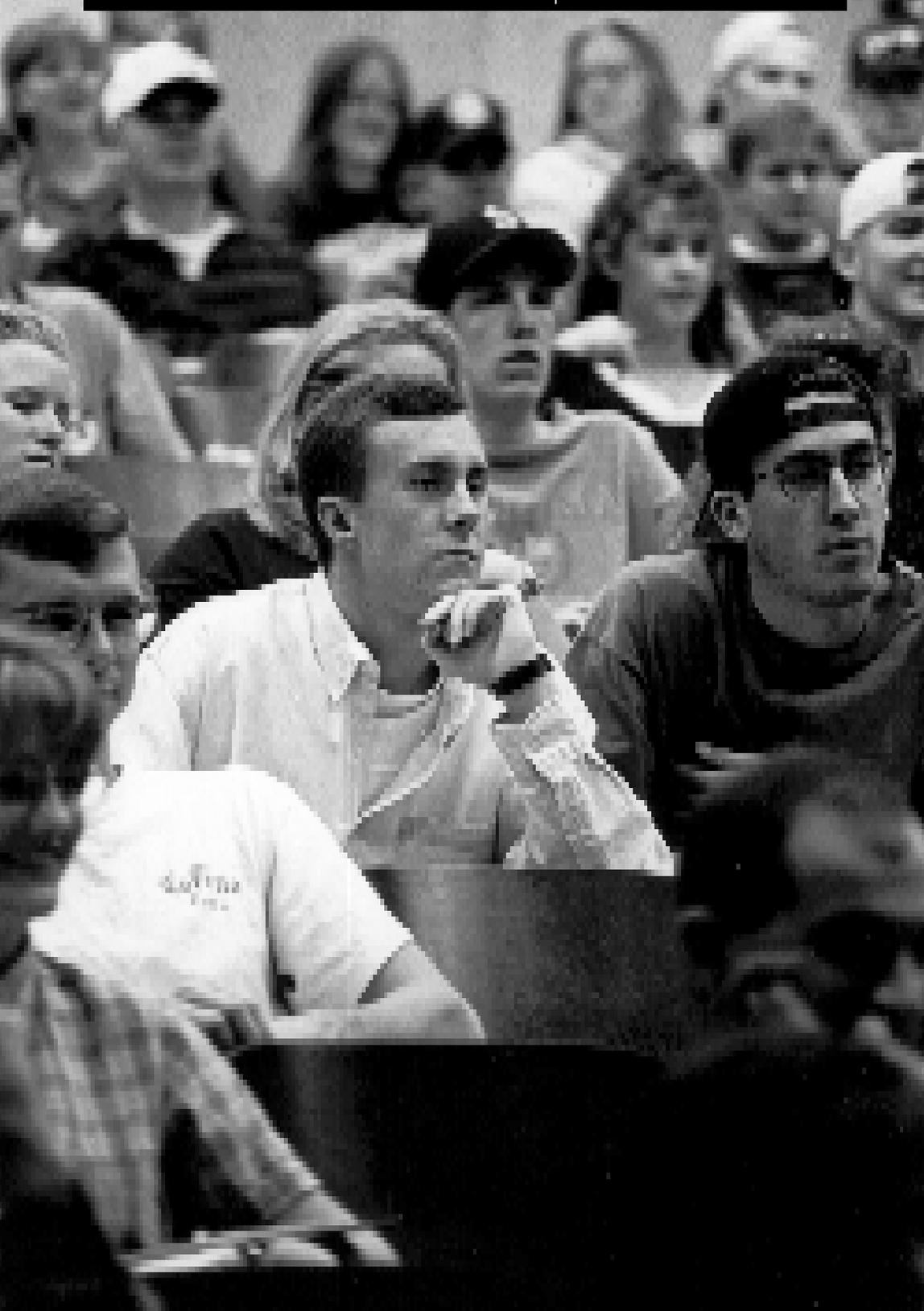


Course Descriptions



COURSE DESCRIPTIONS

This is the Course Descriptions section of the 1997-1999 University of Minnesota, Duluth Catalog

The following is a comprehensive listing of all courses offered regularly by UMD academic units. The courses are listed alphabetically by study field, and the college unit responsible for each course is shown in italics. For more information about courses, contact the appropriate college or department.

Non-Degree Credit Courses

These courses have content normally available in a standard secondary school curriculum and the credits cannot be used for a UMD degree. They are designated with the following statement in parentheses after the course number and title: “cr cannot be applied to a degree.” The courses carry

credit and students must pay normal tuition for them. When appropriate, the credits may be used in determining financial aid. In some instances, the credits also may be used in determining intercollegiate athletic eligibility. Students should contact the Department of Intercollegiate Athletics regarding the effect of non-degree credit courses on athletic eligibility. Non-degree credits are not included in the total UMD credits earned, GPA, or in determining student classification. Non-degree credit courses in this bulletin are: Chem 1001—Preparatory Chemistry, Math 1001—Elementary Algebra, Math 1002—Geometry, Math 1003—Intermediate Algebra, SSP 1002—Special Topics in College Learning, SSP 1003—Basic Mathematics.

Course Numbers and Symbols

Courses numbered 1000 through 1998 are lower division courses and are primarily for freshmen and sophomores; 3000 through 3998 are upper division courses and are generally restricted to juniors and seniors; 5000 through 5998 are open to upper division students and students enrolled in graduate programs; 8000 and above are open only to students enrolled in graduate programs. All 5xxx-level courses may be applied to Graduate School programs, unless otherwise designated with the following statement in brackets after the number of credits: “cr cannot be applied to a Graduate School program.”

A series of courses separated by commas (e.g., 1001, 1002) may be taken in any order.

A sequence of courses separated by hyphens (e.g., 1001-1002) must be taken in the order listed.

Because the University of Minnesota operates under a quarter system, all credits shown indicate quarter credits.

A variable-credit course with the credits separated by a hyphen, (e.g., 1-3 cr) is offered for variable credit at the student’s option.

A variable-credit course with the credits separated by the word “to” (e.g., 1 to 4 cr) is offered for variable credit at the department’s option. Students should consult the current *Class Schedule* for information concerning available credits.

If no prerequisites are listed, there are none, except insofar as the course number indicates a minimum class standing requirement. When a course is listed as a prerequisite, it is assumed that an equivalent course may be substituted to meet the requirement.

When no abbreviated department prefix precedes the number of a course listed as a prerequisite, the prerequisite course is in the same department as the course being described.

In prerequisite listings, comma means “and.”

The following symbols are used throughout the course descriptions in lieu of page footnotes:

* Courses in which graduate students may prepare Plan B projects.

† All courses preceding this symbol must be completed before credit will be granted for any quarter of the sequence.

§ Credit will not be granted if credit has been received for the course listed after this symbol.

¶ Concurrent registration is allowed in the course listed after this symbol.

..... Consent of the instructor is required before registration.

Δ Consent of the department offering the course is required for registration.

□ Consent of the college unit offering the course is required before registration.

Accounting (Acct)

School of Business and Economics

Acct 1511. Financial Accounting I. (3 cr; prereq 30 cr)
Accounting as a means of communicating financial information to external parties in society; the process of recording, classifying, measuring, and reporting business data emphasizing the balance sheet and income statement; accounting for monetary and fixed assets.

Acct 1512. Financial Accounting II. (3 cr; prereq 1511, 30 cr or ☐)
Accounting concepts and principles underlying inventories, current and long-term liabilities, corporation and partnership accounts, statement of cash flows, international accounting, and other special topics.

Acct 1995. Survey of Accounting. (4 cr, §1985; not open to SBE students and BAc minors)
Accounting information presented in published financial statements. Debt financing, stock issuance, alternative methods of accounting. Bookkeeping topics not emphasized.

Acct 3001. Management Accounting. (4 cr [cr not available for BAc degree or Acct minor], §1523; prereq 1512, BBA candidate or non-SBE students/non-Acct minors with 90 cr or ☐)
System of information collection and analysis in an organization. Topics include cost behavior analysis, cost-volume-profit relationships, budgeting, budget variances analysis, centralized organization design, performance evaluation, and human and organization behavior concerns.

Acct 3102. Computer Applications in Accounting. (3 cr; prereq SBE candidate or Acct minor or ☐)
Various microcomputer and mainframe applications for solving financial and managerial accounting problems. Main focus on electronic spreadsheets, quantitative and statistical analyses, and graphics. Completion of a computerized financial accounting practice set.

Acct 3340. Volunteer Income Tax Assistance. (1 cr [may be repeated for 2 cr max, cr not available as Acct elective]; prereq 40 cr, Δ)
Introduction to preparation of federal and Minnesota state tax returns for low-income individuals. Preparation of actual tax returns as a volunteer, supervised by faculty.

Acct 3501. Intermediate Accounting I. (4 cr; prereq SBE candidate or approved Acct minor or ☐)
The search for principles and postulates of accounting, with emphasis on the timing of revenue recognition and expense matching; concepts of income, and the impact of inventory measurement on its determination.

Acct 3502. Intermediate Accounting II. (4 cr; prereq 3501, SBE candidate or approved Acct minor or ☐)
Application of concepts examined in 3501 to all traditional balance sheet components and a probing of possible future changes in the reporting of financial condition and results of operations of business firms, with a view toward providing more useful information to the firm and its many publics.

Acct 3503. Intermediate Accounting III. (4 cr; prereq 3502, SBE candidate or approved Acct minor)
Financial reporting to investors and interested external parties. Topics include income tax allocation, changes in financial position, price-level and current-value accounting, analysis of financial statements, consignments, and installment sales.

Acct 3507. Cost Accounting I. (4 cr; prereq 3102, SBE candidate or approved Acct minor or ☐)
Determining manufacturing costs, e.g., in a job order or process manufacturing environment. Cost-volume-profit relationships, activity-based accounting, standard costing techniques.

Acct 3544. Income Tax Accounting. (4 cr; prereq 1512, SBE candidate or approved Acct minor or ☐)
Principles involved in determining taxable net income and computation of federal and state income taxes. Individual and corporation taxes emphasized.

Acct 3546. Auditing. (4 cr; prereq 3503, BAc candidate with 120 cr or Acct minor with 90 cr or ☐)
Theory and procedures in the audit process and completion of an audit case.

Acct 3548. Advanced Accounting. (4 cr; prereq 3503, BAc candidate with 120 cr or Acct minor with 90 cr or ☐)
Advanced accounting topics including consolidated financial statements, partnership and fiduciary accounting.

Acct 3570. Internship in Accounting. (3 cr; [may be repeated for 6 cr max; no more than a total of 3 cr can be applied to Acct electives]; prereq 3503, BAc candidate, Δ; offered S-N only)
Students work full-time for at least eight weeks during any quarter or summer in a professional work experience. Professional skills workshops are completed before registration and internship interviews.

Acct 3970. Independent Study. (1-3 cr [cr not available as Acct elective]; prereq BAc candidate with 120 cr, Δ)
For students wishing to do special work in an accounting area that extends beyond, or in greater depth than, regular course offerings.

Acct 3980. Special Topics: (Various Titles to be Assigned). (1 to 4 cr [may be repeated for 8 cr max]; prereq BAc candidate, 120 cr or ☐)
Contemporary accounting topics and problems and approaches to their solution.

Acct 5508. Cost Accounting II. (3 cr; prereq 3507, SBE candidate or approved Acct minor or grad or ☐)
Use of cost information in managerial decision making.

Acct 5514. Fund and Not-for-Profit Accounting. (3 cr; prereq 1512, 90 cr or ☐)
Accounting concepts and processes applied to government, hospital, education, charity, and other not-for-profit entities.

Acct 5525. Seminar in International Accounting. (3 cr; prereq 3503, SBE candidate or approved Acct minor or grad or ☐)
International comparative analysis, accounting measurement, and reporting issues unique to multinational business transactions and multinational enterprises; international financial markets; foreign exchange accounting; international audit environment; international taxation and transfer pricing; harmonization of worldwide accounting.

Acct 5545. Advanced Income Taxation. (3 cr; prereq 3544, SBE candidate or Acct minor with 120 cr or grad or ☐)
Emphasis on decision making and tax planning. Analysis of federal and state taxes relating to partnerships, corporations, and associations; corporate distributions and reorganizations; trust and foundations; estate, gift, and inheritance taxes.

Acct 5547. Advanced Auditing. (3 cr; prereq 3546, BAc candidate with 120 cr or Acct minor with 90 cr or grad or ☐)
Advanced auditing topics including, but not limited to, statistical sampling, EDP auditing, internal auditing.

Acct 8512. Management Accounting. (3 cr; prereq 5501 or equiv, grad)

Interpreting and using accounting reports and supplementary information for management planning, coordination, and control; emphasis on using accounting information for decision making in problems of capital budgeting, product mix, cost-volume-profit analysis, and other profit planning and control areas.

Aerospace Studies (Air)

College of Science and Engineering

Air 1101-1102-1103. The Air Force Today. (1 cr each; 1 hr lect, 1 hr lab)

Three-part survey of the U.S. Air Force as a public-service organization. Role of the military in U.S. society; military history; officership; professionalism; core values; career opportunities; customs/courtesies; communication skills.

Air 1201-1202-1203. The Air Force Way. (1 cr each; 1 hr lect, 1 hr lab)

Air Force heritage; development/deployment of air power, a primary element of U.S. national security; leadership and quality principles; ethics and values. Emphasis on leadership development based on student participation in group problem solving. Oral/written communication development emphasized.

Air 1500. Leadership Practicum. (1 cr [may be repeated for 6 cr max]; 1 hr seminar, 1 hr lab)

Leadership techniques and their practical application in structured problems and realistic situations; Air Force customs and courtesies.

Air 3310-3311-3312. Air Force Leadership/Management. (3 cr each; 3 hrs seminar, 1 hr lab)
Comprehensive study of leadership/quality management fundamentals, professional knowledge, organizational doctrine and ethics, and communication skills required of today's Air Force officer. Leadership/management case studies.

Air 3410-3411-3412. Preparation for Active Duty. (3 cr each; 3 hrs seminar, 1 hr lab)

Advanced leadership development; national security processes, regional studies, advanced leadership ethics, doctrine, the military as a profession, officership, military justice, civilian control of the military, preparation for active duty, current issues affecting military professionalism.

Air 3482. Introduction to Aviation. (4 cr, \$3481; 4 hrs lect)

Weather; Federal Aviation Agency regulations; dead-reckoning navigation; radio navigation; related topics required to complete the private pilot's written examination. Open to any student interested in preparing to take the FAA private pilot's license written examination.

Air 3501. Leadership Practicum. (1-3 cr [may be repeated for 6 cr max]; 1 hr seminar, 1 hr lab per cr)
Practical application of leadership and management in realistic situations.

Air 3681. Project Management. (4 cr; prereq Econ 1203 or Pol 3200 or Psy 3020 or Soc 3500 or Stat 1565 or Stat 3062 or Stat 3562 or #)

Concepts and elements of project/risk management within a systems approach to complete resource, schedule, and performance-constrained projects. Use and limitations of current computer software. Managing multidisciplinary project teams.

American Indian Studies (AmIn)

College of Liberal Arts

AmIn 1103-1104. Beginning Chippewa. (3 cr each)
Speaking and comprehension of basic Chippewa speech patterns. Development of rudimentary reading knowledge.

AmIn 1105. Survey of North American Indian Arts. (4 cr, \$3110, \$3120, \$3130)
Survey of the traditional arts of North American Indians and the cultures that produced them; a study of techniques, motifs, and aesthetics of Indian textiles, utilitarian and ceremonial arts.

AmIn 1106. American Indian Prose, Poetry, and Oratory. (3 cr)
Survey of transcribed/translated American Indian oratory, post-1900 prose, and contemporary poetry by Indian writers/speakers. Works used to facilitate understanding of major themes in American Indian life.

AmIn 1115. Chippewa History and Culture. (4 cr, \$5920)
Anishinabe, Ojibway, and Chippewa. Origins and lifestyle showing relationship between traditional and contemporary times. Emphasis on Minnesota.

AmIn 1120. American Indians in the 20th Century. (4 cr, \$3051)

Topical review of Indian-white contacts, antiquity to present. Historical analysis of the people, their culture, and their transition into the 20th century.

AmIn 1203-1204. Intermediate Chippewa. (3 cr each)
Speaking basic Chippewa sentences and paragraphs at fluent level so listener can understand speaking pattern context. Ability to write and read written Chippewa language proficiently.

AmIn 3106. Indian-White Relations. (4 cr, \$3105; prereq 1120 or #)
Ten to twelve significant events and their ramifications for contemporary Indian affairs. Variety of options for fulfilling course requirements.

AmIn 3222. Current American Indian Legal Issues. (4 cr; prereq 1120 or 3333 or 3520 or #)
Topical study of matters of current legal controversy in Indian-white relations.

AmIn 3224. Counseling the American Indian. (3 cr; prereq 1120 or #)
General traits, perspectives, norms, values, and techniques relevant to the American Indian counseling process.

AmIn 3260. American Indian Novel. (3 cr; prereq 1120 or #)
Approximately four novels by American Indian authors will be read with an explication of the novels and the milieu that produced them.

AmIn 3300. Projects in American Indian Studies. (1-5 cr [may be repeated for 10 cr max]; prereq 1120 or 3105)
Directed reading, research, or involvement in social action culminating in the preparation of a paper.

AmIn 3301. Advanced Chippewa. (3 cr)
Taught entirely in Chippewa language. Fluent Chippewa speaking, writing, reading, and conversations to increase oral and comprehension abilities.

Amln 3302. Independent Study of the Chippewa Language. (1-6 cr [may be repeated for 12 cr max]; prereq 1103 or #)
Individual opportunity to devise and/or be involved in programs to increase fluency.

Amln 3333. Introduction to Federal Indian Law. (4 cr; prereq 1120 or #)
Legal concepts, cases, and issues surrounding American Indian federal law (e.g., treaties).

Amln 3410. Fur Trade in Canada and United States. (4 cr; prereq 1120, 3105 or #)
Historical review and analysis of Canadian and U.S. Indians in the fur trades.

Amln 3520. Tribal Law and Government. (4 cr; prereq one intro soc sci course, 1120, 3106 or #)
Review of American Indian law and an analysis of modern tribal government.

Amln 3630. American Indians and the Media. (3 cr; prereq 1120 or #)
Examination of American Indian media such as literature, movies, TV, toys, music, and sports as they have contributed to and continue to perpetuate stereotypic and distorted images.

Amln 3750. Problems in American Indian Psychology. (4 cr; prereq one soc sci course, 1120, 3106 or #)
Review of the major theories of psychology, psychotherapy, and personality, with emphasis on selected psychological issues and problems of contemporary American Indians.

Amln 3840. American Indian Leaders. (3 cr; prereq 1120 or #)
How Indian leaders responded as individuals and tribe members to war, allotment, and removal. Contemporary as well as historic leaders and the social, political, and economic implications their contribution had on tribal and non-native society.

Amln 3905. Special Topics: (Various Titles to be Assigned). (4 cr [may be repeated for 12 cr max]; prereq one intro soc sci course or 1120 or #)
Study of special topics not included in regular curriculum. Topic announced before course offered.

Amln 3921. Internship in American Indian Studies. (6-12 cr [may be repeated for 12 cr max]; prereq AIS major; may not be taken final qtr of sr yr; may be taken in one or two qtrs)
Supervised lab experience in American Indian agency or project or one with significant Indian clientele. Advance, concurrent, and follow-up written and oral presentations.

Amln 3970. Tribal Economic Development and Management. (4 cr; prereq 1120 or #)
Management concepts and theories; tribal environment and its contemporary economic and governmental development; tribal managerial techniques.

Amln 5910. Topics in American Indian Studies. (4 cr [may be repeated for a 12 cr max; no more than a total of 6 cr can be applied to a Graduate School Program]; prereq one intro soc sci course or 1120 or #)
Focus on areas of particular relevancy to both Indian and non-Indian people in this region. Faculty-student-community consultation determines topic selection for a given quarter.

Amln 5990. Directed Research. (1-6 cr; prereq #)
Qualified seniors and graduate students may register for work on tutorial basis.

American Studies (AmS)

College of Liberal Arts

AmS 1030. Landscapes, Environments, and U.S. Culture. (4 cr, \$3390)
Interdisciplinary study of U.S. landscapes and environments as an index to the United States' diverse cultures. Readings from travelers, naturalists, ecologists, geographers, poets, and fiction writers; slides of paintings and photographs; films.

AmS 1040. U.S. Culture: The Frontier Heritage. (4 cr, \$3130, \$Hum 1032)
The frontier experience examined through primary documents, film, art, myth, literature, and historiography, with emphasis on cross-cultural comparisons of the Canadian and American frontiers from the perspective of Europeans and Native Americans of both genders.

AmS 1060. American Immigrant Heritage. (4 cr, \$1050, \$Hum 1033)
Immigrant and ethnic experiences in the 20th century as depicted in prose, poetry, and the arts; patterns of contemporary prestige and status.

AmS 5101. Directed Study. (2-4 cr each; prereq #)
Supervised independent study on selected American studies topics or themes.

Anatomy and Cell Biology (Anat)

School of Medicine

Anat 3100. Practical Human Anatomy. (3 cr; offered through UC) Repesh
Lectures present gross structure of human body by regions: head/neck, thorax, abdomen, pelvis, limbs. For nurse/nurse practitioners; physician's assistants; emergency medical workers; pre-medicine, physical education, athletic training, and coaching students. Selected study of predissected human specimens optional.

Anat 5133. Developmental, Cell, and Tissue Biology. (5 cr; prereq grad) Downing, Holy, Leino
In-depth study of cytology, embryological origins, development, structure, and functions of basic tissues of the human body.

Anat 5545. Transmission and Scanning Electron Microscopy. (3 cr; prereq general biol, cell biol, general chem, #) Leino, Downing, Forbes, Repesh
Introduction to electron microscopy as a research tool. Processing biological specimens for transmission and scanning electron microscopy. Operation of microscopes learned through lectures and hands-on use. Preparation and interpretation of electron micrographs.

Anat 8102-8112-8122-8132. Human Developmental Anatomy. (1 cr each; prereq #) Forbes
Synopsis of human development from early development (gametogenesis, fertilization) to organogenesis. The more common congenital malformations of each system highlighted in an attempt to bridge the gap between embryology and adult anatomy.

Anat 8114. Human Neuroanatomy. (4 cr; prereq #) Forbes, Severson
Gross and microscopic structure of the central nervous system, with correlation of structure, function, and clinical relevance. Includes consideration of special senses.

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Anat 8121-8131-8141-8151. Human Gross Anatomy. (4 cr each; prereq #) Repesh, Severson Regional dissection of the human body supplemented with the normal topographic and radiographic anatomy of the body, basic-clinical science correlation conferences, and demonstrations of anatomy using fresh autopsy specimens. Emphasis applied anatomical features of each region and builds the graduate student's understanding of gross anatomical relationships in preparation for more effective future teaching.

Anat 8123-8133-8143-8153. Human Microscopic Anatomy. (2 cr each; prereq #) Downing, Leino Introduction to human microscopic structure, and the cytochemical and functional aspects of cells, tissues, and organs. Emphasis on basic concepts of microscopic anatomy and the identification of specific cells, tissues, and organs.

Anthropology (Anth)

College of Liberal Arts

Anth 1602. Prehistoric Cultures. (5 cr)
Origin and development of extinct and living human beings, including growth and differentiation of cultures from their beginnings to the earliest stages of ancient civilizations.

Anth 1604. Cultural Anthropology. (5 cr)
Introduction to representative cultures of the world and to the concepts and methods of cultural anthropology, focusing on the range of variation and degree of uniformity in human behavior and in cultural adaptations.

Anth 1612. Introduction to Archaeology. (5 cr; 4 hrs lect, 2 hrs lab)
Basic principles of archaeology with examples of their use selected from world prehistory.

Anth 3614. Peasant Societies and Cultures. (4 cr; prereq 1604, 40 cr or #)
Comparative study of peasant societies; their role in traditional urban nation-states, and their place in contemporary economic development and cultural change.

Anth 3616. Cultures of Arctic North America. (4 cr; prereq 1604, 40 cr or #)
Ethnographic account of the traditional and contemporary cultures of Eskimos and Indians in northern North America. Analyses of the processes of cultural change that have produced the contemporary situations in this area.

Anth 3618. Ancient Middle America. (4 cr; prereq 1604, 40 cr or #)
Survey of the Aztecs, Maya, and their predecessors.

Anth 3620. Independent Study in Anthropology. (1-5 cr [may be repeated for 10 cr max]; prereq 55 cr, Comp 31xx advanced writing, #)
Directed reading and research leading to the presentation of a paper.

Anth 3622. Prehistoric Archaeology of the Old World. (4 cr; prereq 40 cr or #)
Archaeological survey of Europe, Africa, and Asia.

Anth 3624. Archaeology of North America. (4 cr; prereq 40 cr or #)
Archaeological survey of major cultural areas of North America north of Mexico.

Anth 3627. Special Topics in Anthropology. (1-5 cr [may be repeated for 10 cr max]; prereq 1604, 40 cr or #)
Seminar on contemporary topics in selected branches of anthropology.

Anth 3628. Women in Cross-Cultural Perspective. (4 cr; prereq 1604, 40 cr or #)
Worldwide survey of position, life cycle, and images of women primarily in non-Western cultures, and examination of sociocultural factors influencing their position, including impact of colonialism, industrialism, and economic development.

Anth 3630. Cross-Cultural Adaptation. (1 cr; prereq exper living in another culture, #)
Analysis of cultural adaptation, cultural shock, and problems of reentry for anthropological fieldworkers, students in study-abroad programs, and business students returning from internships and/or study in other cultures.

Anth 3632. Latin American Cultures. (4 cr; prereq 1604, 40 cr or #)
Survey of social, political, economic, and religious organization of contemporary national and native cultures of Mexico, Central America, and South America.

Anth 3634. Cultures of Africa. (4 cr; prereq 1604, 40 cr or #)
Ethnographic survey of human societies of sub-Saharan Africa focusing on precolonial life ways, the response to colonization, and post-imperial transformations and problems. Balanced emphasis on regional variability and pan-Africanism.

Anth 3636. Anthropology of India. (4 cr; prereq 1604, 40 cr or #)
Peoples and cultures of India with focus on village life within historical context of regional differences, emphasizing importance of caste, kinship, and religion to unity and diversity of modern-day India and challenges it faces.

Anth 3676. Field Research in Archaeology. (1-15 cr; prereq 1602 or 1612, #)
Archaeological field excavation, survey, and research in historic and prehistoric sites in Minnesota.

Anth 5616. Culture and Personality. (4 cr; prereq 1604, 70 cr or grad or #)
Role of culture in forming of personality; problems of individual adjustment to demands of culture. Psychological and sociopsychological approach to culture.

Anth 5621. Myth and Sacred Symbols. (4 cr; prereq 1604, 70 cr or grad or #)
Interpretation of myths and sacred symbols found in the beliefs and rituals of selected traditional cultures.

Anth 5622. Honors Research. (2 cr [may be repeated for 6 cr max]; prereq 5626, Soc 1500, Soc 3500, Soc 3520, 120 cr, approval by the dept honors program director)
Advanced individual project in any area of anthropology demonstrating sound theoretical and research foundations and resulting in a written report.

Anth 5623. Anthropology and Contemporary Human Problems. (4 cr; prereq 1604, 70 cr or grad or #)
Analyses of the cultural roots of such interrelated contemporary human problems as over-population, food production and distribution, health and nutrition, social and ecological disorders. A review of alternative solutions to such problems as suggested by anthropological study and analyses.

Anth 5626. Development of Anthropological Theory. (4 cr; prereq 1604, Anth major/minor, 70 cr or grad or #)
Theoretical perspectives in anthropology from mid-19th century to the present; examination of several major theorists central to the development of the discipline.

Anth 5627. Special Topics in Anthropology. (1-5 cr [may be repeated for 10 cr max; no more than 6 cr total can be applied to a Graduate School program]; prereq 1604, 70 cr or grad or #)
Seminar on contemporary topics in selected branches of anthropology.

Anth 5628. Language and Culture. (4 cr; prereq 70 cr or grad or #)
Study of relationship between language and culture through comparative cases from diverse areas of the world.

Anth 5630. Human Ecology. (4 cr; prereq 1604, 70 cr or grad or #)
In-depth study of some of the methods and concepts concerning the interrelations of certain human populations and their environments in diverse natural, cultural, historical, and evolutionary settings.

Anth 5640. International Development: Women and Population. (4 cr; prereq 1604 or Soc 1100, Soc 1500, 70 cr or #)
Impact of macro- and microstructural components of population and development on Asian, African, and Latin American women. Challenges facing women as sociocultural, political, and economic development occurs. Approached from demographic and culturally specific perspective.

