the natural history of vertebrates, their evolutionary history, patterns of geographic distribution and systematics.

**ZOOL 391 Vertebrate Zoology Field Trips (1)** Three hours of laboratory per week. Prerequisites: BIOL 106 and ZOOL 210 or permission of department. Corequisite: ZOOL 390. Field trips to observe vertebrates and to institutions where scientific research on vertebrates is being conducted.

**ZOOL 396 Biology of Extinct Animals (3)** Prerequisites: BIOL 106 and ZOOL 210. 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.

**ZOOL 402 Neural Systems (3)** Prerequisite: ZOOL 211. Neural development, followed by sensory, motor and integrative system organization in the central nervous system.

**ZOOL 410 Cell Biology Lectures (3)** Prerequisites: ZOOL 211 and BIOL 222 and CHEM 233. Credit will be granted for only one of the following: ZOOL 410, ZOOL 411 or PBIO 400. Molecular and biochemical bases of cellular organization and function in eukaryotes.

**ZOOL 411 Cell Biology (4)** Three hours of lecture and four hours of laboratory per week. Prerequisites: ZOOL 211 and BIOL 222 and CHEM 233. Also offered as PBIO 400. Credit will be granted

for only one of the following: ZOOL 410, ZOOL 411 or PBIO 400. Molecular and biochemical bases of cellular organization and function in eukaryotes.

**ZOOL 413 Biophysics (3)** Prerequisite: ZOOL 211; and (PHYS 122 or PHYS 142); and (MATH 140 or MATH 220). An introduction to the ideas and methods used in biophysics to analyze the functional components of cells and tissues as physical-chemical systems.

**ZOOL 415 Cell Differentiation (3)** Prerequisites: ZOOL 211 and BIOL 222. The processes by which cells become differentiated from each other during development, with an emphasis on the biochemical and ultrastructural mechanisms of these changes.

**ZOOL 416 Biology of Cancer (3)** Prerequisites: (ZOOL 211 and BIOL 222) or permission of department. Causes and consequences of neoplastic transformations at the biochemical and cellular levels.

**ZOOL 417 Biology of the Human Genome (3)** Prerequisite: BIOL 222. Recommended: ZOOL 211. New approaches to studying human genetics and its application to basic biology and medicine. New medical treatments and genetic screening. Ethical, economic, and moral questions of availability, cost, and confidentiality.

**ZOOL 420 Neurophysiology Lectures (3)** Prerequisites: ZOOL 211 and CHEM 233 and PHYS 122. Credit will be granted for only one of the following: ZOOL 420 or ZOOL 421. The physiology of nerves, muscles and sensory receptors and aspects of central nervous system physiology.

**ZOOL 421 Neurophysiology (4)** Three hours of lecture and three hours of laboratory per week. Prerequisites: ZOOL 211; and CHEM 233; and PHYS 122. Credit will be granted for only one of the following: ZOOL 420 or ZOOL 421. The physiology of nerves, muscles and sensory receptors and aspects of central nervous system physiology.

**ZOOL 422 Mammalian Physiology (4)** Three hours of lecture and two hours of discussion/recitation per week. Prerequisites: ZOOL 211 and CHEM 233 or permission of department. 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 ZOOL 423).

**ZOOL 423 Mammalian Physiology Lab (2)** Four hours of laboratory per week. Corequisite: ZOOL 422. Laboratory exercises in experimental mammalian physiology.

**ZOOL 425 Mathematical Biology (4)** Three hours of lecture and three hours of laboratory per week. Prerequisites: MATH 220 and MATH 221. Mathematical methods for 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.

**ZOOL 426 General Endocrinology (3)** Prerequisites: ZOOL 211; and CHEM 233; and CHEM 243. Functions and the functioning of the endocrine glands of animals with special reference to the vertebrates.

**ZOOL 430 Developmental Biology (3)** Prerequisites: ZOOL 211 and BIOL 222. 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.

**ZOOL 440 Evolution (3)** Prerequisite: BIOL 106. Understanding evolution and its role in changing and creating biological species. The mechanisms of evolution are examined from a population and genetic viewpoint. The importance of natural selection, genetic drift, mutation and migration is discussed.