Anth 5652. Independent Study in Archaeology. (1-5 cr [may be repeated for 5 cr max]; prereq 1612, Comp 31xx advanced writing, #)
Directed reading and research leading to the presentation of a paper.

Anth 5654. Physical Anthropology. (4 cr; prereq #; offered alt yrs)
The human skeleton as source of information about individual variations, population structure, and human evolution. Study of human remains from archaeological sites, morphology, paleopathology, and relevant statistical methods. Lectures and labs emphasize acquiring practical experiences in analysis and interpretation.

Art (Art)

School of Fine Arts

Art 1001. Art Today. (4 cr)
Introductory survey of the influence of art and roles of artists in varied sociocultural contexts, with particular emphasis on recent art and its historical sources.

Art 1002. Introduction to Art. (4 cr; prereq for all studio art courses)
Studio course in art for those with little or no creative experience in art, introducing various materials, techniques, and problems. Emphasis on studio work, class discussions, films, and outside reading.

Art 1003. Topics in Art: (Various Titles to be Assigned). (1 to 6 cr each offering [may be repeated for 12 cr max]; prereq #)
Study of special topics not included in regular curriculum. Topic announced before course offered.

Art 1009. Drawing. (3 cr; not for art majors or minors)
Stimulation of visual and conceptual skills through the dynamics of drawing.

Art 1010. Drawing. (3 cr; prereq ¶1002 or art or art ed major or #)
Introduction to the drawing experience and other problems concerned with the translation of three-dimensional visual experience into two-dimensional form.

Art 1011. Design. (3 cr; prereq ¶1002 or art or art ed major or #)
Introduction to two-dimensional design in art through a study of primary elements and structural aspects and exploration of the application of these elements in various media.

Art 1012. 3-D Design. (3 cr; prereq ¶1002 or art or art ed major or #)
Introduction to basic concepts and materials of three-dimensional form and space.

Art 1013. Design Using Computers. (3 cr; prereq 1002 or art or art ed major or #)
Two-dimensional design concepts using the computer as an artist's tool.

Art 1014. 3-D Computer Design. (3 cr; prereq 1013 or #)
Introduction to concepts and materials of three-dimensional form and space using digital visualization.

Art 1055. Introduction to Graphic Design. (3 cr; prereq 1010, 1011 or 1013 or #)
Introduction to graphic design through lectures, studio projects, and group critiques.

Art 1100. Painting. (3 cr; prereq [1002 or art or art ed major, 1010, 1011 or 1013] or #)
Color and pigment theory, basic concepts and explorations in technology and imagery. Discussion of painting traditions and contemporary directions.

Art 1125. Watercolor Painting. (3 cr; prereq [1010, 1011 or 1013] or #)
Basic concepts and techniques in watercolor.

Art 1200. Sculpture. (3 cr; prereq 1002 or art or art ed major, 1010, 1012 or #)
Exploration of sculptural materials, methods, and concepts, with problems relating to form, time, and space.

Art 1300. Print Processes. (3 cr; prereq [1002 or art or art ed major, 1010, 1011 or 1013] or #)
Basic concepts in traditional and contemporary fine art print techniques.

Art 1400. Ceramics. (3 cr; prereq 1002 or art or art ed major, 1010, 1012 or #)
Hand-forming methods, decoration, glazing, elementary glaze chemistry, and firing of pottery.

Art 1405. Ceramics. (3 cr; not for art majors or minors)
Basic hand-building, glazing, and firing techniques.

Art 1500. Jewelry and Metals. (3 cr; prereq [1002 or art or art ed major, 1011 or 1013] or #)
Basic jewelry techniques and design using copper, brass, silver, and copper enameling.

Art 1510. Weaving and Fibers. (3 cr; prereq 1002 or art or art ed major, 1011 or 1013, 1012 or #)
Contemporary weaving and fibers.

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Art 1600. Photography. (3 cr; prereq 1002 or art or art ed major or #)
Introduction to photographic concepts, materials, history, and darkroom practice, in a creative context.

Art 1605. Fundamentals of Photography. (3 cr; not for art majors or minors)
Elementary photographic principles and techniques through a studio art experience.

Art 1606. Photography. (3 cr [may be repeated for 6 cr max]; prereq 1605 or #; not for art majors or minors; offered through UC)
Photographic principles and techniques through studio art experiences.

Art 1906. Visual Literacy. (3 cr; prereq 40 cr or #)
Study of various forms of visual expression (art, commercial imagery, typography, architecture, graffiti) as rhetoric. Theories and modes of criticism and their value in explaining visual expression.

Art 1907. Contemporary Issues in Visual Art. (3 cr, \$1905; prereq art or art ed major, 9 cr art or #)
Seminar to help art students better understand their role in the contemporary visual arts.

Art 3001. Topics in Art: (Various Titles to Be Assigned). (1 to 6 cr each offering [may be repeated for 12 cr max]; prereq #)
Intensive study of special topics outside the usual art courses. Topic announced before course offered.

Art 3016. Computer Studio. (3 cr; prereq 1002 or art or art ed major, 1013 or #)
Computer use as a fine arts medium. Development of a serial approach to visual imagery.

Art 3017. Computer Studio. (3 cr; prereq 3016 or #)
Advanced studio course using the computer as a fine arts medium. Development of a serial approach to visual imagery.

Art 3020. Silkscreen as a Poster Medium. (3 cr [may be repeated for 6 cr max], \$1020; prereq 1010, 1011 or 1013 or art or art ed major or #)
Basic silkscreen stencil and printing techniques applied to the design and printing of posters.

Art 3040. Graphic Processes and Techniques I. (3 cr; prereq 1010, 1011 or 1013 or #)
Methods and techniques of graphic reproduction. Introduction to computers and application of graphics/text software.

Art 3042. Prepress Management. (3 cr; prereq 3040 or #)
Planning, production techniques, materials, selecting printers.

Art 3052. Fundamentals of Graphic Design. (3 cr; prereq [1011 or 1013], 3040, 13053 or #)
Introduction to the principles of communication for graphic designers.

Art 3053. Typography. (3 cr; prereq art major, 1013, 3040 or #)
Relates traditional aesthetic experiences of composing and printing with metal type to the current design environment of digital type.

Art 3054. Motion Graphics. (3 cr; prereq 1013, 3052 or #)
Time and motion-based graphic design. An introduction to computer-based animation.

Art 3058. Graphic Design I. (3 cr; prereq 3040, 3052, 3053 or #)
Basic design principles and techniques used to solve problems.

Art 3059. Graphic Design II. (3 cr; prereq 3058 or #)
Advance problem solving in graphic design.

Art 3062. Advanced Typography. (3 cr; prereq 1906, 3052 or #)
Advanced typographic systems, use of grid systems, and type as illustration.

Art 3101. Painting. (3 cr; prereq 1100 or #)
Studies developing conceptual and technological resources. Includes discussion of traditional and contemporary directions in painting.

Art 3103. Painting. (3 cr; prereq 3101 or #)
Intermediate study in painting.

Art 3127. Watercolor Painting. (3 cr [may be repeated for 6 cr max]; prereq 1125 or #)
Further development of techniques and concepts in watercolor.

Art 3128. Watercolor Painting. (3 cr [may be repeated for 9 cr max]; prereq 1125, 3127 or #)
Developing, exploring, and experimenting with new concepts and techniques in watercolor.

Art 3201. Sculpture. (3 cr; prereq 1200 or #)
Experiences with a variety of sculptural forms and media with an emphasis on creative expression.

Art 3202. Sculpture. (3 cr; prereq 3201 or #)
Individual supervised study; creative projects in a sculptural medium of student's special interest.

Art 3300. Lithography. (3 cr [may be repeated for 6 cr max]; prereq 1002 or art or art ed major, 1010, 1011 or 1013 or #)
History and process of fine art lithography. Studio work covering printing techniques from stones and metal plates.

Art 3301. Print Processes. (3 cr; prereq 1300 or #)
Experiences with a variety of silk-screen, relief, intaglio, and lithographic fine art print techniques.

Art 3302. Print Processes. (3 cr; prereq 3301 or #)
Individual supervised study; creative development of the print processes.

Art 3401. Ceramics. (3 cr; prereq 1400 or #)
Emphasis on advanced hand-building and glazing techniques.

Art 3402. Ceramics. (3 cr; prereq 3401 or #)
Individual supervised study; creative projects in ceramics and chemistry of glazes.

Art 3405. Ceramics. (3 cr [may be repeated for 6 cr max]; prereq 1405 or #; not for art majors or minors; offered through UC)
Forming and decorating techniques, glaze experiments, and kiln operation.

Art 3501. Jewelry and Metals. (3 cr; prereq 1500 or #)
Studio course in metal casting of jewelry in silver, gold, and bronze. Gem setting and cutting.

Art 3502. Jewelry and Metals. (3 cr; prereq 3501 or #)
Advanced techniques and concepts in jewelry and metals.

Art 3511. Weaving and Fibers. (3 cr; prereq 1510 or #)
Weaving and related techniques in fibers and fabrics.

Art 3512. Fibers. (3 cr; prereq 3511 or #)
Individually supervised study in fibers and mixed media of the student's choice.

Art 3601. Photography. (3 cr; prereq 1600 or 1605 or #)
Experience with varied photographic processes, equipment, and attitudes in a creative context.

Art 3602. Photography. (3 cr; prereq 3601 or #)
Individual supervised study; creative projects using selected photographic processes.

Art 3605. Photography. (3 cr [may be repeated for 6 cr max]; prereq 1605 or #; not for art majors or minors; offered through UC)
Photographic experimentation using a fine arts approach.

Art 3713. Drawing. (3 cr; prereq 1009 or 1010, 1011 or 1013 or #)
Exploration of drawing concepts, techniques, and mediums using a variety of sources.

Art 3714. Drawing. (3 cr; prereq 3713 or #)
Exploration of drawing concepts, techniques, and mediums using a variety of sources.

Art 3715. Anatomy and Life Drawing. (3 cr [may be repeated for 9 cr max]; prereq [1010, 3713 or 3714] or #)
Study of the human form, its structure and movements related to aesthetic considerations.

Art 3716. Illustration. (3 cr; prereq 1010 or Δ)
Studio course in conceptual and technical aspects of this specialized form of drawing and painting.

Art 3800. Community Involvement Through Art. (Cr or [may be repeated for 6 cr max]; 1 cr for each 30 hrs of fieldwork; prereq #)
For the student interested in gaining experience working with public and private social agencies through an art program.

Art 3802. Visual Arts Administration Internship. (3 cr [may be repeated for 9 cr max, 1 cr for each 30 hrs of work]; prereq #)
Department administrative internship in activities relating to the visual arts.

Art 3806. Early Childhood Art. (2 cr; prereq art or art ed major or admission to ECh program or #)
Preschool art development including studio experiences.

Art 3810. Art in Elementary Education. (5 cr; prereq 1002 or art or art ed major or #)
Instructional problems; growth and development of art expression in children. Studio application of elementary art curriculum.

Art 3815. Art in Secondary Education. (5 cr; prereq art or art ed major or minor or #)
Objectives and nature of art programs in the secondary school; content and methods. Development of secondary art curriculum.

Art 3835. Problems in Art Education. (Cr or; prereq art major or minor, #)
Individual supervised study for especially capable art education students. Practical research in art education techniques.

Art 3904. Honors Studio Internship. (1-3 cr [may be repeated for 9 cr max]; prereq art major, #)
Internship in studio management and supervision for students of exceptional ability.

Art 3914. Creating Across Cultures. (4 cr)
Underrepresented visual arts of cultural groups within U.S. society.

Art 5016. Computer Studio. (3 cr [may be repeated for 9 cr max]; prereq 3017 or #)
Advanced work in using the computer to make art.

Art 5041. Graphic Processes and Techniques II. (3 cr [cr cannot be applied to a Graduate School program], §Art 3041, §Ind 3644; prereq 3040, 3059 or #)
Graphic production processes. Process photography and scanning; film assembly and masking; finishing and binding; use of paper and ink systems.

Art 5063. Graphic Systems. (3 cr [cr cannot be applied to a Graduate School program], §3063; prereq 3058, 3062 or #)
Packaging design, corporate identity, and signage systems.

Art 5064. Graphic Design Service. (3 cr [may be repeated for 9 cr max; cr cannot be applied to a Graduate School program], §3064; prereq [13020, 3040, 3059, 3062, 5041 or #], sr graphic design major)
Students work on graphics projects for use by nonprofit organizations.

Art 5065. Digital Imaging. (3 cr, §3065; prereq 1013, 1600 or 1605 or #)
Computer-mediated image manipulation for the graphic and fine arts using varied sources, including photography.

Art 5073. Workshop: (Various Titles to be Assigned). (1 to 6 cr each offering [no more than 6 cr total can be applied to a Graduate School program]; prereq #)
Selected art experiences using specialized techniques and materials.

Art 5080. Honors Graphic Design. (3 cr [cr cannot be applied to a Graduate School program]; prereq #)
Directed, but primarily independent, creative research for outstanding students.

Art 5091. Individual Study in Graphic Design. (1-3 cr [may be repeated for 9 cr max]; prereq 3058, 4 qtrs work in this area or #)
Supervised study in selected aspect of graphic design.

Art 5150. Painting. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 3103 or #)
Painting in the area of specialized interest.

Art 5151. Advanced Painting. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 5150 or #)
Individually supervised projects using both traditional and contemporary painting media and techniques.

Art 5191. Individual Study in Painting. (1-3 cr [may be repeated for 9 cr max]; prereq 4 qtrs work in this area, Δ)

Art 5250. Sculpture. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 3202 or #)
Sculpture in the area of specialized interest.

Art 5251. Advanced Sculpture. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 5250 or #)
Advanced sculpture in the area of specialized interest.

Art 5291. Individual Study in Sculpture. (1-3 cr [may be repeated for 9 cr max]; prereq 4 qtrs work in this area, Δ)

COURSE DESCRIPTIONS

Art 5350. Print Processes. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 3301 or #)
Printmaking in the area of specialized interest.

Art 5351. Advanced Print Processes. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 5350 or #)
Advanced printmaking in the area of specialized interest.

Art 5391. Individual Study in Print Processes. (1-3 cr [may be repeated for 9 cr max]; prereq 4 qtrs work in this area, Δ)

Art 5452. Advanced Ceramics. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 3402 or #)
Individual artistic development using one or more forming processes and investigation into technology relating to glaze and body chemistry.

Art 5453. Advanced Ceramics. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 5452 or #)
Individual artistic development within a single forming process and investigation into technology relating to processing ceramic art.

Art 5454. Ceramics: Materials. (3 cr; prereq 3402 or #)
Clay body, engobe, and glaze formulation; fundamentals of kiln construction for the studio ceramist.

Art 5491. Individual Study in Ceramics. (1-3 cr [may be repeated for 9 cr max]; prereq 4 qtrs work in this area, Δ)

Art 5552. Jewelry and Metals. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 3502 or #)
Advanced work in jewelry casting, fabricating, and other metal techniques of special interest.

Art 5553. Advanced Jewelry and Metals. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 5552 or #)
Studio work, research, and experimentation in developing a personal artistic style in jewelry and metals.

Art 5560. Advanced Fibers. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 3512 or #)
On- or off-loom studio projects for the advanced student.

Art 5581. Individual Study in Fibers. (1-3 cr [may be repeated for 9 cr max; not more than 6 cr total can be applied to a Graduate School program]; prereq 4 qtrs work in this area, Δ)

Art 5591. Individual Study In Jewelry and Metals. (1-3 cr [may be repeated for 9 cr max]; prereq 4 qtrs work in this area, Δ)

Art 5650. Advanced Photography. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 3602 or #)
Advanced photography in the area of specialized interest.

Art 5651. Thematic Photography. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 5650 or #)
Development of a body of work based on a single theme.

Art 5691. Individual Study in Photography. (1-3 cr [may be repeated for 9 cr max]; prereq 4 qtrs work in this area, Δ)

Art 5700. Honors Studio. (3 cr [cr cannot be applied to a Graduate School program]; prereq #)
Directed, but largely independent, creative inquiry for students of exceptional ability.

Art 5701. Intermedia Studio Problems. (1-3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 3 qtrs work in each subject area with Δ, #)
Directed study that emphasizes intermedia concerns.

Art 5750. Advanced Drawing. (3 cr [may be repeated for 9 cr max, repeatable to 12 cr with #]; prereq 3713, 3714 or #)
Individually supervised projects supporting involvement in other studio areas.

Art 5791. Individual Study in Drawing. (1-3 cr [may be repeated for 9 cr max]; prereq 4 qtrs work in this area, Δ)

Art 5800. Arts Internship Experience. (Cr or [may be repeated for 12 cr max; 1 cr for each 30 hrs of fieldwork]; prereq #)
For advanced student. Field research and actual experience working with arts programming, practice, or management in public or private agency, including University itself.

Art 5801. Honors Art Education Research. (3 cr [cr cannot be applied to a Graduate School program]; prereq #)
Directed, but largely independent, research in an area of art education for students of exceptional ability.

Art 5900. Art Museum Internship. (3 cr [may be repeated for 12 cr max; 1 cr for each 30 hrs of work]; prereq 1001, 12 cr art history, #)
Supervised practicum in art museum operation.

Art 5912. Art Seminar. (3 cr [cr cannot be applied to a Graduate School program]; prereq sr or #)
Investigation of current visual arts issues through directed study, lectures, assigned readings, and preparation of student presentations.

Art 5990. Independent International Study. (1-15 cr with Δ [not more than 6 cr total can be applied to a Graduate School program]; sr or grad standing in art advisable)
Travel and research in international museums, schools, arts organizations, and art centers. Advanced planning necessary. Credit allowed will depend on nature and scope of the project.

Art 5998. Senior Exhibit. (1 cr [cr cannot be applied to a Graduate School program]; prereq sr art major or #)
Senior art majors, singly or in pairs, plan, prepare, and present, under the guidance of the museum staff, an exhibition of their best undergraduate work in the Tweed Museum of Art.

Art 8160. Advanced Painting. (3 cr [may be repeated for 9 cr max]; prereq 6 cr of 5151 or #)
Individually supervised independent projects.

Art 8360. Advanced Printmaking. (3 cr [may be repeated for 9 cr max]; prereq 6 cr of 5350 or #)
Individually supervised projects in printmaking.

Art 8464. Advanced Ceramics. (3 cr [may be repeated for 9 cr max]; prereq 6 cr of 5453 or #)
Development of individual artistic style in the ceramic medium and investigation of technology related to ceramic art.

Art 8491. Individual Study in Ceramics. (1-3 cr [may be repeated for 9 cr max]; prereq 3 cr of 8464 or #)

Art 8700.* Graduate Show and Supporting Paper. (3 cr; to be taken in final qtr)
Graduate exhibition and supporting paper to be credited toward studio requirements.

Art 8701. Graduate Projects: Multimedia. (1-3 cr [may be repeated for 9 cr max]; prereq #)
Individualized study in areas that merge various materials and concepts.

Art 8850. Teaching Assistants Seminar. (1 cr [may be repeated for 3 cr max]; prereq grad tchg assts, #; required of all grad tchg assts during their first qtr of tchg)
Orientation to college teaching of fundamental concepts in studio courses.

Art 8890.* Art Studies Project and Supporting Paper. (Cr ar [may be repeated for 9 cr max]; prereq consent of major adviser)
Independent project under faculty guidance; may include advanced studio practice or research in art theory, museum practice, arts administration, or interdisciplinary and intermedia courses.

Art 8950. Graduate Art Seminar. (1 cr [may be repeated for 4 cr max]; prereq grad art major or #)
Selected topics in art theory and criticism.

Art 8960. Independent Studio Research. (3 cr [may be repeated for 6 cr max]; prereq 2 qtrs grad studio coursework, #)
Supervised inquiry and readings in student's personal studio direction.

Art History (Arth)

School of Fine Arts

ArtH 1203. History of World Art I. (4 cr, \$1201)
Development of world art and architecture from prehistory through Middle Ages.

ArtH 1204. History of World Art II. (4 cr, \$1202)
Development of world art and architecture from Renaissance to present.

ArtH 1305. Classical Themes in Art History. (4 cr)
Genres of painting and special related subjects in Western art from 1400 to 1800.

ArtH 3310. History of Graphic Design. (3 cr; prereq 1906 or #)
History of graphic communications to present.

ArtH 3320. Ancient Art. (4 cr, \$5167)
History and development of Greek, Etruscan, and Roman painting, sculpture, and architecture.

ArtH 3330. Italian Renaissance Painting. (4 cr, \$5302)
Developments in painting during the 15th and 16th centuries in Italy.

ArtH 3331. Italian Renaissance Architecture, Sculpture. (4 cr; \$5303)
Developments in architecture and sculpture during the 15th and 16th centuries in Florence, Venice, and Rome.

ArtH 3332. Northern Renaissance Art. (4 cr, \$5304)
Northern European painting during the 15th and 16th centuries.

ArtH 3340. Baroque Art. (4 cr, \$5406)
European art during the 17th century.

ArtH 3350. Eighteenth-Century European Art. (4 cr, \$5507)
European art from 1700 to the French Revolution.

ArtH 3360. European Art, 1789-1850. (4 cr, \$5508)
European art from the French Revolution through the pan-European revolutions of 1848-50, examined in social and historical contexts.

ArtH 3361. European Art, 1850-1900. (4 cr, \$5509)
European art from the mid-19th century through 1900, including late Realism, Impressionism, pan-European Symbolism, and Art Nouveau, examined in social and historical contexts.

ArtH 3370. European Art, 1900-1940. (4 cr, \$5510)
European Art from 1900 to World War II, including Cubism, Futurism, Dada, de Stijl, German Expressionism, New Objectivity, Surrealism, art of Bauhaus, and art of National Socialists, examined in social and historical contexts.

ArtH 3380. Art of the United States, 1650-1900. (4 cr, \$5511)
U.S. art from the colonial period through 1900 examined in social and historical contexts.

ArtH 3391. Honors Art History Research. (4 cr, \$5996; prereq #)
Directed, but primarily independent, research in an area of art history for students of exceptional ability.

ArtH 3512. American Art of the 20th Century. (4 cr, \$5512)
American art from the Armory Show of 1913 to present examined in social and historical contexts.

ArtH 3807. The Art of Japan. (4 cr)
Japanese art and architecture from prehistory to present examined in religious, social, political, and economic contexts.

ArtH 3997. Topics in Art History: (Various Titles to be Assigned). (1-4 cr each offering [may be repeated for 8 cr max])
Special topics in art history. Title announced before course offered.

ArtH 5999. Directed Study in Art History. (1-4 cr [may be repeated for 6 cr max for undergrad, 20 cr max for grad]; prereq #)
Independent research in an area of art history pertinent to the interests of the student. Fundamental knowledge of period or subject required.

Astronomy (Ast)

College of Science and Engineering

Ast 1040. Introductory Astronomy. (4 cr, \$1010, \$1020, \$1030; 4 hrs lect, 1 hr rec per wk during first 4 wks)
Nonmathematical description of present knowledge of the solar system, stars, interstellar space, galaxies, the universe.

Ast 3040. The Solar System. (4 cr; prereq 1040, Math 1250 or 1210 or #)
Survey of planets and their satellites; asteroids, comets, interplanetary debris; origin and evolution of solar system.

Behavioral Sciences (BhSc)

School of Medicine

BhSc 5401-5402-5403. Human Problems in Family Medicine. (2 cr each; prereq regis med or Δ) Davis, Hoffman Human problems throughout the life span. *5401*: Problems of infancy, childhood, and adolescence such as attachment, attention deficit, disruptive behavior, and eating disorders; developmental delays; child abuse. *5402-5403*: Problems of adulthood such as anxiety, somatoform, mood, and personality disorders; chronic pain; addictions; schizophrenia; dementia; delirium. Emphasis on how these problems are demonstrated in a family practice setting. Assessment and treatment described as relevant to family practice.

BhSc 5501. Problems in Medical Behavioral Science. (Cr ar [may be repeated for 10 cr max; no more than 6 cr total can be applied to a Graduate School program]; open to med students as an elective and to qualified upper div and grad students with #)

Independent study on a tutorial, seminar, or lecture basis. Investigative work, lecture material, and/or appropriate reading and discussions designed according to the interest and capabilities of the individual student.

BhSc 5514-5515. Topics in Medical Social Psychology. (1 cr each; prereq #) Boulger, Davis, Hoffman Series of electives on various topics in the general area of medical behavioral science. Typically, these include the social psychology of deviance, alternatives in health care delivery, family dynamics, and others.

Biochemistry and Molecular Biology (MdBc)

School of Medicine

College of Science and Engineering

MdBc 5501. Neurobiochemistry. (2 cr; prereq Chem 3311 or Chem 5337 or Med 5120 or Med 5221 or #) Drewes, Prohaska

Current concepts in neurobiochemistry including topics on anatomical and compositional properties of brain; membranes and transport; neurotransmission; receptors and signal transduction mechanisms; energy, carbohydrate, protein, lipid, and nucleic acid metabolism; development and diseases of the CNS.

MdBc 8151. Biochemistry Seminar. (1 cr; prereq grad major in biochem or chem or #) Current topics in biochemistry.

MdBc 8291. Current Research Techniques. (1-3 cr; prereq grad major in biochem or chem or #) Research projects in biochemistry, each to be carried out in the research lab of an individual faculty member.

MdBc 8666. Doctoral Pre-Thesis Credits. (1-18 cr [11 cr max per summer term]; prereq doctoral student who has not passed preliminary oral examination)

MdBc 8777. Thesis Credits: Masters. (1-16 cr, [max 11 cr per summer term]; prereq grad) Thesis research and development.

MdBc 8888. Thesis Credits: Doctoral. (1-36 cr [max 18 cr per qtr, 11 cr per summer term]) Doctoral dissertation research and preparation.

Biology (Biol)

College of Science and Engineering

Biol 1001. Elements of Microbiology. (4 cr; open to family life education majors, student nurses, paranurses, certain preprofessional students; 2 hrs lect, 4 hrs lab) Microbes affecting health of individuals and the community. Survey of microbes, growth, lab procedures, control, representative diseases, immunity. Food, water, and environmental microbiology.

Biol 1010. Home Horticulture. (3 cr; not applicable to Biol major or minor; 2 hrs lect, 2 hrs lab) Plant identification, growth, and culture with practical applications to home landscaping, house plants, and fruit, flower, and vegetable gardening.

Biol 1012. Human Anatomy. (5 cr; primarily for students preparing for nursing, preprofessional programs, communication disorders, physical education; 3 hrs lect, 4 hrs lab) Gross and microscopic structure of the human body from a functional standpoint using charts, models, and skeletons; cat and sheep organ dissection to demonstrate mammalian anatomy.

Biol 1102. Biology and Society. (5 cr, \$1109, \$1110, \$1111, \$1112, \$1113; 4 hrs lect, 2 hrs lab) Contemporary issues in biology. For nonmajors.

Biol 1111. General Biology. (5 cr, \$1109, \$1110; prereq high school chem or 1 qtr college chem; 4 hrs lect, 2 hrs lab) Fundamental concepts of biology, including chemical basis of life, cell structure and function, energy transformation pathways and photosynthesis, development, genetics, evolution.

Biol 1112. Animal Biology. (5 cr, \$1109, \$1110; prereq 1111; 3 hrs lect, 4 hrs lab) Fundamental concepts of biology, including animal form and function, physiological adaptations, reproduction, diversity, interactions between animals and environment.

Biol 1113. Plant Biology. (5 cr, \$1110; prereq 1111; 3 hrs lect, 4 hrs lab) Fundamental concepts of biology, including plant physiology and development; plant-water relations; classification and diversity among fungi, algae, bryophytes, and vascular plants; plant-animal interactions; ecosystem ecology.

Biol 3101. Laboratory Teaching Experience. (1-2 cr [may be repeated for 3 cr max; 2 cr max may be applied toward Biol major]; prereq Biol or Life Sci major, 90 cr incl 25 cr Biol, #) Participation in teaching of biology lab courses. Experience includes helping to set up and share in the teaching of labs.

Biol 3154. Principles of Genetics. (4 cr; prereq 1110 or 1112, 1113, Math 1003 or equiv; 4 hrs lect) Basic principles of Mendelian inheritance, molecular genetics, chromosomal aberrations, and population genetics.

Biol 3170. Issues in Global Ecology. (3 cr; prereq 1102 or 1110 or 1111 or #; 3 hrs lect) Holistic approach to current status and future prospects of Earth's life support systems.

Biol 3245. Cellular Biology. (4 cr, \$3243, \$3244; prereq 1110 or 1112, 1113, 5 cr organic chem or #; 4 hrs lect) Structure and function of prokaryotic and eukaryotic cells, including cell surface, membranes, organelles, cytoskeleton, cell growth, cell physiology, and experimental methods used in cell studies.

Biol 3410. Plant Diversity. (5 cr; prereq 1110 or 1113; 3 hrs lect, 4 hrs lab)

Evolutionary survey of plants focusing on diversity of life histories and patterns of organization. Discussion of fossil and extant groups, including algae and nonvascular and vascular land plants.

Biol 3463. Plant Taxonomy. (5 cr \$5461; prereq 1110 or 1113; 3 hrs lect, 4 hrs lab)

Introduction to taxonomy of vascular plants with emphasis on seed plants; representative families; terminology; literature, use of keys.

Biol 3510. Animal Diversity. (5 cr; prereq 1109 or 1112 or #; 3 hrs lect, 4 hrs lab)

Survey of major animal phyla focusing on phylogeny, anatomy, physiology, and ontogeny.

Biol 3774. General Ecology Laboratory. (2 cr; prereq concurrent regis or prior cr in 3775; 4 hrs lab)

Experience in methods of measuring environmental factors, interpreting data.

Biol 3775. General Ecology. (4 cr, \$3773; prereq 1110 or 1112, 1113 or #; may be taken without lab 3774; 4 hrs lect)

Relationships between life and environment for individuals, populations, communities, and ecosystems; surveys of environmental factors and biomes.

Biol 3900. Topics in Biology. (Cr or [may be repeated for 6 cr max]; prereq 1110 or 1112, 1113 or Δ)

Biol 3959. Seminar Evaluation. (1 cr; prereq jr or #) Students attend and evaluate department seminars.

Biol 3960. Seminar. (1 cr [may be repeated for 3 cr max]; prereq 3959, jr or sr or #)

Experience in oral presentation of student-initiated field, lab, or library research findings.

Biol 3970. Internship in Biology. (1-3 cr [1 cr may be applied to Biol major]; prereq 1110 or 1112, 1113, #, Δ)

Credit given for professional work experience outside an academic department. Prior department approval and coordination with faculty sponsor required.

Biol 3990. Undergraduate Research. (1-2 cr [may be repeated for 6 cr max; 2 cr may be applied to Biol major or minor as upper div elective]; prereq 1110 or 1112, 1113, jr, Δ)

Advanced work in special fields.

Biol 5155. Evolutionary Biology. (3 cr; prereq 1110 or 1112, 1113 or #; 3 hrs lect)

Examination of origin, history, opposition, and evidence supporting evolutionary ideas. Basic concepts include the origin of life, phylogeny, biological history, mechanisms of evolutionary change, population genetics, speciation, tempo of evolution, macroevolution, extinction, biogeography, evolution of social systems and altruism.

Biol 5214. Plant Development and Structure. (5 cr, \$5213; prereq 3410, [3154 or 3245] or #; 3 hrs lect, 4 hrs lab)

Development of plant form and structure, emphasizing basic patterns of differentiation and the parameters of variation. Emphasis on development and function of plant body during the entire life cycle.

Biol 5237. Developmental Biology. (5 cr, \$5236; prereq 3154, 3245 or #; 3 hrs lect, 4 hrs lab)

Molecular and cellular mechanisms of development, including cell cycle, gametogenesis, fertilization, gastrulation, gene expression and control, determination, induction, cytodifferentiation, cell interactions, pattern formation, metamorphosis, and regeneration.

Biol 5241. Experimental Immunology. (4 cr; prereq 5403 or MicB 5545, #; 2 hrs lect, 6 hrs lab)

Principles and practices of basic and advanced immunological laboratory techniques.

Biol 5255. Molecular Biology and Genetics. (5 cr, \$5222, \$5254; prereq 3154, 3245 or #; 5 hrs lect)

Contemporary topics dealing with the molecular biology and genetics of procaryotic and eucaryotic organisms.

Biol 5256. Molecular Biology and Genetics Laboratory. (3 cr, \$5254; prereq concurrent regis or Biol 5255 or #; 1 hr lect, 6 hrs lab)

Lab emphasizing recombinant DNA procedures and their use with bacteria and viruses.

Biol 5403. General Microbiology. (5 cr; prereq 3245 or #; 3 hrs lect, 6 hrs lab) Hicks

Morphology of microorganisms; growth; environmental and physiological types; physical and chemical control; taxonomy; viruses; genetics of bacteria; practical applications including medical, water, soil, and food microbiology.

Biol 5443. Plant Physiology. (3 cr; prereq 3245 or #; 3 hrs lect)

Study of plant functions with emphasis on the higher plants. Biochemical and physical aspects of plants, their growth, nutrition, metabolism, and relationship to light, water, and other environmental factors. Research paper required of graduate students.

Biol 5444. Plant Physiology Laboratory. (2 cr; prereq 5443; 6 hrs lab)

Experimental basis for interpretation of certain physiological phenomena in plants, research problems, methods, and techniques in plant physiology. Research problem required of graduate students.

Biol 5517. Comparative Anatomy of Vertebrates. (5 cr; prereq 1110 or 1112, 1113; 3 hrs lect, 4 hrs lab)

Christian
Review of vertebrate groups with emphasis on phylogeny.

Biol 5518. Vertebrate Embryology. (4 cr, \$5235; prereq 3245 or #; 2 hrs lect, 4 hrs lab)

Firling
Comparative morphogenesis of vertebrate embryo, including reproductive cycles, gametogenesis, fertilization, cleavage, gastrulation, embryonic adaptations, evolutionary relationships, and detailed consideration of mammalian organogenesis. Lab study of developmental anatomy of frog, chick, and pig embryo.

Biol 5519. Histology I. (3 cr; prereq 3245; 2 hrs lect, 2 hrs lab)

Biological components of mammalian tissues studied at the light and electron microscopic levels. Structure and function of cellular elements; epithelium; peripheral blood; connective tissues; mineralized tissue and joints; muscle, nerve, cardiovascular, and myeloid tissues.

COURSE DESCRIPTIONS

Biol 5520. Histology II. (3 cr; prereq 5519; 2 hrs lect, 2 hrs lab)

Biological structure and function of mammalian organs and systems studied at the light and electron microscopic levels. The eye and ear; lymphoid, respiratory, urinary, integumentary, digestive, endocrine, and reproductive systems.

Biol 5523. Natural History of Invertebrates. (4 cr; prereq 1110 or 1112, 1113 or #; 2 hrs lect, 5 hrs lab and field) Holmstrand

Collection, identification, life histories, and ecological relationships of local invertebrates; emphasis on aquatic species.

Biol 5526. Ichthyology. (4 cr; prereq 3775 or #; 2 hrs lect, 5 hrs lab) Collins

Physiologic, taxonomic, ecologic, economic, and behavioral aspects of fishes. Lab emphasis on fishes of the Great Lakes region including field conducted independent study.

Biol 5527. Ornithology. (5 cr; prereq 1110 or 1112, 1113 or #; 3 hrs lect, 5 hrs lab and field) Niemi

Lab and field identification of birds, their migration and habitats; biological, taxonomic, and economic considerations.

Biol 5561. Introductory Entomology. (5 cr; prereq 1110 or 1112, 1113 or #; 2 hrs lect, 6 hrs lab and field) Hershey

Structure, life history, ecology, classification, evolution, principles of control, and the significance of insects in our society. Field collections.

Biol 5583. Animal Behavior. (3 cr; prereq 1110 or 1112, 1113 or #; 3 hrs lect)

Description of the known behavior of the various vertebrate and invertebrate phyla with emphasis on adaptive significance and the genetics and ontogeny of behavioral patterns. Emphasis on mating, aggressive, nutritive, and nurturing behavior. Behavior related to ecology of animal populations.

Biol 5584. Animal Behavior Laboratory. (2 cr; prereq 5583 or #5583; 4 hrs lab) Collins

Lab analysis of animal behavior. Student projects will be assigned for demonstration of behavior principles.

Biol 5674. Coral Reef Field Studies. (3 cr, \$5673; prereq 1110 or 1112, 1113 or #; 2 hrs lect, 10-day field trip; offered 1995-96 and alt yrs)

Biological studies of the coral reef complex and associated habitats of the Florida Keys. Ecology and taxonomy of associated biota. Field studies in Florida. Costs include tuition and prorated share of field trip expenses.

Biol 5677. Microbial Ecology. (5 cr; prereq 3245, 3775 or 5403 or #; 3 hrs lect, 6 hrs lab) Hicks

Bacterial and fungal distribution, energetics, regulation, growth, and reproduction in aerobic and anaerobic environments. Interactions of microbial populations and communities; their roles in biodegradation, biogeochemical cycling, ecosystem functioning, and industrial, agricultural, and environmental applications. Lab focuses on modern microbial ecology and physiology techniques.

Biol 5771. Stream Ecology. (5 cr, \$5671, \$5672; prereq 3775 or #; 3 hrs lect, 5 hrs lab and field; offered 1995-96 and alt yrs) Hershey

Studies of stream communities and ecosystems as influenced by biological interactions and physical factors. Emphasis on North Shore streams.

Biol 5772. Managing and Monitoring Lakes and Streams. (3 cr; prereq 3775, 5771 or 5773 or #; 3 hrs lect) Aquatic ecology (lakes, streams, wetlands), common water resource problems and impacts, technical tools for assessing problems, strategies for restoring and remediating disturbed aquatic ecosystems.

Biol 5773. Limnology. (4 cr; prereq 3775 or #; 2 hrs lect, 4 hrs lab) Klemmer

Biology, geology, physics, and chemistry of inland waters. Field and lab sessions focus on ecological assessments of regional lake conditions.

Biol 5776. Ecosystems Ecology. (4 cr; prereq 3774, 3775 or #; 2 hrs lect, 4 hrs lab) Hershey
Survey of terrestrial and aquatic ecosystems emphasizing current literature on ecosystem processes.

Biol 5777. Plankton Ecology. (4 cr; prereq 5773 or #; 2 hrs lect, 4 hrs lab)

Ecology of plant and animal plankton, with an emphasis on lake communities.

Biol 5780. Plant Autecology. (4 cr; prereq 3775; 3 hrs lect, 2 hrs lab) Schimpf

Survey of environmental factors and responses to these by an individual plant; ecological life histories; biotic interactions; intraspecific variation; use of instrumentation; emphasis on seed plants.

Biol 5781. Plant Population and Community Ecology. (5 cr; prereq 3774; 3 hrs lect, 4 hrs lab) Schimpf
Structure and dynamics of plant populations and plant communities in relation to environment; emphasis on seed plants.

Biol 5821. Mathematical Ecology. (3 cr; prereq 3775, Math 1296; 3 hrs lect)

Analysis of ecological problems using mathematical methods; logistic equation, Lotka-Volterra equations, Markov chains, stability analysis, and mass balance constraints, among others. Introduction to computer techniques for solving these mathematical problems and inferring their ecological implications.

Biol 5871. Water Pollution Biology. (3 cr; prereq 5773 or #; 2 hrs lect, 3 hrs lab) Klemmer

Systems approach to the responses of aquatic organisms, communities, and ecosystems to pollutants and human use. Case studies of stressed aquatic ecosystems.

Biol 5900. Topics in Biology. (1-5 cr [may be repeated for 6 cr max]; prereq 1110 or 1112, 1113, #)
Specific topics submitted for biology department review. Topic announced before course offered.

Biol 8777. Thesis Credits: Master's. (1-16 cr [11 cr max per summer term]; prereq grad)
Thesis research and development.

Biol 8871. Seminar in Ecology. (1 cr [may be repeated]; prereq grad in Biol or related field, #)
In-depth analyses of topics in ecology.

Biol 8960. Graduate Seminar. (1 cr [may be repeated for a max of 3 cr]; prereq Δ)
Reports on recent developments in biology and on research projects in the department.

Biol 8990. Graduate Research. (Cr ar; prereq #)

Business Law (BLaw)

School of Business and Economics

BLaw 1106. The Legal Environment. (4 cr; prereq 30 cr)

Introduction to the U.S. legal system and its impact on modern business operations. Ethical, economic, social, and political perspectives of the legal environment. Constitutional law, administrative regulation, torts and products liability, contracts, business organizations, employment/labor law.

BLaw 3107. Law of Contracts, Sales, Property, and Bankruptcy. (4 cr; prereq 1106, SBE candidate or approved Bus Adm minor or □)

Law of contract and sales, application of Uniform Commercial Code, basic laws affecting business transactions, laws of property and bankruptcy in relation to business management.

BLaw 3108. Law of Partnerships, Corporations, and Property. (4 cr; prereq 1106, SBE candidate or approved Bus Adm minor or □)

Laws of business organizations and organization members as principal-agent, employer-employee. Real and personal property, wills and estates, to provide orderly management and succession of property interests. For those seeking accounting or other professional business certification.

Chemical Engineering (ChE)

College of Science and Engineering

ChE 1010. Introduction to Chemical Engineering. (4 cr, §3010, §ChPE 3010; prereq [high school chem, high school algebra] or #)

Differences between natural sciences and chemical engineering. Continuous processing concept and waste disposal problems. Brief description of common chemical engineering equipment. Selection of process paths on basis of economics. Species allocation and selection of species separation methods. Discussion of typical process flow sheets.

ChE 3050. Computational Methods in Chemical Engineering. (2 cr; prereq [Math 3380, BChE major or candidate] or #)

Use of numerical computation software for solving chemical engineering problems; spreadsheet software for performing iterative calculations in material and energy balances, repetitive calculations in chemical engineering lab, and plotting graphs; and computer-aided drafting or graphic software for drawing chemical engineering flow sheets. Numerical and graphical methods.

ChE 3110. Stoichiometry. (4 cr; prereq [Chem 1112 or Chem 1132H, BChE major or candidate] or #)

Elementary principles of chemical processes with emphasis on material balances.

ChE 3113. Material and Energy Balances. (4 cr, §3110; prereq college chem or #)

Applications of the principles of material and energy balances to industrial processes.

ChE 3210. Fluid Mechanics. (4 cr, §3211; prereq [Engr 3015, Math 3380, BChE candidate] or #)

Flow of viscous incompressible fluids, fluid statics, Bernoulli equation, momentum conservation, laminar and turbulent pipe flow, laminar and turbulent boundary layers, pumps, fluid systems.

ChE 3220. Heat Transfer. (4 cr, §3212; prereq [3210, BChE candidate] or #)

Steady and unsteady conduction of heat. Convection heat transfer in boundary layer and duct flows, forced and free convection, boiling and heat exchangers. Heat transfer by thermal radiation. Radiative properties of black bodies and real surfaces. Design of heat transfer systems. Evaporation.

ChE 3230. Mass Transfer Operations. (4 cr; prereq [3110, 3212, BChE candidate] or #)

Applications of principles of mass transfer. Design of distillation, gas absorption, desorption, liquid extraction, drying, and leaching processes.

ChE 3411. Chemical Engineering Laboratory I. (3 cr; prereq [grade of C or better in 3110, 3210, 3220], Chem 5622 or ¶[Chem 5622, BChE candidate or #])

Experiments illustrating physicochemical, fluids mechanics, and heat transfer principles. Technical report writing.

ChE 3412. Chemical Engineering Laboratory II. (3 cr; prereq [3230, grade of C or better in 3411, BChE candidate] or #)

Experiments illustrating mass transfer, simultaneous mass and heat transfer, and other separation process principles. Technical report writing.

ChE 3526. Experimental Design in Chemical Engineering. (3 cr, §3525; prereq [3110, Math 3320, Math 3380, BChE major or candidate] or #)

Modern techniques used to design and operate chemical process systems. Steady-state and dynamic methods. Techniques for search of the optimum.

ChE 3601-3602. Thermodynamics I-II. (3 cr each; prereq [3110, BChE major or candidate] or #)

Application of thermodynamic principles to chemical engineering with emphasis on pressure-volume-temperature relationships, thermodynamic laws, thermochemistry, chemical equilibrium, and phase relationships.

ChE 3611. Chemical Reactor Design and Analysis. (4 cr; prereq [3110, Chem 5622, Math 3380 or Math 3381, BChE candidate] or #)

Theory of rates of chemical reactions. Application of rate data to design of batch, tubular, continuous stirred-tank, and catalytic-chemical reactors.

ChE 3621. Process Control. (4 cr; prereq [3110, 3230, 3611, Math 3380 or Math 3381, BChE candidate] or #)

Dynamic behavior of processes and systems and their control. Design of various types of control strategies, including feedback and feedforward control systems.

ChE 3631. Chemical Engineering Analysis. (4 cr, §ChPE 3631; prereq [3110, 3230, 3611 or ¶3611, Math 3340, Math 3380 or Math 3381, BChE candidate] or #)

Analysis of chemical processes by mathematical modeling and their simulation using computer-aided methods.

COURSE DESCRIPTIONS

ChE 3651. Engineering Economy. (4 cr; prereq [Math 3298, BChE or BIE candidate] or #)
Economic decisions involving design of process plants and their operation, including economic alternative selection, economic feasibility prediction, financing methods available, depreciation and tax considerations, life-cycle costing, and sensitivity and risk analysis.

ChE 3700. Independent Study. (1 to 4 cr, \$ChPE 3700; prereq Δ)
Directed individual study to be arranged with the instructor and the head of the department before registration.

ChE 3701-3702. Chemical Engineering Design I-II. (5 cr each; prereq [3110, 3230, 3611, 5535, 3601 or \S 3601, 3621 or \S 3621, 3651 or \S 3651, BChE candidate] or #)
Preliminary design of a chemical processing plant, including market survey, process selection, site selection, flowsheet preparation, material and energy balances, instrumentation, equipment design, plant safety, plant layout, environmental pollution control, economic feasibility, and sensitivity analysis.

ChE 3910. Chemical Engineering Research. (1-4 cr [may be repeated for 8 cr max; no more than 8 cr in 3910 and 3910H combined]; prereq BChE candidate, Δ ; cannot be used to satisfy requirements for ChE major)
Experience in a selected area of research in chemical engineering. Student must present a satisfactory written report and oral presentation. Course can also be used for preparation of a research proposal.

ChE 3910H. Honors Chemical Engineering Research. (1-4 cr [may be repeated for 8 cr max; no more than 8 cr in 3910 and 3910H combined]; prereq BChE candidate, Δ ; cannot be used to satisfy requirements for ChE major)
Experience in a selected area of research in chemical engineering for honors students. Student must present a satisfactory written report and oral presentation. Course can also be used for preparation of a research proposal for a department honors program.

ChE 3940. Hazardous Waste Processing for Non-chemical Engineers. (4 cr, \$5534-5535; prereq high school chem, high school algebra or #; cannot be used to satisfy requirements for ChE major)
Definition of hazardous waste. Federal laws pertaining to hazardous wastes, air and water pollution. Air pollutants and their control. Wastewater treatment. Waste minimization, resource recycling and recovery. Hazardous waste management. Radioactive waste.

ChE 3950. Cooperative Education. (1 to 6 cr [may be repeated for 30 cr max]; prereq BChE candidate, Δ ; cannot be used to satisfy requirements for ChE major)
Practical work experience with an employer closely associated with student's academic area. Arranged by mutual agreement among student, department, and employer. Formal written report of work done submitted to department at end of co-op experience.

ChE 5534-5535. Hazardous Waste Processing Engineering I-II. (4 cr each; prereq [Chem 3513 or Chem 3542, Chem 5611 or \S Chem 5611 or Chem 5621 or \S Chem 5621, Phys 1109 or Phys 1109H] or #)
Identification of hazardous substances and their effects. Federal and state regulations. Design of waste treatment processes. Management of hazardous wastes. Modifications of processes to avoid hazardous waste formation.

ChE 5800. Special Topics: (Various Titles to be Assigned). (1 to 5 cr [may be repeated for 12 cr max]; cannot be used to satisfy requirements for ChE major; prereq #)

Study of current and special topics in chemical engineering of interest to students that are not available in the regular department curriculum. May involve specialties of the department or visiting faculty.

Chemistry (Chem)

College of Science and Engineering

Chem 1001. Preparatory Chemistry. (4 cr [cr cannot be applied to a degree]; offered through UC)
For students who have not taken high school chemistry or who need additional background before enrolling in general chemistry.

Chem 1101. Aspects of Chemistry. (5 cr, \S 1105, \S 1110, \S 1130H, \S 1140)
Selected topics in general, organic, and biological chemistry. Study of chemical principles, their application, and their impact on daily life. Intended to be a liberal education offering. Independent unit in contrast to Chem 1105, 1110, or 1130H.

Chem 1105-1106-1107. Introduction to General, Organic, and Biological Chemistry. (5 cr each, \S 1103, \S 1110, \S 1130H, \S 1140 for 1105; \S 1104, \S 1111, \S 1131H, \S 1140 for 1106; \S 1500, \S 3311, \S 3512, \S 3540 for 1107; prereq 1105 for 1106, 1106 for 1107; for students terminating study of chem with no more than 15 cr; 5 hrs lect, rec, lab prep, 2 hrs lab)
Chemical principles and their applications: atomic and molecular structure, solutions, acids, bases, salts, equilibria; physical and chemical properties of organic compounds, major functional groups found in living systems; study of carbohydrates, lipids, proteins, enzymes, nucleic acids, and metabolic pathways.

Chem 1110-1111-1112. General Chemistry. (5 cr each, \S 1103-1104 [exceptions permitted by dept action only], \S 1105-1106 [exceptions permitted by dept action only], \S 1130H-1131H-1132H, \S 1140 for 1110, 1111; primarily for students who will take more than 15 cr chem; prereq high school chem, high school algebra or Δ ; 5 hrs lect, rec, lab prep, 3 hrs lab)
Fundamental principles exemplified by study of elements, compounds, and their reactions.

Chem 1130H-1131H-1132H. General Chemistry. (5 cr each, \S 1103-1104 [exceptions permitted by dept action only], \S 1105-1106 [exceptions permitted by dept action only], \S 1110-1111-1112, \S 1140 for 1130H, 1131H; primarily for chem majors and others selected for aptitude and interest; prereq high school chem, high school algebra or Δ ; 5 hrs lect, rec, lab prep, 3 hrs lab)
Fundamental principles exemplified by study of elements, compounds, and their reactions.

Chem 1140. General Chemistry. (5 cr, \S 1103-1104 [exceptions permitted by dept action only], \S 1105-1106 [exceptions permitted by dept action only], \S 1110-1111, \S 1130H-1131H; prereq Phys 1108, ECE or IE or Phys or Applied Phys major with 42 cr or #; 4 hrs lect, 2 hrs lab)
Fundamental principles exemplified by study of elements, compounds, and their reactions. Accelerated course for engineering majors with strong background in physics and mathematics.

Chem 1150. Independent Study. (1-2 cr [may be repeated for 4 cr max]; prereq Δ)

For students wishing to do special work in areas useful to individual programs and objectives when such are not available in regular course offerings.

Chem 3107. Introductory Environmental Chemistry. (4 cr; prereq 1112 or 1132H)

Introduction to air and water chemistry. Sources and reactions of C, N, O, P, S and trace metals. Pollution and waste disposal. Field trips to local laboratories.

Chem 3150. Topics in Chemistry. (1 cr [may be repeated for 2 cr max]; prereq sr, Δ)

Integration of subject matter in the four-year curriculum.

Chem 3181. Undergraduate Seminar. ($\frac{1}{2}$ cr per qtr; 1 hr per wk for 4 qtrs; prereq BS Chem or Biochem/Molecular Biol majors)

Practice in the preparation and oral presentation of reports on articles from the literature or on senior research.

Chem 3192. Chemistry Research. (1-3 cr [may be repeated for 9 cr max]; prereq Δ)

Provides experience in a selected area of research in chemistry.

Chem 3210. Introductory Quantitative Analysis. (5 cr; prereq 1112 or 1132H; 3 hrs lect, 6 hrs lab)

Theory and practice in analytical techniques; introduces gravimetric, volumetric, and spectrophotometric methods.

Chem 3311. Biochemistry. (4 cr, §5336-5337; prereq 3513 or #; 4 hrs lect)

Survey of biochemistry with emphasis on enzyme catalysis, cellular energetics, and major metabolic processes.

Chem 3512-3513. Organic Chemistry. (5 cr each, §3540; prereq 1112 or 1132H or #; 4 hrs lect, 3 hrs lab)

Chemistry of carbon compounds with emphasis on those of biological importance.

Chem 3514. Intermediate Organic Chemistry. (4 cr, §3542; prereq 3513; 2 hrs lect, 6 hrs lab)

Advanced topics in organic chemistry for those planning on a chemistry career.

Chem 5120. Advanced Chemistry Laboratory. (1 cr; prereq 3210, 3514 or 3542; 3 hrs lab)

Basic measurements in chemical systems.

Chem 5121-5122-5123. Advanced Chemistry Laboratory. (2 cr each; prereq 3210, 5620, [5420 or §5420 and 5621 or §5621 for 5121], [5622 or §5622 for 5122]; 6 hrs lab each)

Integrated lab program in chemistry, including thermodynamics, spectroscopy, kinetics, synthesis, and instrumental analysis.

Chem 5230. Instrumental Analysis. (3 cr; prereq 3210, 5611 or 5622)

Theory and applications of instrumental methods of chemical analysis, including electrochemistry, spectroscopy, and separations.

Chem 5335. Biochemical Techniques. (1-3 cr [three areas covered separately with 1 cr for each; students may take any combination of a, b, and c]; prereq 5361 or #; 3 hrs lab per cr)

Lab in biochemical techniques with emphasis on (a) chromatography and electrophoresis, (b) radioisotopes, and (c) enzymes and metabolism.

Chem 5336-5337. Biochemistry. (4 cr each, §3311; prereq 3513 or 3542, Math 1296; physical chem recommended; 4 hrs lect)

Introduction to the properties of biochemically important compounds and their interactions in living systems with emphasis on bioenergetics, enzyme mechanisms, major metabolic pathways, and metabolic regulation.

Chem 5338. Molecular Biology. (4 cr; prereq 5337, Biol 3154 or #)

Biochemistry of information storage and transfer in biological systems, including DNA/chromosome structure, transcription, gene regulation, translation, replication, DNA repair, and recombinant DNA technology.

Chem 5361. Biochemistry Laboratory. (2 cr; prereq 3210, 3311 or §3311 with # or 5337 or §5337 with #; 6 hrs lab)

Introduction to various biochemical techniques.

Chem 5362. Advanced Biochemistry and Molecular Biology Laboratory. (2 cr; prereq 5338 or §5338, 5361 or #; 6 hrs lab)

Applications of advanced biochemistry and molecular biology techniques.

Chem 5399. Research Topics for High School Chemistry Teachers. (3-6 cr [may be repeated for 12 cr max]; prereq admission to MA in ed or MEd program, Δ)
Experimental work and philosophy associated with a selected research topic in chemistry.

Chem 5420-5421. Inorganic Chemistry. (3 cr each; prereq 5610 or 5620; 3 hrs lect)

5420: Atomic structure and properties of elements based thereon. Chemical bonding. Chemistry of coordination compounds. *5421*: Mechanisms of selected inorganic reactions; survey of the chemistry of the representative elements. Organometallic chemistry. Bioinorganic chemistry.

Chem 5610-5611. Physical Chemistry. ($\frac{3}{4}$ cr [may be taken for 3/3 cr by omitting lab work]; prereq 3513 or #, Math 1297, Phys 1109 or 1109H for 5610; 5610 for 5611; 3210 or # for 5611 lab; 3 hrs lab for 5611)

Properties of gases, liquids, and solutions; thermodynamics and equilibria; electrochemistry; chemical kinetics.

Chem 5620-5621-5622. Physical Chemistry. (3 cr each; prereq 2 yrs chem, Math 3298, Math 3320, [Phys 1109 or Phys 1109H])

Quantitative treatment of physical principles and theories underlying chemistry.

Chem 5710. Structural Chemistry. (5 cr; prereq grad or #)

Application and instrumentation in spectroscopy; techniques for structure elucidation.

Chem 5720. Theoretical Chemistry. (4 cr; prereq grad or #)

Introduction to theoretical aspects of atomic and molecular structure, chemical bonding, symmetry, and spectroscopic methods.

Chem 5730. Synthesis. (4 cr; prereq grad or #)

Philosophy, nature, and concepts of chemical synthesis.

Chem 5740. Thermodynamics. (4 cr; prereq grad or #)

Basic principles of classical and statistical thermodynamics with applications to the various areas of chemistry.

Chem 5750. Kinetics and Mechanisms. (4 cr; prereq grad or #)

Reaction rate theory, relationship between kinetics and thermodynamics, catalysis, methods and theory of establishing mechanisms.

Chem 8180. Seminar. (1 cr [may be repeated for cr])
Practice in the preparation and oral presentation of reports on articles from the literature or on graduate research.

Chem 8240. Electrochemical Methods. (4 cr)
Treatment of electrochemical methods including potentiometry, voltammetry, and coulometry.