**ZOOL 441 Molecular Evolution (3)** Prerequisite: BIOL 222 (genetics) or permission of department. 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.

**ZOOL 446 Molecular Genetics (3)** Prerequisites: a course in genetics (e.g. BIOL 222) and CHEM 233. The molecular basis of gene structure and function. Regulation of differential gene expression.

**ZOOL 452 Recombinant DNA (3)** Prerequisites: (ZOOL 211 or MICB 200) and BIOL 222. 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.

**ZOOL 455 General Immunology (3)** Prerequisites: ZOOL 211; BIOL 222. Credit will be granted for only one of the following: ZOOL 455 and MICB 450. Basic principles of immunobiology,

immunochemistry and immunogenetics with emphasis on the cellular and molecular basis of the immune response; cells of the immune system and their development, interactions and physiologic environment; the antibody response and interaction with antigen; cell mediated immunity; genetic regulation of the immune response; and the relationship of the immune system to disease.

**ZOOL 460 Ethology (3)** *Prerequisites: BIOL 106; and BIOL 222.* Study of animal behavior with emphasis on its evolution and function. Topics include: communication, foraging, cooperation and mate selection.

**ZOOL 461 Ethology Laboratory (3)** *One hour of lecture and six hours of laboratory per week. Pre- or corequisite: (ZOOL 460 or ZOOL 465) or permission of department.* Training in the description of behavior, methods of quantification and experimentation, and the mathematical treatment of behavioral data.

**ZOOL 465 Behavioral Ecology (3)** *Prerequisites: BIOL 106; and (ZOOL 210 or BIOL 222) or permission of department.* How natural and social environments shape individual behavior. The influence of evolution on patterns of individual adaptation. Use of the evolutionary paradigm to investigate specific problems in animal and human behavior.

**ZOOL 468 Experimental Behavioral Endocrinology (2)** *One hour of lecture and six hours of laboratory per week. Prerequisite: ZOOL 368 or permission of department. Repeatable to 4 credits.*

**ZOOL 470 Advanced Population Ecology (3)** *Prerequisites: BIOL 106 and MATH 220.* Theory of population growth and regulation, life tables, and theory of competition and predation, evolution in ecological settings, community structure and dynamics.

**ZOOL 471 Laboratory and Field Ecology (2)** Four hours of laboratory and field work per week. *Pre- or corequisites: ZOOL 470 and a course in statistics.* Laboratory and field exercises involving problems of contemporary ecological interest; population density regulation, community structure, and spatial pattern diversity in both terrestrial and aquatic systems.

**ZOOL 472 Protozoology (4)** *Prerequisite: one year of biology.* Two hours of lecture and six hours of laboratory including field trips per week. Basic conceptual treatment of free-living and parasitic protozoan functional morphology, life history, and systematics. The laboratory will stress observations of protozoa, living and stained, collected from diverse habits.

**ZOOL 473 Marine Ecology (3)** *Prerequisite: ZOOL 210.* 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.

**ZOOL 477 Symbiology (3)** *Prerequisite: BIOL 106.* An introduction to basic concepts of symbiosis, with emphasis on coevolution between symbiotic organisms. Adaptations for establishment and maintenance of mutualistic, commensal and parasitic associations. Emphasis on current literature and a research perspective.

**ZOOL 481 The Biology of Marine and Estuarine Invertebrates (4)** *Two hours of lecture and six hours of laboratory per week. Prerequisite: one year of zoology including ZOOL 210 or equivalent.* A study of the taxonomy and functional morphology of the invertebrates, exclusive of insects. Emphasis on the study of living material.

**ZOOL 484 Experimental Aquatic Ecology (3)** *Prerequisites: BIOL 106 and ZOOL 210.* Role of theory and experimentation in aquatic ecology. Experimental approaches and testing hypotheses.

**ZOOL 495 Mammalian Histology (4)** *Two hours of lecture and six hours of laboratory per week. Prerequisites: ZOOL 211; and ZOOL 422; or permission of department.* A study of the microscopic anatomy, ultrastructure and histophysiology of tissues and organs of mammals.