Chem 8241. Methods of Separation. (4 cr)
Theory and applications of various separation techniques, including solvent extraction, chromatography, and ion exchange.

Chem 8340. Advanced Biochemistry. (4 cr; prereq 5337 or equiv)
Current topics in biochemistry.

Chem 8440. Theoretical Inorganic Chemistry. (4 cr; prereq 5720)
Discussion of structure, reactions, and bonding in inorganic compounds in terms of valence bond, molecular orbital, and ligand field theories. Theory and application of absorption spectroscopy.

Chem 8441. Physical Methods in Inorganic Chemistry. (4 cr; prereq 8440)
Theory of physical methods with application to inorganic compounds.

Chem 8540. Organic Reaction Mechanisms. (4 cr; prereq 5750)
Specific application to organic reactions of material covered in 5750.

Chem 8541. Organic Synthesis. (4 cr; prereq 5730)
Selected total synthesis and synthetic methods in organic chemistry.

Chem 8641. Quantum Chemistry. (4 cr; prereq 5720, grad or #)
Applications of quantum theory in chemistry.

Chem 8740. Selected Topics in Chemistry. (Cr ar; prereq grad or #)

Chem 8777. Thesis Credits: Master's. (1-16 cr [max 11 cr per summer term])
Thesis research and development.

Chemistry for High School Teachers

Sci 5350-5351. Chemistry for High School Teachers III-IV. (3 cr each; prereq Δ; 4 hrs lect, 3 hrs lab; offered summer only)

Complete participation in lecture-quiz of Chem 3512-3513 required. Library research paper and special problems assigned. Experiments of particular importance to high school chemistry included in the lab assignments.

Coaching Certification (CC)

College of Education and Human Service Professions

CC 3100. Sport Science for Coaches. (3 cr; not open to PE majors; prereq coaching certification or coaching minor or #)

Introduction to the anatomical, biomechanical, and physiological bases of athletic performance and conditioning; designed specifically to meet the requirements of the Minnesota Board of Teaching Licensure requirements for head coaches.

CC 3116. Care and Prevention of Sport Injuries. (4 cr; prereq coaching certification or coaching minor or #; not open to PE majors)

Study of prevention and care of injuries with special emphasis on sport training programs. Reconditioning and preconditioning regimens.

CC 3150. Coaching Methods. (3 cr; prereq coaching certification or coaching minor or #)

Study and application of educational methods in an athletic setting. Topics include: skill development, learning styles, biological considerations, practice development, conditioning for sport, and skill analysis.

CC 3160. Psychological Aspects of Coaching. (2 cr; prereq coaching certification or coaching minor or #)

Introduction to field of coaching with its educational value coupled with the study of psychological and sociological dimensions of high-level performance.

CC 3161. Administrative Aspects of Coaching. (2 cr; prereq coaching certification or coaching minor or #)

State and federal governing organizations, budgeting, scheduling, insurance, contest administration, public relations procedures.

CC 3171. Coaching Basketball. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Fundamentals, styles of offense and defense, training suggestions.

CC 3172. Coaching Volleyball. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Coaching of volleyball offenses and defenses. Conditioning programs, coaching philosophies.

CC 3174. Coaching Soccer. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Fundamental skills, systems of offense and defense, strategy and rules of the game, methods of organizing practices.

CC 3175. Coaching Ice Hockey. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Fundamental skills, systems of offense and defense, strategy and rules of the game, methods of organizing practices.

CC 3176. Coaching Swimming. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Theory of coaching and teaching aquatics. Review of literature available on the competitive swimming and diving field, discussion of coaching philosophy, techniques, and methods.

CC 3177. Coaching Tennis. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Strategies, fundamentals, offense and defensive systems, practice drills, and training techniques.

CC 3178. Coaching Track and Field. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Fundamentals, mechanical analysis of events, training techniques, and strategies.

CC 3179. Coaching Wrestling. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Analysis of physical skills, training aspects, practice sessions, rule interpretations, and coaching philosophies that formulate a sound wrestling program.

CC 3270. Coaching Baseball. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Fundamentals, practice sessions, training techniques, and offensive and defensive strategies.

CC 3271. Coaching Softball. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Fundamentals, practice sessions, training techniques, and offensive and defensive strategies.

CC 3272. Coaching Football. (2 cr; prereq coaching certification or coaching minor or #; offered through UC)

Systems of offense and defense, strategy and methods of organizing practices and working with team members.

CC 3900. Coaching Practicum. (1-3 cr [may be repeated for 3 cr max; no more than 1 cr can be applied to coaching certification requirements]; prereq 15 cr CC courses, Δ)

Supervised coaching experience in a school setting.

College of Liberal Arts (CLA)

College of Liberal Arts

CLA 0001. CLA Freshman Orientation. (No cr; regis required first qtr in CLA)

Program to help facilitate the successful transition into the College of Liberal Arts.

Communication (Comm)

College of Liberal Arts

Comm 1000. Human Communication Theory. (4 cr, §3202)

Introduction to fundamental concepts, models, and theories of human communication. Examines issues concerning verbal and nonverbal symbolic processes, language and meaning, and the relationship between communication and understanding. Explores communication processes and problems in various contexts.

Comm 1112. Public Speaking. (4 cr, §1111)

Application of the theoretical bases of rhetoric to the public speaking situation.

Comm 1222. Interpersonal Communication. (4 cr, §1202)

Analysis of the role communication plays in interpersonal relationships.

Comm 1331. Modes of Film Communication. (4 cr; offered through UC)

Analyzes film as a medium, with emphasis on the form and function. A study of the technique of feature filmmaking. Includes a mandatory screening session separate from lecture/discussion sections.

Comm 1500. Media, Persuasion, and Society. (4 cr)

Analyzes the manipulative influence of contemporary media on American society. Examples drawn from campaigns, commercial advertising, and editorials.

Comm 3001. Advanced Public Speaking. (4 cr, §3000; prereq 1112)

Continuation of the study and practice of public speaking, with specific emphasis on persuasive speaking.

Comm 3020. Group Communication. (4 cr, §3121)

Techniques of problem solving and study of communication and dynamics within small, task-oriented groups.

Comm 3021. Communication in Organizations I. (4 cr, §3231; prereq 1112, jr or sr or #)

History of organizational development and the effect of organizational design and communication on one another. Analysis of communication issues including culture, power, conflict, networks, and gender.

Comm 3022. Communication in Organizations II. (4 cr, §3232; prereq 3021 or #)

Emphasis on the study and development of organization culture, communication and organizational design, and qualitative research methods in the organizational field.

Comm 3100. Principles of Persuasion. (4 cr, §3101; prereq one soc sci course or #)

Social scientific theory and research on communication techniques used to influence attitudes, perceptions, and behaviors of others. Examines research evidence regarding persuasion processes and effects on individuals and society.

Comm 3106. Presentational Speaking. (4 cr; prereq 1112, jr or sr or #)

Design and delivery of persuasive presentations, with specific applications to business and professional settings.

Comm 3112. Argumentation. (4 cr, §3111; prereq 1112)

Theory and practice in applying reasoned discourse to analyzing and presenting problems and their solutions to audiences.

Comm 3120. Group Decision Making. (4 cr)

Study of various small group approaches to problem management. Useful for anyone intending to participate in decision-making groups.

Comm 3122. Group Leadership. (4 cr)

Theory and practice of leadership and related skills in task-oriented, small group setting.

Comm 3123. Communication and Creativity. (4 cr)

Examines relationship between communication and the creative process. Techniques of deliberate creativity; creativity audits; the necessity of creative approaches to group, organizational, and social circumstances; physical and social aspects of creativity.

COURSE DESCRIPTIONS

Comm 3131. History of Rhetoric. (4 cr, \$3130; prereq Comm major or Δ)
Development of rhetorical thought as expressed by representative writers.

Comm 3151. Ethics in Human Communication. (4 cr, \$3150; prereq jr or sr or #)
Ethical questions faced by communicators in a variety of communication contexts, including interpersonal, public address, and mass media, emphasizing potential perspectives for making judgments about human communication.

Comm 3161. Special Topics in Communication: (Various Titles to be Assigned). (1-4 cr [may be repeated for 8 cr max])
Study of special topics not included in regular curriculum. Topic announced before course offered.

Comm 3171. Independent Study. (1-4 cr [may be repeated for 8 cr max; no more than 4 cr may be applied to Comm major or minor requirements]; prereq sr, 3.30 GPA in major/minor, #)
Directed readings and projects of interest to the student in the areas of communication, communication media, or communication education. Application deadline one week before beginning of registration for following quarter.

Comm 3200. Communication Research Methods. (3 cr; prereq Comm major or #)
Examines basic research methods used in science-based communication research. Introduces research design, measurement issues, elementary data analysis, and ethical issues in research on human subjects.

Comm 3220. Gender Communication. (4 cr, \$3230; prereq 1222)
Analysis of the changing role of women and men in modern society and the impact of those changes on establishing meaningful interpersonal relationships.

Comm 3226. Interviewing: Skills and Applications. (4 cr; prereq 1112, jr or sr or #)
Theory and techniques of effective interviewing. Emphasis placed on skill development in vocational and persuasive interview settings.

Comm 3240. Internship in Communication. (1-12 cr [no more than 4 cr may be applied to Comm major or minor requirements]; prereq sr Comm major/minor or Jour minor, 3.00 GPA in major/minor, Δ)
Students work in a pre-approved program with a public agency, private organization, or other service agency; work must be in specific area of communication. Internship must offer students professional experience not available in the classroom and/or practical application of classroom theory. Students submit to the department written and oral reports during the internship and at its conclusion; the employer submits a written evaluation. Application deadline is one week before the beginning of registration for the following quarter.

Comm 3251. Advanced Interpersonal Communication. (4 cr; prereq 1222)
In-depth study of and practice in listening skills, assertive communication skills, and conflict management.

Comm 3261. Communication in Families. (4 cr, \$3260)
Study of principles of interpersonal communication as they relate to various family types.

Comm 3265. Communication and Aging. (4 cr; prereq 1222 or #)
Communicative behavior of the elderly and the role of communication and aging in family relationships; communication between caregivers and the elderly; media portrayals of the elderly and their effect on perceptions.

Comm 3270. Communication in Personal Relationships. (4 cr; prereq 1000 or 1222)
Role of communication in developing, maintaining, and changing personal relationships.

Comm 3280. Intercultural Communication. (4 cr)
Role of cultures in shaping communication practices at interpersonal and intergroup relationship levels.

Comm 3322. Government Regulation of the Electronic Media. (4 cr, \$3321; prereq Jour 1101, jr or sr or #)
Study of origins, development, and applications of statutory and nonstatutory regulation of the electronic media in the United States and abroad, including broadcasting, cable, satellite, and emerging technologies.

Comm 3331. Critical Assessments of Television. (4 cr, \$3330; prereq Jour 1101)
Examination and critical evaluation of historical and contemporary programming and advertising on network, public, and cable television. Study and application of a variety of critical methods, including content analysis, semiotics, ideological analysis, narrative analysis, feminist analysis.

Comm 3334. Media Theory and Research. (4 cr, \$3333; prereq Comm major, Jour 1101 or Δ)
Theoretical concepts and research perspectives currently used to understand the intricacies of our mediated society. Introduction and application of basic research methods to study questions concerning the impact of media on society and individuals.

Comm 3342. Documentary Film and Television. (4 cr, \$3341; offered through UC)
Theories and methods of using film and television for information, persuasion, and propaganda.

Comm 3550. Communication and the Advertising Process. (4 cr, \$5550)
Analysis of theories of advertising and the role communication plays in promoting images. Students conduct an advertising campaign.

Comm 3612. Political Communication I. (4 cr, \$3611)
Aspects of the American presidency, judiciary, and legislature from a communication perspective.

Comm 3615. Rhetorical Criticism. (4 cr, \$3610; prereq jr or sr or #)
Survey of approaches to rhetorical analysis of communicative acts, events, and artifacts.

Comm 3621. Case Studies in Public Discourse. (4 cr, \$3260; prereq jr or sr or #)
Guided investigation of public discourse within selected periods of history. Topics vary.

Comm 3900. Intern Teaching in Communication. (3 cr [may be repeated for 6 cr max; no more than 3 cr may be applied to Comm major or minor requirements]; prereq sr Comm major/minor, #)
Practical experience in teaching beginning courses in the department. Students will serve as intern teachers assisting instructor in administration of the course. Application deadline one week before beginning of registration for following quarter.

Comm 5171. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq grad, #)
Directed readings and projects of interest to the student in the areas of communication, communication media, or communication education. Application deadline is one week before the beginning of registration for the following quarter.

Comm 5220. Conflict Management. (4 cr, §5230; prereq sr or grad or #)
Application of interpersonal conflict management theory and skills to small group, organizational, and community conflicts.

Comm 5330. Children and Television. (4 cr)
Exploration of children's television from critical/analytical, regulatory/policy, and social scientific perspectives.

Comm 5900. Workshop: (Various Titles to be Assigned). (1-4 cr [may be repeated for 8 cr max])
Intensive study of various aspects of communication.

Communication Sciences and Disorders (CSD)

College of Education and Human Service Professions

CSD 1990. Introduction to Phonetics. (4 cr, §CD 1990)
Study and practice in use of the International Phonetic Alphabet with relation to English and certain non-English speech sounds as they occur separately and in connected speech. For the English, modern language, speech, and communication disorders student.

CSD 3050. Speech, Language, and Gender. (4 cr; offered through Study in England program)
Study of differences and similarities in language, speech, and voice of males and females from three perspectives: use of communication parameters, perception of these parameters, self-perception of these parameters.

CSD 3060. Developing Effective Professional Communication Skills. (4 cr; offered through Study in England program)
Basic parameters of communication and their effective use. Personal communication styles and dialects.

CSD 3111. Introduction to Communication Disorders. (3 cr, §CD 3111; prereq #)
Overview of normal speech development and function. Speech, language, and hearing disorders and their management. Professional role and responsibilities of the speech clinician.

CSD 3211. Fundamentals of Speech Science. (4 cr, §CD 3211; prereq CSD major or #)
Structure and function of the neuromuscular system in breathing, phonation, and articulation. Acoustic correlates of speech production.

CSD 3214. Fundamentals of Hearing Science. (4 cr, §CD 3214; prereq 3211, CSD major or #)
Structure and function of the peripheral and central auditory system, basic principles underlying current theories of psychoacoustics. Lab.

CSD 3311. Articulation Development and Disorders. (4 cr, §CD 3311; prereq 3111, 3211, CSD major or #)
Normal articulation and phonological development; assessing and treating articulation disorders.

CSD 3411. Organic Disorders. (4 cr, §CD 3411; prereq 3111, CSD major or #)
Introduction to the etiology, evaluation, and management of those persons presenting neurophysiological and maxillofacial disturbances as they affect oral communication.

CSD 3510. Stuttering. (4 cr, §CD 3510; prereq 3111, CSD major or #)
Etiologies, development, and characteristics of stuttering. Normal fluency development and other fluency disorders.

CSD 3711. Introduction to Audiology. (3 cr, §CD 3711; prereq 3214, CSD major or #)
Overview of basic hearing assessment procedures as they occur clinically. Includes introduction to amplification systems. Computerized testing experiences and opportunity for observation.

CSD 3811. Aural Rehabilitation. (3 cr, §CD 3811; prereq 3214, CSD major or #)
Theories, principles, and methods of current approaches to auditory rehabilitation of hearing impaired children and adults.

CSD 3905. Observation: Professional Settings. (1 cr [may be repeated for 2 cr max], §CD 3905)
Direct observation of professional clinicians in differing treatment centers off campus.

CSD 3906. Clinical Methods. (5 cr, §CD 3901; prereq CSD major, 2 cr in 3905 or #)
Theory and methodology of diagnosis and treatment of individuals with language and speech disorders. Synthesizes information regarding the broad topic of interaction within the speech clinical setting.

CSD 3909. Introduction to Clinical Procedures. (1 cr [may be repeated]; prereq CSD major, grade of C or better in 3901 or 3906, 25 hrs clinical observation or #; 1 hr sem per wk; offered SS 1 only)
Beginning experience of supervised clinical practicum with speech, language, and/or hearing-impaired persons.

CSD 3910. Clinical Procedures. (2 cr, §CD 3910 [may be repeated for 8 cr max]; prereq CSD major, 25 hrs clinical observation or #; 1 hr sem per wk)
Supervised clinical practicum with speech, language and/or hearing-impaired persons.

CSD 5050. Microcomputer Applications in Communication Disorders. (3 cr, §CD 5050; prereq CSD major or #; offered alt yrs)
Use of microcomputers in communication disorders and special education settings.

COURSE DESCRIPTIONS

CSD 5060. Alternative Methods of Communication for Severely Handicapped. (3 cr, §CD 5060; prereq 5050 or 5065 or #) Communication systems (prostheses) for severely handicapped speakers.

CSD 5065. Adapting the Computer for the Handicapped. (3 cr, §ACH 5065; prereq #; offered alt yrs) Hands-on experience adapting Apple and IBM computers into communication aids. Scanning, expanded keyboard, Morse Code, assisted keyboard. Operation of ordinary software with alternate access methods. For teachers and speech clinicians with some computer experience.

CSD 5076. Counseling Applications in Communication Disorders. (3 cr, §CD 5075 or §CD 5076; prereq sr or grad CSD major or #; offered alt yrs) How counseling theories can be applied to communication sciences and disorders.

CSD 5080. Diagnosis and Appraisal of Communication Disorders. (2 cr, §CD 5080; prereq CSD major or #) General issues of diagnosis and appraisal pertinent to all age groups and disorders.

CSD 5110. Normal Language Development. (4 cr, §CD 5110) Study of the physical, psychological, and environmental requisites for normal speech and language development. Characteristic phases of language development and implications of language behavior for social and academic adjustment.

CSD 5200. Workshop: (Various Titles to be Assigned). (1-3 cr each offering [may be repeated for 6 cr max]; offered through UC) Opportunities for in-service speech clinicians and other students to concentrate study on new materials presented in the workshop format.

CSD 5210. Language Disorders in Children. (4 cr, §CD 5210; prereq CSD major or grad, 5110 or #) Investigation into incidence, etiology, diagnosis, and remediation of language disorders in children.

CSD 5276. Phonological Disorders. (3 cr, §CD 5275 or §CD 5276; prereq CSD major or #; offered alt yrs) Phonology as linguistic rules for combining phonetic data; its application to evaluation and remediation of deficient phonological patterns in children's speech.

CSD 5365. Dysphagia. (3 cr, §CD 5365; prereq 3411 or #) Theoretical and practical study of swallowing disorders.

CSD 5371. Motor and Orofacial Speech Disorders. (3 cr; prereq grad CSD major or #) Theoretical and practical study of motor and orofacial speech disorders.

CSD 5375. Neuromuscular Speech Disorders. (3 cr, §CD 5375; prereq #) Theoretical and practical study of neuromuscular speech disorders.

CSD 5472. Language Disorders in Preschool Children. (3 cr, §CD 5472; prereq sr or grad CSD major or #; offered alt yrs) Etiology, diagnosis, and clinical techniques pertinent to preschool language-disordered children.

CSD 5476. Language Disorders in School-aged Children. (3 cr, §CD 5476; prereq sr or grad CSD major or #; offered alt yrs) Etiology, diagnosis, and clinical techniques pertinent to school-aged language-disordered children.

CSD 5479. Childhood Language Disorders. (3 cr, §CD 5475 or §CD 5479; prereq 5110) Investigation into etiology, diagnosis, and intervention of language disorders to assist the classroom teacher in providing appropriate services for preschool and early elementary school age children with language disorders.

CSD 5500. Communication Disorders in Chronically Ill and Aged. (3 cr, §CD 5500) Communication skills in the chronically ill and aged and the roles they play in the total rehabilitation and/or adjustment of patients. Emphasis on consideration of patient care needs in light of the nature and extent of communication description.

CSD 5505. Stuttering. (3 cr, §CD 5505; prereq CSD major, 3510 or CD 3510 or #; offered alt yrs) Theoretical and practical study of individuals with arrhythmic speech patterns.

CSD 5575. Voice and Voice Disturbances. (4 cr, §CD 5575; prereq sr or grad CSD major or #) Theoretical and practical study of voice and voice disturbances.

CSD 5576. Alaryngeal Speech Rehabilitation. (3 cr; prereq grad CSD major, 5575 or #) Theoretical and practical study of laryngectomy and current perspectives on alaryngeal speech rehabilitation.

CSD 5600. Audiological Assessment. (3 cr, §CD 5600; prereq 3711, 3811, CSD grad or #; offered summer only) Advanced study of principles and practices underlying clinical assessment of auditory system integrity as well as theoretical and practical approaches to fitting of appropriate amplification systems.

CSD 5621. Diagnostic Audiology Practicum. (1-2 cr [may be repeated for 12 cr max; 6 cr max may be applied to a Graduate School program], §CD 5621; prereq 3711, 5600, CSD major or #) Provides a student the opportunity to exercise and refine diagnostic clinical skills under direct supervision.

CSD 5730. Sign Language I. (3 cr, §CD 5730; prereq #; offered through UC) Application of basic vocabulary in American Sign Language and fingerspelling alphabet in a manual representation of English. Introduction to various sign systems, their use by the deaf and in teaching the deaf.

CSD 5735. Sign Language II. (3 cr, §CD 5735; prereq 5730 or #; offered through UC) Expansion of vocabulary base in American Sign Language. Comparative linguistic study of various sign systems, their use by the deaf and in teaching the deaf.

CSD 5740. Sign Language III. (3 cr, §CD 5740; prereq 5735 or #; offered through UC) In-depth study of principles of American Sign Language as used receptively and expressively in communication with deaf individuals.

CSD 5755. American Sign Language Studies: Theory and Practice I. (3 cr [cr cannot be applied to a Graduate School program], §CD 5750 or §CD 5755; prereq 5740 or #; offered through UC)
Beginning level study of grammatical and linguistic features of ASL; focus on expressive and receptive skills.

CSD 5760. American Sign Language Studies: Theory and Practice II. (3 cr [cr cannot be applied to a Graduate School program], §CD 5760; prereq 5755 or #; offered through UC)
Intermediate level study of grammatical and linguistic features of ASL; focus on developing fluency in expressive and receptive skills.

CSD 5765. American Sign Language Studies: Theory and Practice III. (3 cr [cr cannot be applied to a Graduate School program], §CD 5765; prereq 5760 or #; offered through UC)
Advanced level study of grammatical and linguistic features of ASL; focus on understanding deaf culture and fluency in expressive and receptive skills.

CSD 5910. Independent Study. (1-3 cr [may be repeated for 6 cr max]; prereq sr or grad in CSD or special ed, Δ)
Directed study, readings, and/or projects of interest to the student in the area of communication disorders.

CSD 5956. Internship: Communication Disorders. (3 cr [may be repeated; no more than 6 cr total can be applied to a Graduate School program]; prereq min 25 hrs supervised clinical observation, CSD grad student or #; 1 hr sem per wk)
Supervised clinical practicum including program development, case management, interprofessional interaction, and planning.

CSD 5966. Externship: Communication Disorders. (7 cr [may be repeated; no more than 7 cr total can be applied to a Graduate School program]; prereq CSD student, #)
Supervised full day practicum in an approved professional setting for an entire academic term.

CSD 8100. Research Methods in Communication Sciences and Disorders. (3 cr, §CD 8100; prereq CSD grad or #)
Common experimental designs and procedures frequently encountered in speech-language pathology and audiology. Participation in a class research project..

CSD 8176. Professional Issues. (3 cr, §CD 8176; prereq #)
Identification and discussion of current professional issues in communication disorders. Professional work settings, organizations, and future trends.

CSD 8205. Adult Language Disorders. (3 cr, §CD 8205; prereq #)
Theoretical and practical study of adult language disorders.

CSD 8305. Clinical Seminar in Audiology: Current Trends in Rehabilitation. (3 cr, §CD 8305; prereq 3811, CSD grad or #; offered summer or UC only)
Study and discussion of current trends in the rehabilitation of hearing-impaired individuals through directed readings. Participants lead discussions for one class period and submit reports of all readings assigned during the term.

CSD 8900. Projects in Communication Disorders. (1-9 cr, §CD 8900; prereq #)
Individual project or research under faculty supervision.

Composition (Comp)

College of Liberal Arts

Comp 1100. Word Processing for Writing. (0-1 cr, §Engl 1100; cr not applicable to Engl major or minor)
Basic computer literacy in word processing and Computer-Aided Instruction (CAI). For students who have not completed UMD's word processing requirement.

Comp 1120. College Writing. (5 cr, §1110, §Engl 1110; student speaking English as a second language must have completed Engl 1802 or SSP 1802 or TOEFL with a score of 550)
Instruction and practice in writing argumentative prose for academic situations with integrated word processing lab.

Comp 3100. Advanced Writing: Language and Literature. (4 cr, §Engl 3100, §Engl 3111; prereq 1110 or 1120 or Engl 1110, 90 cr, upper div papers filed)
Writing critical essays and analyses using oral, published, and archival materials on liberal arts topics.

Comp 3110. Advanced Writing: Arts and Letters. (4 cr, §Engl 3110; prereq 1110 or 1120 or Engl 1110, 90 cr, upper div papers filed)
Practice in arts and letters writing.

Comp 3120. Advanced Writing: Business. (4 cr, §Engl 3120; prereq 1110 or 1120 or Engl 1110, SBE candidate with 105 cr or #)
Practice in business writing.

Comp 3130. Advanced Writing: Engineering. (4 cr, §Engl 3130; prereq 1110 or 1120 or Engl 1110, 90 cr, upper div papers filed)
Practice in engineering writing.

Comp 3140. Advanced Writing: Human Services. (4 cr, §Engl 3140; prereq 1110 or 1120 or Engl 1110, 90 cr)
Practice in human services writing.

Comp 3150. Advanced Writing: Science. (4 cr, §Engl 3150; prereq 1110 or 1120 or Engl 1110, 90 cr, upper div papers filed)
Practice in science writing.

Comp 3160. Advanced Writing: Social Sciences. (4 cr, §Engl 3160; prereq 1110 or 1120 or Engl 1110, 90 cr, upper div papers filed)
Practice in social sciences writing.

Comp 3170. Organizational Writing. (4 cr; prereq 1110 or 1120, 90 cr, upper div papers filed or Δ)
Writing of letters, memos, proposals, and reports appropriate to business and organizations; significant emphasis on rhetoric and theory.

Comp 3180. Advanced Writing: Environmental Studies and Natural Resources. (4 cr; prereq 1120 or #; offered as an Individualized Learning Program course through UC)
Practice writing in environmental studies and natural resources.

Comp 5115. Internship in Writing. (2 cr [may be repeated for 4 cr max], §Engl 5115; prereq #)
Practical writing experience arranged by the student with a media organization, business, or government agency.

Comp 5220. Document Design and Graphics. (4 cr [may be repeated for 8 cr max; no more than 4 cr total can be applied to a Graduate School program])
Study of the principles and practice of using computer programs to design, create, and print documents effectively integrating verbal and graphic texts.

Comp 5591. Independent Study. (1-4 cr [may be repeated for 8 cr max; no more than 6 cr total can be applied to a Graduate School program; cr in Engl 5590 and Engl 5591 count toward 8 cr max]; prereq #)
Students choose their projects with their instructor.

Comp 8500. Graduate Seminar. (4 cr)
Various topics appropriate to the study of composition, English, language, and rhetoric.

Comp 8902. Teaching College Composition. (4 cr, §Engl 8902; prereq #; required for tchg assts in composition and English depts)
Methods, materials, and objectives of college composition, including practice in writing, teaching writing, and evaluating writing.

Comp 8903. Directed Research in Composition. (1-4 cr [may be repeated for 4 cr max], §Engl 8903; prereq 8902, #)
Controlled research in methods, materials, and theories (both linguistic and rhetorical) used in composition classes, sometimes involving experiments with composition students in secondary schools and colleges.

Comp 8910. Practicum in Teaching Composition. (4 cr, §Engl 8910; prereq Δ)
Teaching, tutoring, and assisting in composition courses; experience in the preparation of materials, microteaching, grading student work.

Computer Science (CS)

College of Science and Engineering

CS 1010. Introduction to Computers and Software. (4 cr, §1001, §FMIS 1201; prereq 2 yrs high school algebra or Math 1003, Comp 1100 or Comp 1120 or #; 3 hrs lect, 2 hrs lab)
Introduction to computing systems. Survey of widely used software: operating systems, database systems, spreadsheets, graphics, programming languages. Brief introduction to computer hardware organization, microprocessors, networks.

CS 1411. FORTRAN 90 Programming. (4 cr, §1501; prereq 3½ yrs high school math or Math 1250 or #; 3 hrs lect, 2 hrs lab)
Comprehensive introduction to the FORTRAN 90 programming language and its application in science and engineering.

CS 1421. Introduction to the C Programming Language. (4 cr, §1623, §3104; prereq 3 yrs high school math or Math 1003, 1 qtr college programming or #; 3 hrs lect, 2 hrs lab)
Comprehensive introduction to the C programming language for programmers experienced in another programming language.

CS 1500. Introduction to Programming in Pascal. (3 cr, §1502; prereq Math 1001 or 1 yr high school algebra or #; 2 hrs lect, 2 hrs lab; recommended for students with no prior programming exper)
Introduction to programming concepts using Pascal. Emphasis on assignment, selection, repetition, modularity with procedures. For students with no prior programming experience or needing additional background before enrolling in Computer Science I.

CS 1501. FORTRAN Programming. (3 cr, §1622, §1622H, §3101; prereq Math 1001 or 1 yr high school algebra or #; 2 hrs lect, 2 hrs lab)
Study of FORTRAN its application in the sciences and engineering. Students with two or more quarters of programming experience should take 3101.

CS 1530. BASIC Programming. (3 cr, §1531, §1621, §1621H; prereq 1 yr high school algebra or #; 2 hrs lect, 2 hrs lab)
Study of BASIC and the preparation of elementary programs, including use of microcomputers, evaluation, and modification of existing programs. Applications of the computer in instruction. For students with no prior programming experience.

CS 1621-1622-1623. Computer Science I-II-III. (5 cr each, §1621H-1622H-1623H; prereq 3½ yrs high school mathematics, ½ yr high school computer programming or 1 qtr college programming or #; 3 hrs lect, 2 hrs rec, 2 hrs lab for 1621-1622; 3 hrs lect, 1 hr rec, 3 hrs lab for 1623)
Comprehensive introduction to computer problem solving using a structured top-down approach. Application of software engineering principles in the design, coding, and testing of small to moderate size programs. Description of essential data structures as abstract data types. Detailed study and analysis of algorithms involving searching, sorting, and recursion.

CS 1621H-1622H-1623H. Computer Science I-II-III. (5 cr each, §1621-1622-1623; prereq 3½ yrs high school mathematics, ½ yr high school computer programming or 1 qtr college programming, #; 3 hrs lect, 2 hrs rec, 2 hrs lab for 1621H-1622H; 3 hrs lect, 1 hr rec, 3 hrs lab for 1623H)
Same as 1621-1622-1623, but in greater depth and with more challenging assignments. For high-ability students.

CS 3000. Internship in Computer Science. (1-3 cr; prereq CS jr, Δ)
Practical, independent project in commercial or industrial setting. Department approval required before beginning project.

CS 3103. Survey of LISP. (1 cr; prereq 2nd qtr of a programming language or #)
Comprehensive introduction to LISP for programmers experienced in another language.

CS 3122. Introduction to C++. (4 cr; prereq 3104 or #; 3 hrs lect, 2 hrs lab)

Comprehensive introduction to C++ programming for programmers experienced in C.

CS 3506. COBOL Programming. (4 cr; prereq 1 qtr of programming or #; 3 hrs lect, 2 hrs lab)
COBOL and preparation of programs with business applications.

CS 3610. Machine Language and Organization. (4 cr; prereq 2nd qtr of programming or #; 3 hrs lect, 2 hrs lab)
Internal representation of programs and data. Computer organization and introduction to computer architecture. Machine language programming. Assembly language. Addressing techniques. Macros and conditional assembly. Input, output, and interrupts. Parameter passing mechanisms.

CS 3620. Introduction to Systems Software. (4 cr; prereq 3610, 1623 or 1623H or #; 3 hrs lect, 2 hrs lab)
Introduction to systems software topics: parsing, compiling, linking, loading, and assembling of programs, operating systems. Emphasis on software design and implementation with an introduction to concepts in software engineering.

CS 3710. Theory of Computer Science. (4 cr; prereq 1622 or 1622H, Math 1297, Math 3320 or #; 4 hrs lect)
Introduction to theoretical concepts of computer science. Recursion. Proofs of program correctness. Analysis of algorithms. Asymptotic complexity measures. Tractable and intractable problems. Computable and uncomputable functions. Formal languages and automata.

CS 3941. Research Colloquium for Majors. (1 cr; prereq CS major with 90 cr, Δ; attendance at 10 dept-approved colloquia; regis only during qtr of 10th lect)
Lectures by faculty, graduate students, and visitors. Reports required from a minimum of 10 lectures attended during junior and senior years.

CS 3950. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq #)
Directed study of special interest topics not available in the standard curriculum. Must be arranged with the instructor in advance of registration. May include readings, research, or special projects.

CS 5510. Computer Architecture I. (4 cr, \$CpE 3070, \$ECE 5305; prereq 3620, CpE 3015 or ECE 1315 or #; 4 hrs lect)
Computer organization from software point of view. Relations between processor organization, assembly language, and operating systems. System organization, including memory, I/O, and peripherals. Introduction to microprogramming and ALU design.

CS 5511. Computer Architecture II. (4 cr; prereq 5510 or #; 3 hrs lect, 2 hrs lab)
Software implications of alternative processing unit organization: pipelined, vector, systolic, heterogeneous array, CISC and RISC organizations. Software aspects of I/O, memory, and peripheral organization. Algorithms for computer arithmetic. Microprogramming issues: horizontal and vertical encoding, standards.

CS 5518. Advanced Data Structures and Algorithms. (4 cr; prereq 1623 or 1623H, 3710 or #; 3 hrs lect, 2 hrs lab)

Definition of common abstract data types such as lists, maps, sets, trees, priority queues, multilists, graphs, and digraphs. Time and space analysis of data-manipulating algorithms such as hashing, tries, merge-find sets, depth-first search, shortest paths, strongly-connected components, internal sorting, and order statistics.

CS 5520. Operating Systems I. (4 cr; prereq 3620 or #; 3 hrs lect, 2 hrs lab)

Operating system as a resource manager. Processor management and scheduling. Deadlocks. Concurrency. Memory management. Aspects of device and information management and interrupt processing.

CS 5521. Operating Systems II. (4 cr; prereq 5520 or #; 3 hrs lect, 2 hrs lab)

Concurrent processes and problems associated with them. Name management. Resource allocation, including queuing, system balancing, job activation, and de-activation. Protection mechanisms and enforcement. Networking and distributed systems.

CS 5529. Software Engineering. (4 cr; prereq 3620, 3710 or #; 3 hrs lect, 2 hrs lab)

Formal methods of software design and development. Quantification and measurement of design parameters. Organization and management of development projects.

CS 5538. File Management. (4 cr; prereq 1623 or 1623H, 3710 or #; 3 hrs lect, 2 hrs lab)

External sorting and searching, file access methods, file systems, introduction to database concepts.

CS 5544. Comparative Programming Languages. (4 cr; prereq 3620 or #)

Survey of significant features of existing programming languages. Emphasis on underlying concepts, implicit relationship between language source codes and run-time representation.

CS 5715. Object-Oriented Software Design. (4 cr; prereq 5529 or #; 3 hrs lect, 2 hrs lab)

Overview of software design methods, focusing on object-oriented design. Issues surrounding software implementation, emphasizing object-oriented development environments. Students design and implement a substantial software product using object-oriented methods and tools.

CS 5730. Computational Geometry. (4 cr; prereq 5518 or #; 3 hrs lect, 2 hrs lab)

Problems in computational geometry: convexity, intersection, geometric searching, proximity, and optimization. Problem-solving techniques including incremental construction, plane sweep, locus, divide and conquer, geometric transformation, prune and search, and dynamization.

CS 5733. User Interface Design. (4 cr; prereq 3620 or #; 3 hrs lect, 2 hrs lab)

Introduction to major topics in user interface design: handling input data, menus, user feedback, command-line systems, window systems, interface management systems, use of color, help systems, error handling and avoidance, design considerations for disabled users.

COURSE DESCRIPTIONS

CS 5736. Computer Graphics I. (4 cr; prereq 3610 or CpE 3025 or ECE 3325, Math 3320 or #; 3 hrs lect, 2 hrs lab)

Study of computer graphics hardware and software. Topics include raster scan and vector displays, hard copy devices, graphics packages, standards, user interface design, transformations, projections, and clipping.

CS 5737. Computer Graphics II. (4 cr; prereq 5736 or #; 3 hrs lect, 2 hrs lab)

Advanced computer graphics topics, including 3-dimensional transformations and viewing, hierarchical object modeling, scan conversion of lines, characters, polygons, representation of 3-dimensional shapes, hidden edge and surface removal, ray-tracing, shading, and use of color.

CS 5746. Database Management Systems. (4 cr; prereq 5538 or #; 3 hrs lect, 2 hrs lab)

Study of concepts and structures necessary to design and implement a database management system.

CS 5756. Compiler Design I. (4 cr; prereq 1623, 3620, 3710 or #; 3 hrs lect, 2 hrs lab)

Finite-state grammars, lexical scanners, and implementation of symbol tables. Context-free languages and parsing techniques. Syntax directed translation.

CS 5757. Compiler Design II. (4 cr; prereq 5756 or #; 3 hrs lect, 2 hrs lab)

Run-time storage allocation. Intermediate languages. Code generation methods. Local and global optimization techniques.

CS 5766. Automata, Computability, and Formal Languages. (4 cr; prereq 3710 or #)

Finite-state deterministic and nondeterministic machines, regular expressions, and closure. Formal grammars, pushdown automata, and grammar algorithms. Computability, Turing machines, and the halting problem.

CS 5776. Artificial Intelligence I. (4 cr; prereq 3103, 3710 or #; 3 hrs lect, 2 hrs lab)

Introduction to principles and programming methods of artificial intelligence. Advanced LISP programming. Knowledge representation methods, state space search strategies, and use of logic for problem solving.

CS 5777. Artificial Intelligence II. (4 cr; prereq 5776 or #; 3 hrs lect, 2 hrs lab)

Advanced topics in artificial intelligence, including machine learning, natural language understanding, computer vision, and expert systems.

CS 5785. Computer Networks. (4 cr; prereq 5520 or #; 3 hrs lect, 2 hrs lab)

Introduction to computer networking and associated software protocols. Study of ISO reference model from software point of view, and commonly used protocols, such as TCP/IP. Concentration on design of computer networking software.

CS 5795. Computer Security. (4 cr; prereq 3610, 3710 or #; 3 hrs lect, 2 hrs lab)

Encryption algorithms, including public key algorithms and more classical algorithms. Related algebraic algorithms such as factoring and primality testing. Access control, information flow control, and inference control.

CS 5798. Information and Text Processing. (4 cr; prereq 1623 or #; 3 hrs lect, 2 hrs lab)

Methods, major retrieval models, and theoretical issues in the automatic processing, storing, accessing, and retrieving of textual material. Statistical properties of text, entropy, automatic text transformation, and knowledge-based processing.

CS 5950. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq #)

Directed study of special interest topics not available in the standard curriculum. Must be arranged with the instructor in advance of registration. May include readings, research, or special projects.

CS 5970. Special Topics: (Various Titles to be Assigned). (1-4 cr [may be repeated for 8 cr max]; prereq #)

Study of a special topic in computer science not available in the standard curriculum. Topic announced in *Class Schedule*.

CS 5980. Honors Project. (2-3 cr; prereq consent of the Computer Science Honors Program Committee)

Each student who wishes to participate in the Computer Science Honors Program must take this course. The student must complete a research project under the supervision of a faculty adviser.

CS 8021. Advanced Computer Architecture. (4 cr; prereq 5510 or CpE 3070 or #, grad; 3 hrs lect)

Hardwired and microprogrammed controllers. Memory devices and memory subsystem organization, including virtual memories and caches. Computer networks. Pipelined, vectorized, and parallel computer systems. Algorithmically specialized functional units.

CS 8022. Advanced Theory of Computation. (4 cr; prereq 5766 or #, grad)

Deterministic Turing machines and the class P; nondeterministic computation and the class NP; relationship between P and NP, polynomial transformations, and NP-completeness; solutions and approximation algorithms for NP-complete problems; Cook's Theorem; the halting problem; Church's thesis; the polynomial hierarchy.

CS 8023. Advanced Systems Programming. (4 cr; prereq 5520, 5756 or #, grad)

Overview of systems program's internal structure with emphasis on unifying themes common to major application areas such as compiler construction, operating systems, or networks. Advanced study of practical aspects of one of these systems, including a substantive software development project.

CS 8136. Advanced Computer Graphics. (4 cr; prereq 5736 or #, grad)

Curve and surface representation, solid modeling, visible surface determination, and rendering and illumination techniques. Advanced algorithms for scan-conversion, clipping, and anti-aliasing.

CS 8176. Artificial Intelligence and Machine Learning. (4 cr; prereq 5776 or #, grad)

Graduate level overview of advanced artificial intelligence topics such as machine learning, knowledge representation, machine vision, natural language processing, search, logic and deduction, problem solving, planning, and robotics. Significant software project required.

CS 8198. Information Retrieval. (4 cr; prereq 5795 or #, grad)

Methods, major models, and theoretical issues in the automatic processing and retrieval of text. Statistical and syntactic approaches in automatic text transformation. Very large database issues (data mining and fusion). Internet applications, knowledge-based processing. Hypertext and multimedia approaches.

CS 8777. Thesis Credits: Master's. (1-16 cr [max 11 cr per summer term])
Thesis research and development.

CS 8900. Seminar. (1-3 cr [may be repeated for cr]; prereq #)

Reports on articles in literature or on current research in department.

Dance (DN)

School of Fine Arts

DN 1101. Modern Dance Technique I. (3 cr [may be repeated for 9 cr max]; 2 hrs lect, 3 hrs lab)
Beginning work in modern dance technique with emphasis on modern dance as a performing art form. Students are encouraged to enroll fall quarter.

DN 1111. Jazz Dance Technique I. (3 cr [may be repeated for 9 cr max]; prereq # for winter and spring qtrs; 2 hrs lect, 3 hrs lab)
Beginning work in jazz dance technique with emphasis on jazz dance as a performing art form. Students are encouraged to enroll fall quarter.

DN 1121. Tap Dance Technique I. (3 cr; prereq 6 cr of 1101 or 1111, #; 2 hrs lect, 3 hrs lab)
Beginning work in tap dance technique with emphasis on tap dance as a performing art form.

DN 1131. Ballet Technique I. (3 cr [may be repeated for 18 cr max]; 2 hrs lect, 3 hrs lab)
Beginning work in ballet technique with emphasis on ballet as a performing art form. Students are encouraged to enroll fall quarter.

DN 1500. Introduction to the World of Dance. (4 cr)
Appreciation of dance as an art and entertainment form using aesthetic, sociocultural, historical, and genre studies. Video and concert viewing, readings on choreographers and dancers, critiques, and lab experiences.

DN 3171. Independent Study in Dance. (1-3 cr [may be repeated for 6 cr max; undergrads may not take more than 6 cr both 3171 and 5171 combined]; prereq #)
Directed readings and projects of interest to student.

DN 3201. Modern Dance Technique II. (3 cr [may be repeated for 27 cr max]; prereq #; 2 hrs lect, 3 hrs lab)
Intermediate work in modern dance technique with emphasis on modern dance as a performing art form.

DN 3211. Jazz Dance Technique II. (3 cr [may be repeated for 27 cr max]; prereq #; 2 hrs lect, 3 hrs lab)
Intermediate work in lyrical and percussive jazz dance techniques.

DN 3217. Musical Theatre Audition Techniques. (3 cr; prereq #; 2 hrs lect, 3 hrs lab)
Advanced dance, song, acting, and marketing capstone course for professionally oriented, musical theatre students.

DN 3221. Tap Dance Technique II. (3 cr; prereq 1121 or #; 2 hrs lect, 3 hrs lab)
Intermediate work in tap dance technique with emphasis on tap dance as a performing art form.

DN 3231. Ballet Technique II. (3 cr [may be repeated for 27 cr max]; prereq #; 2 hrs lect, 3 hrs lab)
Intermediate work in ballet technique with emphasis on ballet as a performing art.

DN 3241. Dance Theatre. (3 cr [may be repeated for 9 cr max]; prereq #)

Dance theatre composition. Integration of text and visual imagery with movement/dance foundations.

DN 3401. Dance Composition. (3 cr; prereq 3201, 3211 or 3231, #; 2 hrs lect, 3 hrs lab)
Studying and developing dance choreography through creative experiences.

DN 3611. Dance History. (4 cr; prereq 1500 or #)
Survey of religious, social, political, and artistic forces that have contributed to development of dance in Western civilization; emphasis on Romantic period through present.

DN 5171. Independent Study in Dance. (1-3 cr [may be repeated for 6 cr max; undergrads may not take more than 6 cr both 3171 and 5171 combined]; prereq 3201, 3211, 3231 or #)
Directed readings and projects of interest to student.

DN 5900. Internship in Professional Dance. (1-12 cr [no more than 6 cr can be applied to a Graduate School program; 1 cr for each 30 hrs of work]; prereq Δ)
Field study in cooperating professional, commercial, or regional dance company.

Early Childhood Studies (ECh)

College of Education and Human Service Professions

ECh 1025. Observing Development in Young Children. (2 cr, §CFD 1050, §CFD 3102; prereq Educ 1000 or #)
Interaction with and in-depth observation of children in child care or educational settings. Focus on implementation of structured observational methods to describe the relationship among program characteristics, child development, and family and community contexts. Pre-practicum.

ECh 3106. Programs for the Young Child. (4 cr; prereq admission to ECh program)
Methods for facilitating development, organization, and administration of child care facilities. Pre-practicum.

ECh 5107. Issues in the Education of Younger Learners. (4 cr, §5106; prereq 90 cr, #; offered summer)
Societal effects on the education and care of younger learners; efficacy research; multicultural and anti-bias curricula; integration and mainstreaming; curriculum and evaluation models.

ECh 5233. Communication Arts Curricula. (4 cr, §3315; prereq 3106, Educ 3333 or #)
Knowledge, strategies, and skills in communication arts for early childhood educators. Cross-cultural models and research evidence for the effectiveness of various models. Pre-practicum.

COURSE DESCRIPTIONS

ECh 5235. Cognitive and Social Skills Curricula. (4 cr, \$3316, \$5592, \$5900; prereq 3106, Educ 3333 or #) Methods and materials for developing social and cognitive skills in young children. Cross-cultural models and research evidence for various models. Pre-practicum.

ECh 5400. Philosophy of Early Childhood Family Education. (1 cr, \$CFD 5400)
Overview of historical and philosophical foundations of early childhood family education. Observation and critique of current needs.

ECh 5421. Literature in Early Childhood Education. (4 cr; prereq #; offered summer or UC only)

Examination of current literature for children from preschool through grade 3; extensive reading of prose and poetry books written for children; in-depth study of a selected area of literature for children.

ECh 5553. Practicum in Early Childhood Education in a Group Setting. (3-9 cr, \$3513, \$5920; prereq 5233, 5235, #)
Application of skills, understanding, and knowledge related to working with children in an early childhood group program.

ECh 5590. Foundations of Early Education. (3 cr; prereq #; offered through UC)
Philosophical, psychological, sociological, and historical foundations of early education; current early education models; trends and issues in early education.

ECh 5594. Early Education Administration. (3 cr; prereq #)
Developing knowledge and competencies in the administration of programs for young children; personnel and financial management; teacher selection, training, and supervision; parent involvement; program evaluation.

ECh 5600. Seminar I: Professional and Portfolio Development for Interdisciplinary Study of Children and Families. (1 cr; offered summer or UC only)
Professional ethics and philosophy of interdisciplinary programs for children and families; preparation of professional portfolio.

ECh 5602. Seminar II: Interdisciplinary Study of Children and Families: A Case Approach to Dichotomies of Theory and Practice. (4 cr; prereq admission to MEd program or #; offered summer and UC only)
Advocacy, conflict resolution, resource systems, cultural differences, special needs, collaboration among families, and agencies. Preventing and solving problems and implementing solutions.

ECh 5603. Seminar III: Participatory Leadership: Challenges and Rewards. (4 cr; prereq admission to MEd program or #; offered summer or UC only)
Participatory leadership models in different settings, including educational, community, global, and cultural contexts. Analyzes useful aspects of models. Collaboratively design a participatory leadership development program and an evaluation component.

ECh 5605. Field Observation. (2 cr; prereq admission to MEd program with ECh concentration or #; 35 hrs of field observation, 5 hrs of seminar, offered summer or UC only)
Field observation in a program serving children and families; reflective seminar.

ECh 5800. International Perspectives: Early Childhood Methods and Pedagogy. (5 cr, \$EIED 5800; prereq #; offered summer or UC only)
Study in a foreign country of early childhood pedagogy and methods. Theory, design of learning experiences and environments for young children.

ECh 5802. Observational Practicum in Early Education in a Foreign Country. (5 cr, \$EIED 5802; prereq #; offered summer or UC only)
Observation and interaction in selected early childhood programs in a foreign country; application of theory to practice.

ECh 5951. Topics in Early Child Care and Development. (1-6 cr [may be repeated for 6 cr max]; prereq #; offered through UC)
Topics selected from early child care and development to meet special needs and interests of different groups of students. Topics vary.

ECh 5953. Independent Study. (1-6 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq Δ)
Individualized reading and research in a special topic in early childhood education.

ECh 5955. Topics in Curriculum: (Various Titles to be Assigned). (1-6 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq #; offered through UC)
Topics selected from current curriculum issues change to meet needs and interests of various groups of students; may differ each time course is offered. Specific topics announced in *Class Schedule*.

ECh 5960. Group Processes in Early Childhood Education. (3 cr; prereq adm to ECh program; offered through UC)
Formal and informal interactions; theories of behavior management; application of theories to guiding behavior of young children.

ECh 5990. Advanced Seminar in Early Childhood Education. (1-6 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq 5553 or 5555, Educ 5433 or #; offered through UC)
Exploration of views of significant thinkers past and present. Discussion of conflicting ideas. Independent projects.

Economics (Econ)

School of Business and Economics

Econ 1002. Economics and Society. (4 cr [cr not allowed toward economics major or minor, BAc or BBA degree]); designed specifically for liberal education purposes)

General description of the economy of the United States and analysis of contemporary economic problems. Introduction to major economic issues and problems of the day providing a simple framework, used by the economist, for analysis of these issues and problems.

Econ 1004. Principles of Economics: Micro. (4 cr)
Demand and supply, utility, production and cost, output market analysis, input market analysis, applications of microeconomics. Of value to the general education student and required for majors and minors in economics and for baccalaureate students in the School of Business and Economics.

Econ 1004H. Principles of Economics: Micro. (4 cr)
Analyzing the free enterprise system through the study of resource and product markets, importance of competition in the functioning of these markets, and application of these concepts to real world economic problems. For general education students and majors/minors in economics, management, and accounting.

Econ 1005. Principles of Economics: Macro. (4 cr)
National income accounting, national income theory, public finance, money, monetary policy, international trade, economic growth. Of value to the general education student and required for majors and minors in economics and for baccalaureate students in the School of Business and Economics.

Econ 1005H. Principles of Economics: Macro. (4 cr)
Analyzing national income accounting and theory, fiscal and monetary policy, and economic growth. Theory applications to current macroeconomy events. For general education students and majors/minors in economics, management, and accounting.

Econ 1009. Personal Financial Management. (4 cr)
Practical applications of concepts and techniques in managing personal finances.

Econ 1203. Statistical Methods. (4 cr; prereq 30 cr, SBE student or Econ major or Soc Sci-Tchg Soc Studies major with Econ concentration or Acct/Bus Adm/Econ minor)
Introduction to modern business statistics, emphasizing problem solving through statistical decision making. Topics include organization and presentation of data, summary statistics, probability theory, distributions, estimation, test of hypotheses, introduction to use of computers in statistical analysis.

Econ 1204. Quantitative Research Methods. (4 cr; prereq 1203, CS 1500 or CS 1501 or FMIS 1201, 30 cr, SBE student or Econ major/minor)
Study of techniques and tools used in analyzing economic and business data: general linear regression models, correlation and analysis of variance, forecasting and time series analysis, Chi-Square application, experimental design, strategic research planning including computer-based analysis.

Econ 3001. Radical Economics. (4 cr; prereq 1002 or 1004, 1005, 45 cr; offered through UC)
Study of the radical Marxist critique of the traditional economic models based on the market, and of the methodology used in developing and applying these models. Study of alternatives to the market system and of the institutional approach to economic analysis. Analysis of some of the current economic problems in the United States from the radical's perspective.

Econ 3059. Seminar. (2 cr; prereq Econ major with 120 cr, □)
Studies and reports on recent developments in theoretical and applied economics.

Econ 3104. Microeconomic Analysis. (4 cr; prereq 1004, 1005, Math 1160 or equivalent, SBE candidate or Econ major or Soc Sci-Tchg Soc Studies major with Econ concentration or approved Acct/Bus Adm/Econ minor)
Behavior of households as consuming units and suppliers of resources; analysis of decision making by firms under various market conditions.

Econ 3105. Macroeconomic Analysis. (4 cr; prereq 1004, 1005, Math 1160 or equivalent, SBE candidate or Econ major or Soc Sci-Tchg Soc Studies major with Econ concentration or approved Acct/Bus Adm/Econ minor)
Determinants of national income, employment, and price levels with particular attention to aggregate demand and aggregate supply, and monetary and fiscal policy.

Econ 3346. Principles of Urban Economics. (4 cr; prereq 1004, 45 cr; offered summer or UC only)
Analysis of the growth of urban centers in a developed economy and the particular problems associated with this growth. Emphasis on the economic structure of cities so that alternative policy measures may be evaluated.

Econ 3411. Managerial Economics. (4 cr; prereq 1004, 1203, 1204)
Applying economic principles and analytical tools to the management of organizations and economic development issues. Capital budgeting; government regulation; demand, price, production and cost, and economic impact analyses.

Econ 3555. Labor Economics. (4 cr; prereq 3104, 90 cr or grad)
Examines labor markets from theoretical and institutional perspectives, including wage theories, labor supply, labor demand and employment, human capital investments, and occupational choice.

Econ 3556. Labor Market Issues. (4 cr; prereq 3104, 90 cr or grad or □; offered alt yrs)
Survey of contemporary labor market problems and public policy, including role of women and minorities in the labor market, income distribution, unemployment, unions, and comparative labor systems.

Econ 3620. Government Regulation of Business. (4 cr; prereq 1004; offered alt yrs)
Alternatives open to a free enterprise economy when the private sector does not achieve economic goals. Use of public regulation and antitrust enforcement.

COURSE DESCRIPTIONS

Econ 3704. Money and Banking. (4 cr; prereq 1005)
Role of financial institutions and markets, emphasis on Federal Reserve system and its control of commercial banking system, monetary theory and policy, and international economics.

Econ 3800. Special Topics. (1 to 4 cr; prereq 1004, 1005 or #)

Study of special topics in economics. Special course topics announced in *Class Schedule*.

Econ 5003. Consumer Economics. (4 cr; prereq 1004, 1005 or □)

Application of economic principles to major decisions of consumers. Concept of alternative choice. Opportunity cost. How to use income most effectively; use of credit; saving; insurance principles; analysis of advertising as it affects the consumer; sources of consumer information; product-testing agencies; analysis of contracts common to consumers; government efforts to protect consumers.

Econ 5020. Current Economic Issues. (1 to 6 cr [may be repeated for 6 cr max]; prereq 1004, 1005 or □)
Current controversies over economic policy and the problems that underlie them. Special study of selected topics.

Econ 5140. Introduction to Mathematical Economics. (4 cr; prereq 3104, 3105, 90 cr or grad or □)

Application of the fundamentals of differential and integral calculus and linear algebra to static and dynamic topics in microeconomics and macroeconomics.

Econ 5333. Tools, Applications of Economic Analysis I. (4 cr; prereq 1204, 3104, 3105, 90 cr or grad; offered alt yrs)

Development and applications of tools of economic research and analysis.

Econ 5334. Tools, Applications of Economic Analysis II. (4 cr; prereq 5333, 90 cr or grad; offered alt yrs)

Additional development and applications of basic tools of economic research and analysis.

Econ 5360. Regional Economics, Location Theory. (4 cr; \$5361; prereq 3104, 90 cr or grad or □; offered alt yrs)

Allocation of unevenly distributed and imperfectly mobile resources. Economic models developed based on critical variables such as population growth, technological innovation, and changes in regional income. Prediction of the future distribution of economic activity based primarily on changes in these variables.

Econ 5362. Urban Economics. (4 cr; prereq 5360, 90 cr or grad; offered alt yrs)

Alternate theories relating to urban growth processes presented and compared. Intraurban structural development models evaluated. Selected economic problems unique to the urban setting analyzed. Government policies with respect to the urban community investigated.

Econ 5453. International Economics and Finance. (5 cr; prereq 3104, 3105, 90 cr or grad or □; offered alt yrs)

Classical and modern theory of international trade. Extension, empirical verification, and applications of modern theory. Alternative theories of international trade. Concept and measurement of balance of payments. Methods of balance of payments adjustments. Alternative international monetary systems. Selected current issues.

Econ 5622. Industrial Organization. (4 cr; prereq 1203, 3104, 90 cr or grad; offered alt yrs)
Examination of the theory of industrial organization, its verification from empirical studies, and policy implications.

Econ 5752. Monetary Economics. (4 cr; prereq 3105, 5704, 90 cr or grad; offered alt yrs)
Problems in monetary theory; Federal Reserve control of financial institutions; money market strategy and principal problems in monetary policy including goals, targets, and indicators.

Econ 5776. Natural Resource and Energy Economics. (4 cr; prereq 1004 or #; offered alt yrs)
Microeconomic analysis of natural resource markets. Topics include the use and pricing of fossil fuel, mineral, timber and animal resources, the role of energy in the economy, current institutional arrangements and legislation that control or influence the natural resource and energy markets, and the limits to growth controversy.

Econ 5777. Environmental Economics. (4 cr; prereq 1004 or #; offered alt yrs)
Microeconomic analysis of the environment as an economic resource. Topics include waste production, benefit/cost analysis, pollution control, and techniques for valuing wilderness environments and recreational experiences. Air and water quality problems and issues in the disposal of hazardous wastes.

Econ 5800. Special Topics. (1 to 6 cr [may be repeated for 12 cr max; 6 cr max can be applied to a Graduate School program]; prereq Δ)
Study of special topics in economics. Special course topics announced in *Class Schedule*.

Econ 5803. Public Finance. (5 cr; prereq 1004, 1005; offered alt yrs)

Government expenditure patterns and revenue related to the economic system, including considerations of public goods, welfare economics, social costs, and determination of public expenditure programs in a democratic society. Distribution of tax burden, tax incidence, types of taxation-income, consumption, property, sales, estate, and gift. Debt policy and economic stabilization.

Econ 5888. Economic Education. (1 to 4 cr; prereq Δ)

Examination of basic economic concepts, course design, materials, methodology, and research relevant to teaching economics, grades K-12.

Econ 5900. Independent Study. (1-9 cr [may be repeated for 9 cr max]; prereq Δ)

For students wishing to do special work in areas useful to individual programs and objectives and not available in regular course offerings.

Econ 8411. Managerial Economics. (3 cr; prereq 1004, 1005 or equiv, grad or □)

Application of economic theory to management decision making and policy formulation within the firm. Demand analysis, production and cost analysis, capital budgeting, and price analysis.

Education (Educ)

College of Education and Human Service Professions

Educ 1000. Human Development. (4 cr, §CFD 1000, §EHS 1050, §Psy 3331; prereq 35 cr, CEHSP student or #)
Patterns and theories of development from conception through late adulthood, with emphasis on adulthood; ecosystem analysis of individual, family, and environmental factors affecting life span development.

Educ 1100. Human Diversity. (4 cr, §CFD 1100, §EHS 1100)

Cultural, physical, socially-constructed, and psychological differences in people. Social, political, and economic implications of human diversity in modern society.

Educ 1101. Education in Modern Society. (4 cr)
Survey of the various educational institutions and practices used in the different sectors of society.

Educ 1111. Developing Critical Thinking Skills. (4 cr, §1110)

Experiences in learning concepts through discovery, induction, and critical reasoning by the use of real materials and real situations. Problem-solving approaches and techniques.

Educ 1201. Managing Planet Earth. (4 cr)
Environmental education; exploration of key concepts and principles that govern how nature works; potential solutions to environmental and resource problems.

Educ 3322. Children's Literature. (3 cr, §EIEd 3322; prereq EIEd, kindergarten-EIEd, ECh, Sec Ed majors or Δ)
Purposes of reading in the elementary school; bases of selecting materials for extensive readings; analyzing studies of children's interests; extensive critical survey of old and new materials for children's readings.

Educ 3333. Learning Environments and Action Research. (3 cr, §CFD 3102, §CFD 3333; prereq 3322, EIEd or kindergarten-EIEd candidate, concurrent regis in EIEd 3113, EIEd 3375, Δ)
Learning models as a basis for structuring learning environments for children and adults; research ideas and methods to identify problems, collect information, and interpret that information in different learning environments.

Educ 3601. Wilderness Philosophy. (3 cr; prereq #; offered summer or UC only)
People and social forces that influenced land-use ethics and policies in northern Midwest; philosophical and historical basis for outdoor education and interpretation.

Educ 3810. Independent Study. (1-3 cr each)

Educ 5001. Mentor Clinical Supervision Model for Cooperating Teachers. (1 cr; prereq certification/licensure in ed tchg exper or #)
Overview of UMD teacher education model and cycles of clinical supervision, including development of observation and assessment skills and analysis of problem situations in supervision.

Educ 5002. Observation and Assessment Skills for Cooperating Teachers. (1-3 cr; prereq Educ 5001, certification/licensure in ed)
Overview of observation and assessment tools used in clinical supervision; experience using tools.

Educ 5102. Cross-Cultural Action Research. (3-6 cr, §CFD 5102; prereq 120 cr or adult special or grad or #; offered through UC)

Research ideas and methods to identify problems, collect information, and interpret that information as applied to educational settings in the United States and selected foreign countries.

Educ 5127. Classroom Management. (3 cr; prereq 90 cr; offered summer session and UC)
Classroom management styles and philosophies for elementary and secondary teachers; strategies for creating and maintaining organized and positive learning environments; strategies for preventing and solving behavior problems within different school settings; needs of students in culturally diverse school settings.

Educ 5128. Urban Education. (1-3 cr [cr cannot be applied to a Graduate School program]; prereq #; offered UC only)

Combines on-site experience in an urban educational setting with reading and reflection. Develops the knowledge, skills, attitudes, motivation, and commitment to work individually and collectively with poor children in urban schools.

Educ 5135. Teacher Mentoring. (1-3 cr [may be repeated for 6 cr max]; prereq #; offered summer or UC only)

For teachers interested in mentoring beginning or student teachers. Examination of needs of beginning or student teachers; roles, functions, and responsibilities of mentoring; teacher development; communication for developing productive relationships; peer coaching techniques.

Educ 5145. Testing Practices in U.S. Schools. (3 cr; prereq tchg exper or #; offered summer or UC only)

Practices and issues related to the use of tests and test data in U.S. schools. Assists educators in becoming wise designers and consumers of tests and test data.

Educ 5146. The Future and Education. (2-3 cr; offered summer or UC only)

Study of the effects of technological and social changes on education and of the future-conscious educational program.

Educ 5158. Maintaining Teacher Effectiveness. (3 cr; offered summer only)

Knowledge, skills, and dispositions that lead to long-term effective teaching and enthusiastic commitment to the profession.

Educ 5159. Improving Educational Productivity. (2-3 cr; offered summer or UC only)

Learning to work smarter, not harder; an exploration and analysis of what various experts believe can improve the efficiency and effectiveness of American education.

Educ 5163. Outdoor Education Methods. (3 cr; prereq #; offered summer or UC only)

Interpreting and teaching environmental education in the outdoors focusing on informal education settings.

Educ 5164. Environmental Education In-Service Training. (1-12 cr [may be repeated for 12 cr max])

Methods, materials, and curricula for professional educators who want to enhance their environmental education skills.

COURSE DESCRIPTIONS

Educ 5165. Models and Theories in Outdoor Education. (2 cr; prereq #; offered 1997-98 and alt yrs) Emphasis on development and understanding of both established and newly constructed outdoor education models. Theoretical foundations of environmental and adventure education.

Educ 5167. Research and Issues in Outdoor Education. (2 cr; prereq #; offered 1997-98 and alt yrs) Salient research studies, designs, methods, and current issues related to environmental and adventure education literature.

Educ 5200. Advanced Child Study. (2-3 cr, §CFD 5200; prereq #; offered through UC) Focus on formal and informal assessment of developmental levels of young children related to physical-motor, cognitive, language, and social-emotional development.

Educ 5210. Teaching Thinking Skills. (3 cr; prereq #) Perspectives on thinking, reasoning, errors and biases, cognitive approaches, formal operations, language and symbol manipulation.

Educ 5234. Science, Technology, and Society. (1-4 cr, §3234) Nontechnical study of the historical and cultural impact of natural science and technology on the earth and its inhabitants.

Educ 5236. Environmental Education for Teachers. (1-4 cr [may be repeated for 4 cr max]; prereq #) Combines environmental study with field experiences to prepare pre-service and in-service teachers for implementation of environmental learning experiences in the school curriculum, grades K-12, all subjects.

Educ 5300. Practicum in Education. (1-16 cr [may be repeated for 16 cr max; no more than 5 cr can be applied to a Graduate School program]; prereq #) Arranged opportunity for persons interested in gaining practical experience in a nontraditional educational program under the direction and supervision of faculty. Location, type of experience, duration of experience, and assessment are variables to be negotiated between the student and the advisers.

Educ 5301. Student Teaching Seminar. (1-3 cr [may be repeated for 4 cr max]; prereq ¶ECh 5553, EdSe 5300, EIEd 5508 or EIEd 5509, SpEd 5600 or □) Discussion of current practice as experienced during the student teaching/professional quarter. Relationship between theory and practice.

Educ 5320. Storytelling and Creative Drama. (3 cr, §EIEd 3320; prereq 90 cr or grad or Δ) Past and present needs for storytelling; sources and selection of suitable stories; experience in telling folktales, fairy tales, realistic stories. Methods for using creative drama to develop language abilities of children and as an effective educational strategy. Drama strategies to develop children's understanding of diversity.

Educ 5340. Interacting with Diverse Families. (4 cr; prereq 90 cr or #) Issues relating to working with and advocating for families from diverse backgrounds and/or with diverse needs. Emphasis on linguistically diverse families, immigrant families, families headed by single parents, families with members with a disability, families headed by lesbian/gay parents.

Educ 5350. Teaching English as a Second Language: Reading. (3 cr; prereq #) Rationale and specific techniques for teaching of reading to non-English speaking or reading students.

Educ 5358. Mathematics Through Activity. (3 cr; prereq #; offered summer or UC only) Teaching mathematical concepts through use of manipulative materials, discovery and problem-solving activities; Piaget applied to mathematics instruction.

Educ 5379. Humanizing Education. (3 cr; prereq 10 cr ed; offered summer or UC only) Provides theory and practice opportunities for developing more human-centered approaches to learning. Emphasis on the affective domain.

Educ 5381. Teaching the American Indian Pupil. (4 cr; prereq 10 cr ed) Survey of contemporary Indian education; evaluation of one's attitudes toward Indian pupils; direct interaction with Indian parents and students; development of culturally sensitive teaching plans regarding Indians.

Educ 5382. Teaching the American Indian Pupil I. (2 cr; prereq EIEd or Kindergarten-EIEd major or Δ) Examines the historical/political and cultural background of American Indian people with emphasis on integrating the knowledge into the elementary curriculum.

Educ 5383. Teaching the American Indian Pupil II. (2 cr; prereq ¶EIEd 3117, EIEd or Kindergarten-EIEd major or Δ) Examines the social context and unique educational needs of American Indian students with emphasis on integrating the knowledge into the elementary classroom.

Educ 5401. The Creative and Intellectually Gifted. (3 cr; open to jrs and above; offered summer or UC only) Identification, characteristics, and service needs of and program differences for high potential students.

Educ 5412. The Computer in Education. (1-4 cr [may be repeated for 6 cr max]) Introductory computer course that prepares students for computer use in instructional settings. PC and Mac platforms. Develops basic skills using software commonly used by educators. Teaching strategies using computer-assisted instruction.

Educ 5413. Teaching With Technology. (4 cr; prereq 5412, 90 cr or grad or adult spec or #; offered through UC) Develop basic computer and educational technology skills, focusing primarily on using microcomputers for communications.

Educ 5414. Using Technology for Administrative Tasks of Teaching. (4 cr; prereq 5412, 90 cr or grad or adult spec or #; offered through UC) Develop basic computer and educational technology skills, with emphasis on using microcomputers for administrative tasks of teaching.

Educ 5415. Current Issues in Computers and Educational Technology. (4 cr; prereq 5412, 5413, 90 cr or grad or adult spec or #; offered through UC) Specific themes and content vary.

Educ 5416. Advanced Educational Media Production. (4 cr; prereq 5412, 5413, 90 cr or grad or adult spec or #; offered through UC)
Further develop basic computer and educational technology skills while creating individual and/or group educational media projects.

Educ 5421. Research Methods in Education. (2-3 cr, \$5420; prereq admission to MEd or MA program or #)
Planning, design, implementation, analysis of data, evaluation, and reporting associated with classroom research and research within school systems.

Educ 5422. Qualitative Research Methods in Education. (3 cr; prereq grad or #; offered summer or UC only)
Qualitative field research in educational settings; methodology, philosophical and ethical perspectives, and practice.

Educ 5433. Foundations of Programs in Child and Family Development. (4 cr, \$CFD 5433, \$ECh 1002, \$SpEd 5200; prereq 3333, admission to EIEd or kindergarten-EIEd or early childhood studies or special ed licensure or #)
Philosophical, sociological, and historical foundations of regular, special, and family education. Social responsibility and future studies as they impact programs for children and families. Cross-cultural components.

Educ 5435. System Perspective for Child and Family Programs. (4 cr, \$CFD 5435, \$ECh 3411, \$SpEd 5327; prereq 3333, admission to EIEd or kindergarten-EIEd or early childhood studies or special ed licensure or #)
Systems perspective in creating and managing human and material resources in programs related to children and families.

Educ 5484. Whole Language Development. (3 cr; prereq #; offered summer or UC only)
Theory and research; development in language abilities; classroom practice; ideas for implementation at both beginning and advanced levels; classroom organization; materials for use in a whole language classroom; focus on integration of children's literature, writing and content areas; theme-based instruction.

Educ 5500. Professional Issues in Teaching. (4 cr, \$Educ 3406; prereq admission to program, sr, Δ)
Study of issues related to professional status and activity of teachers, historical and philosophical foundations of education, communication, job seeking skills, and current national and state study group results.

Educ 5555. Environmental Education for Practicing Educators. (3 cr; offered through UC only)
Provides information base for informed decision making about environmental issues. Develops knowledge, skills, attitudes, motivation, and commitment to work individually and collectively toward sustaining a healthy work environment.

Educ 5560. Current Research and Issues in Science Education. (2-3 cr [may be repeated for 6 cr max]; prereq #; offered summer or UC only)
Examines science education research literature. Trends in research and teaching.

Educ 5570. Exemplary Models for Science Education. (1-3 cr [may be repeated for 6 cr max]; prereq #; offered summer or UC only)
Emphasis on hands-on and/or integrated curriculum needs.

Educ 5600. Models for Staff Development. (1-6 cr; prereq #; offered summer or UC only)
Models for helping staff improve classroom instruction. Emphasis on various innovative approaches, including using educational technology, computers, and peripheral equipment.

Educ 5666. Creating Social Studies Curriculum Materials. (3 cr; prereq EdSe 5244 or EIEd 3366 or #; offered through UC)
Using historic sites and related materials to create curriculum materials and implementing and evaluating living history learning experiences in classrooms.

Educ 5731. Teaching Writing in School Curriculum. (3 cr; prereq 90 cr or #; offered summer or UC only)
Teacher as writer; models of writing instruction across curriculum, development in writing; strategies for writing process; journal writing and learning logs; teaching and evaluating specific genre; alternative writing assessments; inclusive literature as models for writing.

Educ 5784. Multicultural Literature for Children. (3 cr)
Review of current multicultural literature for children and development of selection guides.

Educ 5801. Curriculum Development Programs and Procedures. (3 cr; prereq EdSe 5233 or EIEd 5401 or #)
Curriculum planning, procedures, operational processes; major considerations in interpersonal relationships and evaluating improvement programs.

Educ 5804. Programs for Young Children—Global Perspectives. (5 cr, \$ECh 5804, \$EIEd 5804; prereq ECh 3106, ECh 5233 or ECh 5235 or #)
Cross-cultural perspectives on elementary education and early childhood education. Intercultural communication in different cultures; teaching and administrative behavior and differing educational structures in various foreign countries.

Educ 5822. Teacher as Researcher. (1-4 cr; prereq practicing teacher, #)
For practicing teachers who ask questions about their classrooms, seek answers from literature reviews and classroom research, and interpret and use the results.

Educ 5823. Teacher as Researcher. (2-4 cr; prereq practicing teacher, #; offered through UC only)
Individualized course for practicing teachers who ask questions about their classes, seek answers from literature reviews and classroom research, and interpret and use the results.

Educ 5841. History of American Education. (3 cr; prereq 9 cr ed or #; offered summer or UC only)
Selected readings in American intellectual, political, economic, and social development; special reference to an emerging system of public education.

Educ 5850. Classroom Learning Applications. (3 cr, \$EHS 5850)
Cognitive processes in education in preparation for developing curriculum and teaching. Emphasis on application of learning theory to development of knowledge systems as applied in education.

COURSE DESCRIPTIONS

Educ 5892. Values and Education. (4 cr; offered summer or UC only)
Study of values implicit in the educational process and their bases in the economic, social, and political order. Intended and unintended effects of schooling on the value systems of students.

Educ 5950. Independent Study. (1-6 cr [may be repeated for 6 cr max]; prereq special or grad, #)
Directed independent study, readings and/or projects of interest to the student in education.

Educ 5951. Topics in Education: (Various Titles to be Assigned). (1-6 cr [may be repeated for 6 cr max]; prereq tchg exper or #)
Topics selected from education to meet needs and interests of different groups of students. Topics vary. Specific course content announced in *Class Schedule*.

Educ 5952. Topics in Curriculum: (Various Titles to Be Assigned). (1-6 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq #)
Topics selected from current issues in curriculum to meet needs and interests of different groups of students. Topics vary. Specific course content announced in *Class Schedule*.

Educ 5953. Current Issues in Educational Leadership: (Various Titles to be Assigned). (1-7 cr [may be repeated for 14 cr max; cr cannot be applied to a Graduate School program]; prereq #; offered UC only)
Designed for K-12 teachers, administrators, and advanced educators.

Educ 5954. Current Issues in Educational Innovations: (Various Titles to be Assigned). (1-7 cr [may be repeated for 14 cr max; cr cannot be applied to a Graduate School program]; prereq #; offered UC only)
Designed for K-12 teachers, administrators, and advanced educators.

Educ 8950.* Problems in Curriculum Construction. (3-9 cr per qtr; prereq admission to candidacy for master's degree, #)
Opportunity for students to work individually on specific problems in elementary or secondary education.

Education and Human Service Professions (EHS)

College of Education and Human Service Professions

EHS 5000. Human Service Systems. (4 cr; prereq course in human development or educational psychology or multicultural education or special education, grad or #; offered summer or UC only)
Theoretical base for human service professions. Various theories critically analyzed to develop a conceptual framework. Examination of current practices and directions for future.

EHS 5050. Applied Human Development. (2-4 cr; prereq #)
Independent study incorporating a life span approach to understanding human development and using this approach to better understand aspects of one's personal and professional life. Reading, viewing videotapes, listening to audiotapes, and completing assignments through independent learning contract.

EHS 5500. Topics in Education and Human Service Professions. (1 to 4 cr [may be repeated under different topics for 12 cr max; no more than 6 cr total can be applied to a Graduate School program]; prereq course in human development or educational psychology or multicultural education or special education, grad or #)

Selected topics in education and human service professions. Topics announced in *Class Schedule*.

EHS 5990. Research Project. (1-12 cr [cr cannot be applied to a Graduate School program]; prereq #)
Faculty-supervised research project required for the M.Ed.

Education, Secondary (EdSe)

College of Education and Human Service Professions

EdSe 3203. Secondary School Apprenticeship. (4 cr, \$3201; prereq ¶3204, Δ)
Assignment of 45 contact hours in a secondary school with licensed teacher. Duties include teaching, tutoring, small group work, teacher's aide activity, keeping reflective journal, attending seminars, and special education module.

EdSe 3204. General Instructional Methods. (4 cr, \$5200; prereq admission to program, Δ)
Roles of teachers and learners; learning styles; Outcome-based education; lesson planning; using instructional media; evaluation techniques; using a variety of instructional techniques; peer teaching; class management; working with parents; teaching in multicultural and mainstreamed classes.

EdSe 3501. Educational Psychology. (4 cr, \$EdSe 3102; prereq admission to program, Δ)
Study of principles of psychology applied to teaching, with particular attention to secondary schools; examination of adolescent growth and development; classroom management.

EdSe 5100. Human Relations in Classroom. (3 cr, \$3120; prereq admission to program, Δ)
Examination of cultural differences; planning instruction to accommodate individual differences in race, gender, ethnic background, cultural background, and physical and mental development; needs of persons with disabilities; humanizing classroom and classroom management procedures.

EdSe 5111. Directed Study: Secondary Curriculum and Administration. (2-3 cr; prereq #)
Supervised study and field work to acquire understanding of organization and administration of secondary school curriculum, current practices, and current issues.

EdSe 5120. Philosophy and Organization of the Middle School. (3 cr; prereq 3501, 120 cr or #; offered summer or UC only)
Study of the philosophies and examination of the organization and structure of middle schools. Assessment of the benefits, drawbacks, and rationale.

EdSe 5212. Literature for Adolescents. (4 cr)
Background for pupil guidance in extensive reading in junior and senior high schools; analysis of studies of adolescent choices in literature; principles of selection; critical reading in broad fields of literary, biographical, historical, scientific, and vocational interests of boys and girls.

EdSe 5215. Reading in Secondary Schools. (4 cr; prereq 9 cr ed)

Teaching procedures, objectives, and materials; emphasis on teaching of reading in various subject-matter fields, practicum experience.

EdSe 5222. Teaching Secondary Mathematics. (5 cr, §3223; prereq admission to program, 3204 or #, Δ)

Goals for secondary mathematics, mathematics curriculum, learning of mathematics; techniques for teaching mathematics topics in grades 7-12; teaching exceptional students; responsibilities to mathematics community.

EdSe 5244. Teaching Social Studies—Secondary. (4 cr, §3245; prereq admission to program, 3204 or #, Δ)

History and philosophy of social studies education; social studies objectives; curriculum design; instructional planning and use of resources; evaluation procedures.

EdSe 5255. Teaching Secondary School Science. (4 cr, §3233, §3234; prereq admission to program, 3204 or #, Δ)

Historical development of science education. Goals and purposes of science education in secondary schools; methods and materials; evaluation procedures; current trends in science education.

EdSe 5300. Student Teaching. (3-17 cr [may be repeated for 17 cr max], §3301; prereq 3203, 3204, 3501, 5100, appropriate method course, Δ)

Supervised practicum in secondary school under direction of licensed professional teacher. Demonstration of subject matter and teaching competency and potential for future improvement.

Electrical and Computer Engineering (ECE)

College of Science and Engineering

ECE 1001. Introduction to Electrical and Computer Engineering. (2 cr; 2 hrs lect)

Definition and description of electrical and computer engineering. Digital and analog systems. Electrical and computer engineering lab equipment and software. Selected electrical and computer engineering specialties.

ECE 1315. Digital System Design. (5 cr, §CpE 1315, §CpE 3015; 4 hrs lect, 3 hrs lab)

Binary number system and digital coding techniques. Boolean algebra, combinational logic circuits, and minimization techniques. Synchronous sequential circuits and state reduction techniques. Fundamental mode asynchronous sequential circuits. Medium Scale Integration (MSI) combinational components.

ECE 1980. Introductory Topics in Electrical and Computer Engineering: (Various Titles to be Assigned). (1 to 3 cr [may be repeated for 3 cr max])

ECE 3006. Electrical Circuit Analysis. (5 cr, §CpE 3005; prereq Phys 1109 or Phys 1109H, ¶Math 3380; 4 hrs lect, 3 hrs lab)

Basic circuit analysis: resistive circuits, voltage and current sources—-independent and dependent. Nodal and mesh analysis. Network theorems. Energy storage elements, RC, RL, and RLC transient and steady-state analysis, phasors. Ideal operational amplifier circuits. SPICE analysis.

ECE 3011. Linear System and Signal Analysis I. (3 cr, §CpE 3011; prereq 3006 or CpE 3005; 3 hrs lect) Signal and system modeling concepts, system analysis in time domain, Fourier transform and Fourier series, Laplace transform, applications.

ECE 3012. Linear System and Signal Analysis II. (4 cr, §CpE 3012; prereq 3011 or CpE 3011; 3 hrs lect, 3 hrs lab)

Discrete time domain signals and systems, Z transform, analysis and design of digital filters, discrete Fourier transform, FFT, applications.

ECE 3021. Electronics I. (3 cr, §CpE 3021; prereq 3006 or CpE 3005; 3 hrs lect)

Introduction to semiconductor device physics and fabrication: diodes, transistors, integrated circuits. Non-linear devices: i-v curves, graphical analysis, large signal response, biasing. Diode circuits, applications. Two-port network analysis. FET device models, circuit analysis, applications.

ECE 3035. Electronics II. (4 cr, §CpE 3035; prereq 3021 or CpE 3021; 3 hrs lect, 3 hrs lab)

BJT device models. Analysis and design of the frequency response of single and multistage amplifiers in discrete and IC configurations.

ECE 3050. Control Systems. (4 cr, §CpE 3050; prereq 3011 or CpE 3011; 4 hrs lect)

System mathematical modeling: differential equations, Laplace transform, block diagrams, signal flow graphs. System performance characteristics: time response, sensitivity, errors. Stability analysis: Routh-Hurwitz, root locus and Nyquist. State variables. Compensation design, software tools.

ECE 3055. Applications of Linear Integrated Circuits. (4 cr, §CpE 3055; prereq 3035, 3050 or CpE 3035, CpE 3050; 3 hrs lect, 3 hrs lab)

Analysis and design of feedback amplifiers; operational amplifier applications. Design of analog/digital and digital/analog converters. Power supply design. Emphasis on IC implementation.

ECE 3060. Digital Signal Processing. (3 cr, §CpE 3060; prereq 3012 or CpE 3012; 3 hrs lect)

Basic theory of digital signal processing, transforms, sampling, filtering, estimation, application and hardware implementation.

ECE 3065. Communication Systems Design. (4 cr, §CpE 3065; prereq 3011, 3035 or CpE 3011, CpE 3035; 3 hrs lect, 3 hrs lab)

Design of modern electronic communication and telemetry systems. Emphasis on practical implementation and comparative evaluation of various modulation systems.

ECE 3325. Microcomputer System Design. (5 cr, §CpE 3025; prereq 1315 or CpE 1315 or CpE 3015; 4 hrs lect, 3 hrs lab)

Microcomputer components. Instruction set and format, machine language, and assembly language programming. Addressing modes. Signed and unsigned arithmetic. Stack uses. Assembly-level translation of high-level language constructions. Input/output interfacing techniques. Interrupt programming. Microcomputer system hardware.

COURSE DESCRIPTIONS

ECE 3340. Digital Computer Circuits. (5 cr, \$CpE 3070; prereq 3325 or CpE 3025; 4 hrs lect, 3 hrs lab) Digital logic family characteristics. Medium Scale Integration (MSI) sequential components. Implementations using Field Programmable Gate Arrays (FPGAs). Hardware description languages. Alternative clocking techniques. Processing and control circuits for digital computers. Microcoding. Processor architecture. Reduced/Complex Instruction Set Computer (RISC/CISC) architectures.

ECE 3410. Introduction to Solid-State Semiconductors. (3 cr, \$CpE 3410, \$Phys 3555; prereq Phys 1109; 3 hrs lect) Fundamentals of solid-state semiconductors and devices. Topics include quantum mechanical concepts and atomic states, solid-state structure, band structure, semiconductor statistics, and transport.

ECE 3445. Electromagnetic Fields. (4 cr, \$CpE 3045; prereq Math 3350, Math 3380, Phys 1109 or Phys 1109H; 4 hrs lect) Fundamentals of electromagnetic analysis. Electrostatic and magnetostatic fields. Introductory numerical analysis of electromagnetic fields. Time-varying fields and potentials. Maxwell's equations and their applications.

ECE 3500. Power Systems. (4 cr; prereq 3006 or CpE 3005; 3 hrs lect, 3 hrs lab) Fundamentals of rotating machines such as DC, synchronous, and induction machines. Transformers. Power system representation. Transmission lines. Power system analysis: stability and dynamic performance. Balanced and unbalanced faults. Power system protection.

ECE 3515. Multiprocessor-Based System Design. (3 cr, \$CpE 3515; prereq 3325, ¶CS 5520; 3 hrs lect) Multiprogramming, multitasking, multiprocessing, and parallel processor-based system design.

ECE 3520. Computer Networks. (3 cr, \$CpE 3520; prereq 5305 or CpE 3510, Stat 3562; 3 hrs lect) Network classification and services. Hardware components: multiplexors, concentrators, communications media. Network protocols and architecture. Research areas.

ECE 3950. Design Workshop: (Various Titles to be Assigned). (4 cr, \$3971, \$CpE 3950, \$CpE 3971; prereq Comp 3130, BECE candidate, 150 cr, #) Study and application of a selected topic to a design project completed individually or in a small group. Focuses on a different method each quarter. Completion satisfies the requirement for a senior design project.

ECE 3970. Senior Project I. (2 cr, \$3950, \$CpE 3950, \$CpE 3970; prereq 3340 or CpE 3040, BECE candidate, #) Selection and completion of project approved and supervised by faculty.

ECE 3971. Senior Project II. (2 cr, \$3950, \$CpE 3950, \$CpE 3971; prereq 3970 or CpE 3970, BECE candidate, #) Senior project results presented in formal report after refinements are made. Complete documentation of results in professional manner required. ECE 3970 and ECE 3971 must be completed within one year for credit.

ECE 3980. Senior Seminar. (1 cr, \$CpE 3980; prereq BECE candidate, 136 cr) New developments in computers and telecommunications. Prepares seniors for transition from University to engineering work environment. Fields of employment and job consideration.

ECE 5060. Multidimensional Signal Processing. (3 cr, \$CpE 5060; prereq 3060 or CpE 3060; 3 hrs lect) Two-dimensional signal processing techniques, discrete image analysis, image quality measures.

ECE 5130. Fuzzy Set Theory and its Application. (4 cr; prereq CS 1623, Math 3320; 4 hrs lect) Fuzzy sets, operations on fuzzy sets. Fuzzy relations, operations on fuzzy relations. The extension principle. Fuzzy arithmetic. Linguistic variables. Fuzzy logic and approximate reasoning. Fuzzy regression model. Fuzzy expert and fuzzy control. Fuzzy set models in operations research.

ECE 5305. Computer Architecture. (5 cr, \$CpE 3510; prereq 3340 or CpE 3070; 4 hrs lect, 3 hrs lab) Advanced assembly language programming techniques. Memory design and hierarchy principles. Virtual memory. Cache memory design. Linear pipeline and instruction pipeline techniques. Register windows. Buses and interconnection standards. Input/output interfacing and Direct Memory Access (DMA).

ECE 5310. Design of Very Large-Scale Integrated Circuits. (4 cr, \$CpE 5310; prereq [3340 or CpE 3070, 3035 or CpE 3035] or #; 3 hrs lect, 3 hrs lab) Philosophy of and techniques for designing VLSI circuits in nMOS and CMOS technologies. Full-custom and semi-custom design techniques. Digital, analog, and hybrid MOS circuits and systems. Substantial design project required.

ECE 5546. Advanced Analog Circuits. (3 cr, \$CpE 5546; prereq 3055 or CpE 3055 or #; 3 hrs lect) Application of linear integrated circuits to data acquisition problems; transducer interfacing, linear and non-linear preprocessing, phase-locked loops, high performance quantization and recovery (A/D, D/A conversion).

ECE 5570. Robotics. (3 cr, \$CpE 5570; prereq 3340 or CpE 3510, 5050 or CpE 5050; 3 hrs lect) Design and control of stationary articulate robots operating as non-feedback systems. Concepts used in robotics and tools for designing articulated mechanical systems and their computer control.

ECE 5800. Introduction to Artificial Neural Networks. (3 cr, \$CpE 5800; prereq CS 1622, Math 3380, Stat 3562 or #; 3 hrs lect) Definitions and models of neural networks. Hopfield network and its variants. Perceptron-based networks. Multilayered networks and error correction algorithms. Associative memories. Supervised and unsupervised learning.

ECE 5960. Independent Study. (1-3 cr; prereq #; does not qualify as ECE technical elective) Special projects not available in regular curriculum. Independent research, studies, or survey of selected projects or problems.

ECE 5980. Selected Advanced Topics or Seminar: (Various Titles to be Assigned). (1 to 3 cr [may be repeated for 3 cr max]; prereq #)

Electronics Technology (ET)

College of Science and Engineering

ET 1801. Fundamentals of DC Electricity. (4 cr, \$Ind 1805; 3 hrs lect, 3 hrs lab)

Basic physical concepts of electricity, generation of DC electricity, conversion of electrical energy, DC network analysis, Kirchhoff's laws, and network theorems.

ET 3831. Design with Transistors. (4 cr, \$Ind 3835; prereq 1801 or Ind 1805 or #; 3 hrs lect, 3 hrs lab)

Theory of operation of diodes and transistors and immediate circuitry associated with these devices, using approximation methods and equivalent circuit parameters.

ET 3832. Special Solid-State Devices. (4 cr, \$Ind 3836; prereq 3831 or Ind 3835 or #; 3 hrs lect, 3 hrs lab)

Theory of operation of FETs, SCRs, unijunction transistors, LEDs, and other special solid-state devices and the immediate circuitry associated with these devices.

ET 3833. Solid-State Design Applications. (4 cr, \$Ind 3837; prereq 3832 or Ind 3836 or #; 3 hrs lect, 3 hrs lab)

Employment of various solid-state devices in a variety of circuits, such as oscillators, audio and RF amplifiers, control circuits, and digital circuits.

ET 3840. Operational Amplifiers and Their Applications. (4 cr, \$3841, \$Ind 3840; prereq 3831 or Ind 3835 or #; 3 hrs lect, 3 hrs lab)

Characteristics of operational amplifiers in circuits and some of their common applications in electronic circuitry.

ET 3841. Applications of Linear Integrated Circuits. (4 cr, \$Ind 3842; prereq 3840 or Ind 3841 or #; 3 hrs lect, 3 hrs lab)

Applications of linear integrated circuits, such as voltage regulators, timers, multipliers, and phase-locked loops, and further applications of operational amplifiers.

ET 3850. Introduction to Digital Electronics. (4 cr, \$Ind 3853; prereq 1801 or Ind 1805 or #; 3 hrs lect, 3 hrs lab)

Introduction to logic circuits and digital design techniques. Gates, flip flops, number systems, binary codes, arithmetic circuits, counters, registers, Boolean algebra, and Karnaugh maps.

ET 3851. Digital Systems and Circuits. (4 cr, \$Ind 3854; prereq 3850 or Ind 3853 or #; 3 hrs lect, 3 hrs lab)

Methods and circuits used to perform various digital functions, such as A to D and D to A conversion, arithmetic operations, I/O systems, and memories.

ET 3852. Introduction to Microprocessors. (4 cr, \$Ind 3855; prereq 3851 or Ind 3854 or #; 3 hrs lect, 3 hrs lab)

Study of microprocessor architecture, interfacing, I/O devices, and the machine language programming of microprocessors for industrial applications.

ET 3853. Microprocessor System Design and Operation. (4 cr, \$Ind 3856; prereq 3852 or Ind 3855 or #; 3 hrs lect, 3 hrs lab)

In-depth study of microprocessor architecture and microprocessor systems that employ advanced programming techniques in assembly language dealing with interrupts and various I/O devices.

ET 3854. Real-Time Microprocessor Applications. (4 cr, \$Ind 3857; prereq 3853 or Ind 3856 or #; 3 hrs lect, 3 hrs lab)

Application of microprocessors in real-time environments, concept of interrupt-driven operating systems. Emphasis on lab development of real-time process control simulations, hardware protocols.

ET 3870. Optical and High Frequency Electronics. (4 cr, \$Ind 3870; prereq [3833, 3850, Phys 1103] or [Ind 3837, 3853, Phys 1103] or #; 3 hrs lect, 2 hrs lab)

Fundamentals of electromagnetic wave generation, transmission, and reception in such areas as fiber optics and microwaves.

Elementary Education (EIEd)

College of Education and Human Service Professions

EIEd 3113. Teaching Strategies I. (5 cr, \$3112; prereq Educ 1000, Educ 1100, EIEd or kindergarten candidate; ¶Educ 3333; 2 hrs lect-discussion, 8 hrs lab, 1 hr seminar per wk)

Motivation and discipline; objectives, planning, and evaluation; classroom management; developing functional writing skills; diagnosing writing errors; conducting child studies.

EIEd 3115. Teaching Strategies II. (3 cr, \$3403; prereq ¶3113, EIEd or kindergarten EIEd candidate, ¶3355, ¶3376 or Δ; 1 hr lect-discussion, 6 hrs lab per wk)

Planning, teaching, and evaluation strategies for elementary education derived from the research knowledge base of teaching and learning. Emphasis on mathematics, reading, and language arts.

EIEd 3117. Teaching Strategies III. (3 cr; prereq 3115, Educ 3322, SpEd 5610, EIEd or kindergarten EIEd candidate, ¶3344, ¶3366 or Δ; 1 hr lect-discussion, 6 hrs lab per wk)

Planning, teaching, and evaluation strategies derived from teaching and learning research. Emphasis on science and social studies.

EIEd 3344. Teaching Science and Environmental Education. (3 cr; prereq EIEd or kindergarten EIEd candidate or #)

Emphasis on resources, materials, and their application in elementary grades.

EIEd 3355. Teaching Mathematics-Elementary. (3 cr; prereq Math 1141, EIEd or kindergarten EIEd candidate or #)

Function of mathematics instruction; curriculum studies; development of socialized units, measurement, and diagnosis; experimental research on methods of mathematics instruction; literature on mathematics.

EIEd 3366. Teaching Social Studies and Environmental Education. (3 cr; prereq EIEd or kindergarten EIEd candidate)

Content and organization of social studies and environmental programs; understanding and improving the learning situation; effective use of materials.

COURSE DESCRIPTIONS

EIEd 3375. Teaching Communications I. (3 cr, \$3373; prereq Educ 3322, SpEd 5305; ¶13113, Educ 3333, Δ) Methods, materials, and research findings related to development and instruction in reading, writing, and oral language at the initial level of instruction in elementary school.

EIEd 3376. Teaching Communications II. (3 cr, \$3374; prereq 3113, 3375, Educ 3322, Educ 3333, SpEd 5305; ¶13115, 3355, Δ) Methods, materials, and research findings related to the teaching of integrated language arts, grades 4-6.

EIEd 3425. Collateral Fields: Field Experiences. (1-3 cr [may be repeated for 6 cr max]; prereq Δ) Experience working with kindergarten or elementary school teacher and children. Work supervised by education adviser and/or faculty member from academic department or collateral field, in cooperation with elementary principal.

EIEd 3508. Student Teaching in Individual Subjects–K-6. (1 to 7 cr [may be repeated for 7 cr max]; prereq Δ) Student teaching in individual subjects (e.g., art, music, physical education) in the kindergarten and elementary grades. Demonstrating subject matter competence, instructional strategies and management skills; self-evaluation.

EIEd 5323. Children's Literature II. (4 cr; prereq Educ 3322 or #; offered summer or UC only) Investigation of current literature available for children; opportunities for wide reading and independent study in special areas of interest; principles of selection of materials; methods of presentation; trends in children's literature.

EIEd 5380. Issues in Literacy Education: (Various Titles to be Assigned). (1-6 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq #; offered summer or UC only) Issues selected from the field of literacy education in order to address the needs or interests of different groups of students. Specific issue announced in *Class Schedule*.

EIEd 5400. Facilitating Cooperative Learning. (2-3 cr; prereq #; offered summer or UC only) Review of models for cooperative learning. Experience in facilitating and critiquing cooperative learning. Practicum.

EIEd 5401. Elementary School Curriculum. (3 cr; prereq #) Curriculum practices, issues, and trends in the modern elementary school; survey of research studies relating to all areas of instruction and analysis of representative programs.

EIEd 5402. Elementary School Supervision. (3 cr; prereq #; offered summer or UC only) Functions and duties of supervisors in improving instruction; specific techniques; likely problems; means of evaluating practical teaching situations.

EIEd 5441. Directed Study: Elementary School Curriculum and Administration. (2-3 cr; prereq #; offered summer or UC only) Supervised study and field work to acquire understanding of organization and administration of elementary school curriculum, current practices, and current issues.

EIEd 5508. Professional Teaching Experience in an Elementary Classroom. (7-14 cr, \$5507; prereq sr, EIEd candidate, Δ) Planning, implementing, and evaluating an elementary curriculum. Assessing learning needs and collaborating with specialists to individualize methods and materials. Biweekly seminar.

EIEd 5509. Professional Teaching Experience in a Kindergarten Classroom. (7 cr, \$3504, \$3507; prereq 5508, 5595, sr, kindergarten EIEd candidate, Δ) Planning, implementing, and evaluating an elementary curriculum. Assessing learning needs and collaborating with specialists to individualize methods and materials. Biweekly seminar.

EIEd 5595. Kindergarten Education. (4 cr, \$3395; prereq ECh 1025, ECh 3106, Educ 3333, kindergarten EIEd candidate or Δ) Organization and function of kindergarten's past and present; kindergarten curricula and physical environments; cross-cultural and research perspectives. Pre-practicum.

EIEd 5660. Issues in Social Studies Education: (Various Titles to be Assigned). (1-6 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq 120 cr or adult special or grad or #; offered summer or UC only) Issues from elementary social studies education addressing the needs or interests of different groups of students. Specific issue announced in *Class Schedule*.

EIEd 5800. International Perspectives: Elementary Education Methods and Pedagogy. (5 cr, \$ECh 5800; prereq #; offered summer or UC only) Study of elementary pedagogy and methods in a foreign country. Theory, design of learning experiences and environments for elementary children.

EIEd 5802. Observational Practicum in Elementary Education in a Foreign Country. (5 cr, \$ECh 5802; prereq #; offered summer or UC only) Observation and interaction in selected elementary education programs in a foreign country; application of theory to practice.

EIEd 5900. Independent Study. (1-6 cr [may be repeated for 6 cr max]; prereq Δ) Directed independent study, reading, and/or projects in kindergarten or elementary education of interest to student.

EIEd 5905. Topics in Elementary Education: (Various Titles to be Assigned). (1-6 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to Graduate School program]; offered summer or UC only) Topics from kindergarten or elementary education to meet special needs and interests of different groups of students. Specific titles and course descriptions announced in *Class Schedule*.

Engineering (Engr)

College of Science and Engineering

Engr 1025. Engineering Graphics. (4 cr; 3 hrs lect, 4 hrs lab)

Engineering representation and analysis of systems of projection; coordinate system and graphical solution of space problems. Precision in graphics and techniques of sketching; pictorial projection systems, size description, standard and simplified practices applied to graphic communication. Introduction to CAD.

Engr 3015. Statics. (4 cr; prereq Phys 1107, ¶ or prior cr Math 1297; 4 hrs lect)

Vector algebra. Applications of the equations of equilibrium to the analysis of simple engineering structures and machines. Nature and influence of friction. Elementary theory of static determinate framed structures. Deformation of structures with axially loaded elements.

Engr 3016. Deformable Body Mechanics. (4 cr; prereq 3015, ¶Math 3380)

Introductory treatment of stress and strain at a point. Stress-strain relation in two dimensions. Axial loading, torsion, shear and bending moment diagrams, bending stresses, deflection of determinate and indeterminate beams, instability.

Engr 3036. Dynamics. (4 cr; prereq 3015, ¶Math 3380)

Review of particle dynamics. Mechanical systems and rigid-body model. Kinematics and dynamics of plane systems.

Engr 3100. Introduction to Surveying and Mapping. (4 cr; prereq Math 1296; 3 hrs lect, 3 hrs lab)

Theory of precision measurements of distance, elevation, angle, and direction. Elements of coordinate systems, datum planes, and maps. Use of aerial photographs for mapping. Fundamentals of geometrics for design, grades, and vertical and horizontal curvature.

Engr 3200. Electrical Power. (3 cr; prereq Phys 1109, Math 3380 or equiv; 3 hrs lect)

Fundamentals of electric circuit analysis. Single-phase and three-phase AC. Rotating electric machines. Power distribution systems.

English (Engl)

College of Liberal Arts

Engl 1100. Literature Appreciation. (4 cr, \$1906, \$1907; primarily for non-majors but also for potential majors and creative writers)

Developing critical reading skills.

Engl 1506. Major Themes in Literature. (4 cr)

Selected works relevant to themes in literature (e.g., hero, anti-hero, quest, self/society and insanity, work, love and identity, narcissism, time and place, the supernatural).

Engl 1535. King Arthur in History and Literature. (4 cr)

Survey of historical accounts and literary treatments of King Arthur in Latin, English, French, and German sources of the Middle Ages and some modern Arthurian literature.

Engl 1563, 1564. American Literature. (4 cr each)

Historical survey of important authors, movements, conventions, genres, and themes. *1563*: 1820 to 1916 (Romantic through Realistic, Naturalistic). *1564*: 1916 to present (Modern, Contemporary).

Engl 1572, 1573. 20th-Century Literature. (4 cr each; primarily for non-majors)

Readings in British and American literature since the 1890s, arranged by types of discourse. *1572*: Poetry and drama. *1573*: The novel since Thomas Hardy; a general introduction to intelligent reading of literature.

Engl 1582. Introduction to World Literatures. (4 cr)

Sampling of literary works from Europe, Middle East, Africa, and Far East.

Engl 1666. Tales of Terror. (4 cr)

Gothic masterpieces chiefly from English and American literature, with emphasis on sociological and psychological implications of the genre.

Engl 1907. Introduction to Literature. (4 cr, \$1906; primarily for non-majors)

Introduction to drama, fiction, and poetry and to methods of critical analysis and interpretation.

Engl 3115. Writing Fiction. (4 cr [may be repeated for 8 cr max]; prereq Comp 1110 or Comp 1120 or #)

Writing of fiction with emphasis on structure and techniques learned from critical reading and classroom analysis.

Engl 3121. Writing Poetry. (4 cr)

Writing of poetry with emphasis on techniques learned through critical reading and classroom analysis.

Engl 3223. Shakespeare. (4 cr)

Introduction to Shakespeare. Selected plays from the histories, comedies, tragedies, and dramatic romances. Aspects of drama such as structure, language, characterization, theme, and dramatic conventions examined in the study of individual plays.

Engl 3271, 3371, 3471. Contemporary Literature. (4 cr each; offered alt yrs)

Readings in American and British literature since 1945 arranged by types of discourse. *3271*: Drama. *3371*: Poetry. *3471*: Novel.

Engl 3411. The Modern Short Story. (4 cr)

Study of the genre emphasizing close reading and interpretation of the elements of short fiction in specific works.

Engl 3412. British Short Stories. (2 cr; offered in Birmingham, England)

Readings in and examination of British short stories.

Engl 3480. American Realism, Naturalism. (4 cr, \$3470, \$5572; prereq 45 cr #; offered alt yrs)

Close study of two to three selected realistic and naturalistic American writers (e.g., Twain, Howells, James, Jewett, Chopin, Wharton, Crane, London).

Engl 3503, 3504, 3505. English Literature. (4 cr each; for Engl majors and minors only)

Chronological study of English literature from the beginnings to the early 20th century, emphasizing major works, authors, and important literary forms, styles, themes, and movements.

Engl 3511. Continental Literature. (4 cr; students may substitute Fr 3511 or Ger 3511 or Span 3511 for Engl 3511 in selecting electives in Engl and may take all four courses if they wish; offered through UC)

Reading of continental literature in translation.

COURSE DESCRIPTIONS

Engl 3574. Topics in American Renaissance. (4 cr [may be repeated for 8 cr max], \$3571, \$5571; prereq 45 cr or #; offered alt yrs)

Close study of two to three selected writers from the American Renaissance (e.g., Emerson, Hawthorne, Thoreau, Fuller, Melville, Douglass, Whitman, Dickinson).

Engl 3580. Women Writers. (4 cr; prereq 45 cr or #) Feminist reading of selected plays, poetry, prose (including critical works) written by women writers.

Engl 3593. Special Topics: (Various Titles to be Assigned). (2-6 cr [may be repeated for 10 cr max]) Study of topics falling outside the usual English courses. Topic announced before course offered.

Engl 3906. Methods of Literary Study. (4 cr, \$1906; prereq Comp 1120, Engl major or #) Introduction to interpretive and scholarly methods used in studying literature.

Engl 5116. Advanced Writing of Fiction. (4 cr [may be repeated for 8 cr max]; prereq #) Writing of short stories; class reading and criticism of student manuscripts.

Engl 5122. Advanced Writing of Poetry. (4 cr [may be repeated for 8 cr max]; prereq 3121 or #; offered alt yrs) Writing of poems; class reading and criticism of student manuscripts.

Engl 5222. Shakespeare. (4 cr; prereq 8 cr literature) Concentrated study of selected plays, with attention to Shakespearean criticism and scholarship. Recommended as the second course in Shakespeare.

Engl 5312. Chaucer. (4 cr; offered alt yrs) Introduction to Middle English. Reading and analysis of Chaucer's works, primarily *Canterbury Tales* and *Troilus and Criseyde*.

Engl 5331. Milton. (4 cr; prereq 8 cr literature; offered alt yrs) Minor poems, *Areopagitica*, *Paradise Lost*, and *Samson Agonistes*.

Engl 5375. Modern Poetry. (4 cr; prereq 8 cr literature; offered alt yrs) Study of 20th-century poetry written in English.

Engl 5471, 5472. American Novel. (4 cr each, \$5452; prereq 85 cr incl 8 cr literature or #; offered alt yrs) History of the American novel from the late 18th century to the present in its social, intellectual, and aesthetic contexts. *5471*: To 1900. *5472*: From 1900 to the present.

Engl 5561. English Romanticism. (4 cr; prereq 8 cr literature; offered alt yrs) Study of the Romantic movement in England as reflected in the works of such writers as Wordsworth, Coleridge, Mary Shelley, Keats, Percy Shelley, and Anne Radcliffe.

Engl 5562. Victorian Literature. (4 cr; prereq 8 cr literature; offered alt yrs) Study of aesthetic, social, and philosophical concerns of Victorian England as reflected in the works of such writers as Tennyson, Arnold, Christina Rossetti, Elizabeth Barrett Browning, and Samuel Butler.

Engl 5566. Irish Literary Revival. (4 cr; prereq 8 cr literature; offered alt yrs) Study of important Irish writers in the historical and political context of the Celtic Renaissance.

Engl 5574. Studies in Major American Authors. (4 cr [may be repeated for 8 cr max]; prereq 8 cr literature) Concentrated study in one to three major authors. Authors to be announced before each time course is offered.

Engl 5591. Independent Study. (1-4 cr [may be repeated for 8 cr max; no more than 6 cr can be applied to a Graduate School program; cr in 5590 counts toward max]; prereq #, Δ) Students choose their projects in consultation with their instructor.

Engl 5593. Special Topics: (Various Titles to be Assigned). (2-6 cr [may be repeated for 10 cr max]; primarily for majors, minors, grads) Intensive study of special topics falling outside the usual English courses. Topic announced before course offered.

Engl 5712. Oral Interpretation of Literature. (3 cr, [cr cannot be applied to MA Engl program], \$5711; prereq 1906 or 3906 or #) Theory and practice of the oral performance of principal literature genres.

Engl 5811. Introduction to Modern English. (4 cr) Modern theories of English grammar.

Engl 5821. History of the English Language. (4 cr) History of sounds, word stock, and structures of the English language from the earliest records to the present time.

Engl 5841, 5842. British Novel. (4 cr each, \$5445; prereq 85 cr incl 8 cr literature or #; offered alt yrs) Development of the British novel in its social, intellectual, and aesthetic contexts. *5841*: To 1872. *5842*: From 1872 to the present.

Engl 5902. Composition for Teachers I. (4 cr; prereq admission to BAA program or #) For prospective teachers involving both practice in composition and study of theory and practice of teaching composition at secondary level.

Engl 5906. Senior Seminar. (4 cr; prereq Engl major) Examination of one literary studies theme or issue.

Engl 5922. Teaching the Language Arts. (4 cr, \$3912) Problems in teaching language arts, suggested methods and materials of instruction.

Engl 8110. Proseminar: Medieval Studies. (4 cr; prereq grad; offered every 3rd yr) Wide reading among important works of a given period, prepares grad students for work in other graduate courses and seminars. Historical, cultural, and literary contexts; methodology; relevant scholarship and criticism.

Engl 8130. Proseminar: Restoration and 18th Century. (4 cr; prereq grad) Wide reading among important works of a given period, prepares graduate students for work in other graduate courses and seminars. Historical, cultural, and literary contexts; methodology; relevant scholarship and criticism.

Engl 8140. Proseminar: 19th-Century British Literature. (4 cr; prereq grad; offered every 3rd yr) Wide reading among important works of a given period, prepares graduate students for work in other graduate courses and seminars. Historical, cultural, and literary contexts; methodology; relevant scholarship and criticism.

Engl 8150. Proseminar: 20th-Century British Literature. (4 cr; prereq grad; offered every 3rd yr)
Wide reading among important works of a given period, prepares graduate students for work in other graduate courses and seminars. Historical, cultural, and literary contexts; methodology; relevant scholarship and criticism.

Engl 8160. Proseminar: American Romanticism. (4 cr; prereq grad; offered every 3rd yr)
Wide reading among important works of a given period, prepares graduate students for work in other graduate courses and seminars. Historical, cultural, and literary contexts; methodology; relevant scholarship and criticism.

Engl 8170. Proseminar: American Realism and Naturalism. (4 cr; prereq grad; offered every 3rd yr)
Wide reading among important works of a given period, prepares graduate students for work in other graduate courses and seminars. Historical, cultural, and literary contexts; methodology; relevant scholarship and criticism.

Engl 8180. Proseminar: 20th-Century American Literature. (4 cr; prereq grad; offered every 3rd yr)
Wide reading among important works of a given period, prepares graduate students for work in other graduate courses and seminars. Historical, cultural, and literary contexts; methodology; relevant scholarship and criticism.

Engl 8666. Doctoral Pre-Thesis Credits. (1-18 cr [11 cr max per summer term]; prereq doctoral student who has not passed preliminary oral examination)

Engl 8888. Thesis Credits: Doctoral. (1-36 cr [18 cr max per qtr, 11 cr per summer term])
Doctoral dissertation research and preparation.

Engl 8906. Introduction to Graduate Studies in English. (4 cr)
Core course required for all English M.A. (Plan B) students. Experience with critical approaches, terminology, written literary analysis, problem solving related to study of literature.

Engl 8930. Practicum in Teaching Literature. (4 cr; prereq 8 cr literature, Δ)
Teaching in sophomore literature courses; experience in preparation of supplementary materials, consultation with students, and assisting instructors in grading student work.

Environmental Studies (ES)

College of Liberal Arts

ES 5001. Environmental Studies Seminar I. (4 cr; prereq ES major, 90 cr; not available for grad cr)
Critical discussion, research, and literature review of multidisciplinary environmental issues.

ES 5002. Environmental Studies Seminar II. (4 cr; prereq 5001, 90 cr; not available for grad cr)
Guided critical discussion, research, and literature review of multidisciplinary-disciplinary environmental issues, leading to individually-designed papers/projects.

ES 5050. Environmental Studies Internship. (2-4 cr [may be repeated for 8 cr max]; prereq ES major, 90 cr or Δ)
Practical experience in some field of environmental work, supervised by a faculty adviser and work-site adviser.

Family Life (FamL)

College of Education and Human Service Professions

FamL 5325. Educating Adults. (3 cr, \$HEEd 5325; prereq sr or grad or #)

Adult learning and development. Planning, presenting, and evaluating formal and informal educational programs for adults. For teachers, extension agents, family life and parent educators, and others interested in leading or organizing adult and out-of-school learning groups.

FamL 5620. Teaching Parenting/Child Development. (3 cr, \$HEEd 5620; prereq 1655 or 5610, 5325, 120 cr or adult spec or #; tchg exper recommended)

Teaching strategies, materials, curriculum development, and evaluation of parenting/child development classes.

FamL 5650. Families in Crisis. (4 cr, \$HE 5650; prereq 1655 or 3675 or #)

Examination of the impact of various crises on family members. Analysis of coping strategies, reorganization of family roles, and survey of available community resources.

FamL 5800. Practicum in Parent Education. (1-6 cr [cr cannot be applied to a Graduate School program], \$HE 5800; prereq admission to parent educator or ECFE licensure program, #)

Applying skills, understanding, and knowledge related to working with adult learners in parent education or early childhood/family education programs.

Family Medicine (FMed)

School of Medicine

FMed 5305. Preventive Medicine and Community Health. (3 cr; prereq regis med or #)
Health and high-level wellness with special reference to definition, assessment, and maintenance of healthy lifestyle. Overview of disease prevention with special reference to community health issues in epidemiology, environment, and public health. Exposure to community preventive health programs.

FMed 5501. Clinical Pathology Pharmacology Conferences. (1 cr; prereq regis med or #)
Working through a differential diagnosis for an unknown clinical case.

FMed 5555. Independent Study. (Cr ar; prereq Δ)
Crouse, staff
Intensive, independent study in medical research, interdisciplinary fellowship study, preceptorship, or other medical area of the student's interest. Department of Family Medicine approval required.

FMed 8100. Clinical Family Medicine. (Cr ar; prereq Δ; cr cannot be applied to a Graduate School program) Crouse, Day
Supervised care of patients of all ages emphasizing continuous, primary, preventive, acute, and chronic care in all general diagnostic categories.

Finance and Management Information Sciences (FMIS)

School of Business and Economics

FMIS 1201. Introduction to Business Information Systems. (4 cr, §1202, §CS 1010)
Business information systems and their applications. Computer concepts; use of command-driven and graphics-user interface operating systems; graphics; word processing, spreadsheet, and database management applications.

FMIS 3140. Business Communications. (4 cr; prereq Comp 1110 or Comp 1120, SBE candidate or Econ major or approved Acct/Bus Adm/Econ minor or □)
Principles of business communication and their application to oral, written, and nonverbal communication. Topics include intercultural communication, people-first language, ethics, and role of technology in business communication.

FMIS 3211. Management Information Systems. (4 cr; prereq SBE candidate or approved Acct/Bus Adm minor or CS/Engr major/minor with 90 cr or □)
Conceptual foundations, structure, development, and implementation of information systems for social organizations. Emphasis on computer-based systems and their behavioral and societal implications for management.

FMIS 3222. Structured Systems Analysis. (4 cr, §3221; prereq 3211, SBE candidate or Acct/Bus Adm minor or CS/Engr major/minor with 90 cr or □)
Analysis phase of the systems development life cycle. Emphasizes feasibility study, requirements analysis, and system specification. Detailed study of current physical and logical systems models and specifications.

FMIS 3223. Structured Systems Design. (4 cr; prereq 3211, 3222, SBE candidate or approved Acct/Bus Adm minor or CS/Engr major/minor with 90 cr or □)
Design phase of the systems development life cycle. Emphasizes systems design, development, and implementation. Detailed study of physical and logical systems models and specifications and program structure design and development.

FMIS 3305. Production and Operations Management. (4 cr, §3201, §3203, §3301; prereq SBE candidate or approved Acct/Bus Adm minor or □)
Introductory survey of production and operations as a functional area of management, including operations strategy, process design, forecasting, resource allocation, inventory management, scheduling, and project management. Computer applications of quantitative techniques to support operations decision making.

FMIS 3309. Service Operations Management. (4 cr, §3302; prereq 3301 or 3305, SBE candidate or approved Acct/Bus Adm minor or □)
Principles of managing service operations. Importance of services, characteristics and design of services, service delivery process planning, and total quality management in service operations.

FMIS 3374. Part-time Internship. (4 cr, §3375, §3376, §MgtS 3375, §MgtS 3376; prereq 120 cr, SBE candidate, #)
Written job description must be obtained and approved before internship begins. Complete a minimum of 150 hours of supervised work experience in public agency, private business, or other organization after junior year. Prepare papers during and following the internship experience.

FMIS 3376. Full-time Internship. (6 cr; prereq business core [except 3362], 120 cr, SBE candidate, Δ)
Following written approval of proposal, student engages in supervised program of full-time work experience in public agency, private business, or other organization. Advance, concurrent, and follow-up written and oral presentations required.

FMIS 3611. Corporation Finance. (4 cr; prereq SBE candidate or Econ major or approved Acct/Bus Adm minor or □)
Fundamental concepts of managerial finance, financial analysis, planning and control of investment decisions on short- and long-term assets. Cost of capital and valuations, sources of short-term intermediate and long-term funds, integrated topics in managerial finance.

FMIS 3612. Managerial Finance. (4 cr; prereq 3611, SBE candidate or approved Acct/Bus Adm minor or □)
Develops abilities for applying financial theory and analytic methods to find solutions to financial management problems.

FMIS 3644. Investment Fundamentals. (4 cr; prereq 3611, SBE candidate or approved Acct/Bus Adm minor or □)
Comprehensive introduction to nature, problems, and process of evaluating particular securities and portfolio construction. Survey of basic principles of security analysis, analytical techniques, and investment policy for individual and institutional investors. Introduction to computer-assisted investment analysis.

FMIS 3647. Financial Markets and Institutions. (4 cr; prereq 3611, SBE candidate or approved Acct/Bus Adm minor or □)
Analysis of money and capital markets, savings-investment process, and financial institutions. Role of Federal Reserve and Treasury in financial market development; supply and demand for loanable funds; level and structure of interest rates. Asset/liability management.

FMIS 3649. International Finance. (4 cr; prereq 3611, SBE candidate or Econ major or approved Acct/Bus Adm/Econ minor or □)
Comprehensive framework and analysis for financial management of international firm. Topics include international financial markets, exchange rates and international firms, elements of international investments, financing decisions, and strategy formulation.

FMIS 3971. Independent Study. (1-4 cr; prereq Δ)
For students wishing to do special work in finance or information sciences that extends beyond, or in greater depth than, regular course offerings.

FMIS 3995. Instructional Assistance. (1 cr [may be repeated for 4 cr max; cr not available as FMIS elective]; prereq Δ)
Teaching experience involving tutoring program in department, as outlined in contract with faculty monitor.

FMIS 5207. Simulation Methods for Management. (4 cr; prereq SBE candidate or Acct/Bus Adm minor with 90 cr or CS/Engr major/minor with 90 cr or grad or □)
Introduction to building and experimenting with computer-based simulation models applicable to service systems and manufacturing operations. Hands-on experience using the General Purpose Simulation System (GPSS) language frequently used in industry.

FMIS 5611. Portfolio Analysis. (4 cr; prereq 3644 or ¶3644, SBE candidate with 120 cr or grad or □; offered alt yrs)

Principles for investment selection under conditions of uncertainty, along Markowitz-Tobin-Sharpe lines; implications of model for capital markets and price behavior in efficient markets; empirical evidence on capital market performance; computer-assisted techniques for portfolio analysis.

FMIS 5613. Capital Budgeting. (4 cr; prereq 3612 or ¶3612, SBE candidate with 120 cr or grad or □; offered alt yrs)

Capital investment policies of firm. Problems in estimating earnings, cost savings, obsolescence of plant and equipment; importance of reviewing past decisions, and buying versus leasing; evaluation of mergers as capital budgeting decision. Emphasis on cost of capital, measures of investment merit, capital rationing, and replacement of plant and equipment. Risk analysis.

FMIS 5615. Futures and Options. (4 cr; prereq 3644 or ¶3644, SBE candidate with 120 cr or grad or □)

Nature and functions of derivative security markets such as options, futures, options on futures, swaps, and financial engineering. Emphasizes their use as tools for risk reduction, portfolio management, and speculative medium for aggressive investor.

FMIS 5617. Management of Financial Institutions. (4 cr; prereq 3647 or ¶3647, SBE candidate with 120 cr or grad or □; offered alt yrs) Techniques for managing commercial banks and other financial institutions through asset/liability management.

FMIS 5619. Analysis of Financial Statements. (4 cr; prereq 3611, SBE candidate with 120 cr or grad or □) Analysis and interpretation of financial statements. Presentation of analytical techniques, including trend, comparative, and ratio analysis. Use of computer-assisted analysis.

FMIS 5651. Risk Management and Insurance. (4 cr; prereq FMIS 3611 or #)

Introduction to risk analysis and management from perspective of individuals and firms in society. Applied use of risk transfer and control techniques, insurance contract construction, and determination of premiums.

FMIS 5981. Special Topics. (1 to 4 cr [may be repeated for 8 cr max]; prereq SBE candidate with 120 cr or grad or □) Exploration of specific contemporary finance and information science problems, issues, and approaches.

FMIS 8211. Management Science. (3 cr; prereq 5201 or equiv, grad or □) Analysis of integration and computer-augmented application of quantitative modeling techniques in dynamic environment. Individual and group projects provide opportunity to implement decision-modeling techniques.

FMIS 8611. Financial Management. (3 cr; prereq 3611 or equiv, grad or □) Corporate financial policy. Application of financial theory and decision-making tools.

FMIS 8971. Independent Study. (1-3 cr [may be repeated for 6 cr max of electives]; prereq grad, Δ) Special study in areas useful to individual programs and objectives in finance or management information science (MIS) that extend beyond, or go into greater depth than, core course offerings.

Fine Arts (FA)

School of Fine Arts

Fine arts courses acquaint students with the interdisciplinary relationships of art, dance, music, theatre, and the humanities.

FA 1200. Creating Across Disciplines. (4 cr) Investigation of the creative process in areas such as art, music, theatre, and dance.

FA 1400. Topics in Fine Arts: (Various Titles to be Assigned). (1 to 4 cr each offering [may be repeated for 12 cr max]; offered through UC) Selected studies in the fine arts with interdisciplinary or multidisciplinary focus.

FA 1405. History of American Architecture: 1600 to Present. (3 cr; offered through UC) Study of architecture from colonial period to present with special emphasis on cultural, art, historical, and social aspects.

FA 1410. Principles of Interior Design. (3 cr; offered through UC) Applying design elements and principles to interior design problems.

FA 5200. Creating Across Disciplines. (4 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to an MA or MEd degree program]) Investigation and research into the creative process in areas such as art, music, theatre, and dance.

FA 5901. Historic Property Internship. (3 cr [may be repeated for 12 cr max]; prereq Art 5900 or 12 cr in Hist or Arth, #; 90 hrs work) Supervised practicum in varied aspects of historic, cultural property operation.

French (Fr)

College of Liberal Arts

Also see courses listed under Language (Lang) later in this section.

Fr 1301-1302-1303. Beginning French I-II-III. (4 cr each; prereq one yr high school Fr or successful completion of 1301 or # for 1302; two yrs high school Fr or successful completion of 1302 or # for 1303) Grammar, reading, conversation.

Fr 1501-1502-1503. College French I-II-III. (4 cr each; prereq successful completion of 1302 or equiv or two or more yrs high school Fr or # for 1501; successful completion of 1501 or # for 1502; successful completion of 1502 or # for 1503) Consolidation and enrichment of previously acquired abilities in speaking and understanding French set within an introduction to written French and a survey of the contemporary culture of French-speaking societies.

Fr 3001-3002. Advanced French I-II. (4 cr each, §1233, §3122 §3123; prereq successful completion of 1503 or equiv or # for 3001; successful completion of 3001 or # for 3002) Developing French literacy within a culturally authentic contemporary context. Emphasis on writing and speaking plus complete review of grammar. Taught in French.

COURSE DESCRIPTIONS

Fr 3006. Language Study Abroad. (1-5 cr [may be repeated for 15 cr max]; prereq Δ)

For students pursuing formal study of French language in a French-speaking country, under the auspices of another college or university or by individual arrangement.

Fr 3141. Poetry. (4 cr, \$3222, \$5001; prereq 3001 or equiv, grade of C or better in last Fr lang course taken or #; offered alt yrs)

Reading and analysis of representative works of poetry from France and Francophone countries.

Fr 3171. Classical French Theatre. (4 cr, \$3532, \$5171; prereq 3001 or equiv, grade of C or better in last Fr lang course taken or #; offered alt yrs)

Representative plays of Corneille, Molière, and Racine.

Fr 3315. From History to Sexuality: The Human Condition in French Film. (4 cr)

Develop appreciation of cinema as an art form with powerful social content, awareness of international scope of Francophone culture, and sensitivity to human diversity issues. Taught in English.

Fr 3400. Culture and Civilization Study Abroad. (1-10 cr [may be repeated for 30 cr max]; prereq Δ)

For students pursuing formal study of French culture and civilization in a French-speaking country, under the auspices of another college or university or by individual arrangement.

Fr 3889. Literature in the Western Tradition. (4 cr, \$Engl 3889, \$Ger 3889, \$Span 3889; prereq 45 cr or #)

Comparison and contrast of major literary movements in the West and derivative cultures, including contrast with non-Western works. Taught in English.

Fr 5172. Classical French Prose. (4 cr, \$3532; prereq 3001 or equiv, grade of C or better in last Fr lang course taken or #; offered alt yrs)

Essays, maxims, and philosophical thoughts about the human condition by Montaigne, Descartes, Pascal, La Bruyère, and La Rochefoucauld.

Fr 5181. Voltaire and Rousseau in English. (4 cr, \$3543; offered alt yrs)

Works of Voltaire and Rousseau in English translation.

Fr 5191. The 19th-Century Novel. (4 cr, \$3552; prereq 3001 or equiv, grade of C or better in last Fr lang course taken or #; offered alt yrs)

Reading and analysis of several novels by major 19th-century writers (e.g., Hugo, Balzac, Stendhal, Flaubert, Zola, Maupassant).

Fr 5201. 20th-Century Novel. (4 cr, \$3573; prereq 3001 or equiv, grade of C or better in last Fr lang course taken or #; offered alt yrs)

Reading of selected novels by leading 20th-century writers.

Fr 5590. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq 3001, grade of C or better in last Fr lang course taken or #, Δ) Kovacovic Students develop reading and research programs in consultation with the instructor.

Fr 5597. Seminar. (2-4 cr [may be repeated for 8 cr max], \$3997; prereq 3001 or equiv, grade of C or better in last Fr lang course taken or #)

Geography (Geog)

College of Liberal Arts

Geog 1201. World Regional Geography. (4 cr)
Geography of human groups in diverse settings. Emphasis on cultural diversity, regional development, and human and environmental forces shaping regional patterns and processes. Geographical analysis of selected regions and countries.

Geog 1303. Cultural Geography. (4 cr)
Ecological basis of human existence. Human population patterns and cultural diffusion. Agricultural geography. Political geography. Geography of language, religion, and ethnic groups. Effects of urbanization; economic geography.

Geog 1305. Environmental Conservation. (4 cr)
Integrated study of physical, economic, social, and political aspects of natural resource management. Emphasis on identifying environmental problems and evaluating alternatives for resolution, including planning, regulation, market incentives, and mitigation activities.

Geog 1312. Economic Geography. (4 cr)
Contemporary geographic pattern analysis of production, distribution, and consumption of goods and services. Development of geographic theories and models that attempt to explain spatial variations of economic activities such as agriculture, manufacturing, and trades and services.

Geog 1413. Physical Geography. (5 cr)
Earth-sun relations, maps and globes, and major factors of the natural environment, including water resources, landforms, weather and climate, natural vegetation, and soils.

Geog 1551. Introduction to Maps and Cartographic Methods. (4 cr, \$3552, \$3553)
Defines maps and map-like images. Maps as communication tools. Scale, projections, cartographic generalization and symbolization. Compares spatial data models and types of spatial (geographic) data. How classification and symbolization methods determine representation of spatial data.

Geog 3103. Historical Geography: United States. (4 cr; prereq 4 cr Geog, 40 cr or #)

Geographic conditions influential in the development and settlement of the United States.

Geog 3112. Geography of American Indians in the United States and Canada. (4 cr; prereq 4 cr Geog, 40 cr or #)

Regional shifts in location and spatial organization of American Indians pre- and post-European contact. Comparative analysis of United States and Canadian groups.

Geog 3142. Ethnic Geography of American Immigration. (4 cr, \$3141, \$5401; prereq 40 cr incl 8 cr Geog or #)

Geographical survey of the origins and distribution of European immigration in the United States; theories relating to migration and location of immigrants; transplanted systems of cultural ecology and the American environment; ethnicity as a geographic expression. Local and regional case studies.

Geog 3161. The Vikings: Environment and Culture. (4 cr, \$Anth 3610; prereq 40 cr incl 1303 or Anth 1604 or #)
Description and analysis of Viking way of life with emphasis on culture, ecology, society, religion, and the place and role of Vikings in European history.

Geog 3332. Urban Geography. (4 cr, §3331; prereq 4 cr Geog, 40 cr or #)

Urbanization as a geographical process. Perspectives on the origins of cities, patterns of urban development, and contemporary urban problems.

Geog 3341. Geography of Transportation. (4 cr; prereq 8 cr Geog incl 1312, 40 cr or #)

Analysis of the distribution and pattern of various transportation modes with examination of the geographical aspects of transport systems at empirical and theoretical levels.

Geog 3351. Urban and Regional Planning. (4 cr; prereq 8 cr Geog incl 1403 or 1413, 40 cr or #)

Perspective on planning principles, process and practice. Consideration of the history and trends in planning; development of comprehensive plans; implementation process in urban and regional planning.

Geog 3361. Geographical Aspects of Outdoor Recreation. (4 cr; prereq 4 cr Geog, 40 cr or #)

Geographical survey of U.S. outdoor recreation sites; theories relating to location; outdoor recreation as a cultural expression of land use. Local and regional case studies of northern Minnesota.

Geog 3381. Geography of U.S. and Canadian Public Lands and Public Land Policy. (4 cr; prereq 4 cr Geog, 40 cr or #)

Comparison of public land systems in the United States and Canada, including philosophies and attitudes toward public land; patterns of land use; current stresses on public lands.

Geog 3393. Political Geography. (4 cr; prereq 40 cr incl 8 cr Geog or #)

Survey of political geography past and present. Environmental-political theories, German geopolitics, territoriality, nation-states and nationalism, boundaries and frontiers, jurisdictional organization and reorganization, locational conflicts, electoral geography, locality studies, and urban politics.

Geog 3412. Weather and Climate. (4 cr; prereq 1403 or 1413, 40 cr or #)

Atmospheric composition, structure and motion; precipitation processes, air masses, fronts, cyclonic storms, and general weather patterns. Global distribution and classification of climates.

Geog 3421. Natural Hazards. (4 cr, §3420; prereq 1403 or 1413, 40 cr or #)

Geography of natural hazards. Human-physical environment interrelationships under extreme geophysical conditions; causes, characteristics, and consequences of natural hazards such as earthquakes, tornadoes, hurricanes, floods, and drought; human adjustment to these events.

Geog 3500. Global Resources. (4 cr; prereq 40 cr or #)

Spatial distribution and uses of global natural resources addressed through models of resource management, focusing on energy, non-fuel minerals, population, food, and technology. Theoretical approach and political perspective applied to trade, international economic development, and environmental issues.

Geog 3531. Map Design and Graphic Methods. (5 cr, §3521, §3522; prereq 1551, CS 1010, 40 cr or #; Stat 1566 recommended; 2 hrs lect, 4 hrs lab)

Thematic mapping of qualitative and quantitative data. Data measurement levels and their relationships to geographic phenomena and map symbols. Appropriate treatment (both statistical and representational) of map data. Designing and creating maps using computers.

Geog 3701. Geography of United States and Canada. (4 cr; prereq 40 cr incl 8 cr Geog or #)

Topical presentation of geographic patterns in the United States and Canada. Emphasis on contemporary social issues, including patterns of regional development and underdevelopment, environmental issues, regionalism, nationalism, cultural patterns and conflict, and social inequality.

Geog 3706. Geography of Minnesota. (3 cr, §3111; prereq 40 cr incl 8 cr Geog or #)

Physical survey followed by study of human activities.

Geog 3711. Geography of Latin America. (4 cr, §5133; prereq 40 cr incl 8 cr Geog or #)

Survey of the cultural and physical diversities of Latin America. Emphasis on physical resources, historical development, population characteristics, and economic activities.

Geog 3731. Geography of China and Japan. (4 cr, §3211, §5211; prereq 40 cr incl 8 cr Geog or #)

Physical and cultural geography of China and Japan. Analysis of contemporary agriculture, resource use, trade, transport, industrialization, population, and urbanization.

Geog 3741. Geography of the Middle East and North Africa. (3 cr; prereq 40 cr incl 8 cr Geog or #)

Geographic study of one of the world's most strategic regions. Emphasis on the continuing geopolitical significance of this region supported by examination of relevant physical and cultural themes, including the role of oil and the Arab-Israeli dispute in the political geography of the Middle East.

Geog 3751. Geography of Russia and other Commonwealth Republics. (4 cr; prereq 40 cr incl 8 cr Geog or #)

Physical and cultural geography. Emphasis on disintegration of the former Soviet Union from an ethnic and geographical perspective.

Geog 3761. Geography of Europe. (4 cr, §5172; prereq 40 cr incl 8 cr Geog or #)

Physical and cultural geography of countries of Europe considered regionally and through a more detailed discussion of topics dealing with environmental, energy, urban, and industrial issues.

Geog 3766. Geography of Scandinavia, Finland, and Iceland. (4 cr, §5573; prereq 40 cr incl 8 cr Geog or #)

Cultural and physical geography of Scandinavia, Finland, and Iceland; introduction to Scandinavian, Finnish, and Icelandic settlements in North America.

Geog 3920. Independent Study in Geography. (1-4 cr [may be repeated for 8 cr max]; prereq Δ)

For students interested in doing advanced work in selected fields of geography.

Geog 3930. Special Topics in Geography:

(Various Titles to be Assigned). (1-4 cr [may be repeated for 12 cr max]; prereq #)

Topics not offered in regular department curriculum; may involve specialties of the staff or visiting faculty.

Geog 5430. Principles of Geographical Hydrology. (4 cr, §3430; prereq 1403 or 1413, 45 cr or #)

Geography of water processes: relationships between rivers and landscape. Incorporating theoretical and empirical studies into hydrologic principles, stream channel processes, and fluvial geomorphology: spatial and temporal variations in water distribution, analyses of hydrological data, flows, sediment, forecasting, hydrographs, and modeling.

Geog 5440. Water Resource Management. (4 cr, \$3440; prereq 1403 or 1413, 5430, 45 cr or grad or #) Geography of water distribution, planning, and management. Application of hydrological information in water resources management: aspects of water quantity and quality, groundwater availability, water use and treatment, resource development, political and administrative issues, basin management problems, forestry, agriculture, urbanization, floods, drought.

Geog 5532. Advanced Cartographic Methods. (4 cr; prereq 3531, Stat 1565, 90 cr incl 16 cr Geog or grad or #; 2 hrs lect, 4 hrs lab) Advanced cartographic issues, including alternative map representations such as multimedia representations, map animations, and maps for physically challenged individuals. Focus on cognitive issues concerning map design to enhance map reading and understanding, such as color perception and nontraditional map symbolization.

Geog 5563. Laboratory in Geographic Information Systems. (4 cr; prereq 3531, CS 1500 or CS 1501, Stat 1565, 90 cr incl 16 cr Geog, concurrent regis in 5564 required or grad or #) Practical application of Geographic Information System (GIS) computer programs to earth science problems; data gathering and coding; spatial analysis; class projects.

Geog 5564. Geographic Information Systems. (4 cr, \$5562; prereq 3531, CS 1500 or CS 1501, Stat 1565, 90 cr incl 16 cr Geog, concurrent regis in 5563 required or grad or #) Theory of design, operation, and application of Geographic Information Systems (GIS). Acquisition, management, and analysis of data for GIS.

Geog 5571. Advanced Geographic Information Systems. (4 cr; prereq #; 2 hrs lect, 4 hrs lab) Advanced issues in GIS, including coordinate systems and geocoding, vector/raster data structures, temporal data structures, surface modeling, error modeling and data uncertainty, visualization, GIS application areas, decision making in a GIS context, system planning, and implementation.

Geog 5611. Field Techniques. (4 cr, \$3611; prereq 90 cr incl 16 cr Geog or grad or #) Geographic survey of physical and cultural aspects of selected urban and rural landscapes, including basic methods of observation, measurement, recording, analysis, and presentation of field data. Chiefly field training.

Geog 5802. Geographic Thought. (4 cr, \$3802; prereq 45 cr incl 16 cr Geog or grad or #) Analysis of development and significance of geographic concepts and thought. Emphasis on history and intellectual roots of contemporary geography, geographers, and geographic institutions.

Geog 5920. Independent Study in Geography. (1-4 cr [may be repeated for 9 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq Δ) Independent problems for postbaccalaureate students interested in doing additional work in selected fields in geography.

Geog 5930. Special Topics in Geography: (Various Titles to be Assigned). (1-4 cr [may be repeated for 9 cr max, no more than 6 cr can be applied to a Graduate School program]; prereq #) Geography topics of current and special interest to students not offered in the regular curriculum. Topics may involve specialties of the staff or visiting faculty.

Geology (Geol)

College of Science and Engineering

Geol 1110. Introductory Geology. (5 cr; 4 hrs lect, 2 hrs lab) Comprehensive survey of Earth including its composition, structure, and dynamics; an understanding of both internal and surface processes is developed and related to theories of seafloor and continental movement, the whole serving as a framework for a summary of geological history and the development of life.

Geol 1130. Life and Death of the Dinosaurs. (4 cr; 4 hrs lect) Rapp
Survey of dinosaurs who dominated large-animal life on Earth for 130 million years; theories of dinosaur extinction; habitat of dinosaurs on worldwide Mesozoic coastal plains; dinosaur fossilization and modern excavation.

Geol 1150. Introduction to Environmental Science. (4 cr; 3 hrs lect, 1 hr recitation) Introduction to Earth's physical and biological environment, climate, oceans, and land systems; human population distribution in relation to distribution of resources; human interaction with the environment (e.g., waste disposal, resource extraction). Topics include climates, soils, ecosystems, food supply, air pollution, global warming, acid rain, expanding deserts, disappearing rainforests, energy policy.

Geol 3100. Geological Field Methods. (3 cr; prereq 3326, 3520) Introduction to and use of Brunton compass and other field instruments; study of topographic maps, geologic maps, and aerial photographs; procedures for note taking, constructing geologic maps, preparing geologic reports.

Geol 3120. Geology of North America. (3 cr; prereq 1110 or 1110H) Matsch
Survey of the major physiographic and tectonic provinces of North America, including their geological nature, origin, and history.

Geol 3131. Oceanography. (4 cr; 3 hrs lect, 1 hr rec) Physicochemical nature of marine waters; origin and history of oceans and basins; processes, currents, tides; oceanic-atmospheric-continental relations; sedimentation in oceans, development of ocean basins; nature of marine organisms, productivity, petroleum generation, trophic levels, ecosystems, ocean resources.

Geol 3141. The Earth's Resources. (4 cr; prereq 30 cr or #; 4 hrs lect) P Morton
Distribution of Earth's resources through space and time, including metals, minerals, fossil fuels, building materials, water, and soil. Interrelationships between population growth and Earth's finite resources. Not for geology majors.

Geol 3150. Environmental Geology. (4 cr; prereq 1110 or 1110H or #; 3 hrs lect, 2 hrs lab, field trip) Interactions between human beings and their physical environment; constraints and influences on human activities imposed by geologic processes, history, and Earth's constitution. Engineering-geological strategies for dealing with some of these problems.

Geol 3185. Geological Computer Applications I. (2 cr; prereq 3320 or #; 1 hr lect, 2 hrs lab) General introduction to DOS-based (IBM) microcomputers and applications, concentrating on operating systems, hardware, geological software, spreadsheets, databases, and CAD.

Geol 3190. Independent Study. (1 to 2 cr [may be repeated for 6 cr max]; prereq #)
Directed readings and projects for students who wish to do independent advanced study or work on topics not normally covered in other courses.

Geol 3200. Geomorphology. (4 cr; prereq 1110 or 1110H; 3 hrs lect, 2 hrs lab, field trips) Matsch
Geologic processes of Earth's surface environment that produce the major elements of the landscape. Aerial photographs and topographic maps as tools for interpreting the origin and geological history of landscapes.

Geol 3300. Basic Mineralogy and Petrology. (5 cr, \$324; prereq 1110 or 1110H; 1 yr high school chem or 1 qtr college chem, 30 cr or #; 3 hrs lect, 4 hrs lab, field trip) P Morton
Introduction to the study of minerals and rocks; a survey of the most common and economically important minerals and rock types including their composition, identification, and origin. Not for geology majors.

Geol 3320. Introduction to Mineralogy. (3 cr; prereq 1110 or 1110H, 1 qtr college chem; 2 hrs lect, 2 hrs lab) P Morton
Study of minerals including basic crystallography, crystal chemistry, physical properties, stability relations, and elementary optical mineralogy.

Geol 3324-3325-3326. Mineralogy and Petrology I-II-III. (4 cr each, \$3321-\$3322-\$3323; prereq 3320: 2 hrs lect, 4 hrs lab, field trips) Grant, Green, Ojakangas
Study of common and important minerals and rocks including their composition, classification, identification, origin, and interpretation. 3324: Igneous. 3325: Sedimentary. 3326: Metamorphic.

Geol 3400. Stratigraphy-Sedimentation. (5 cr; prereq 3300 or 3325 or #; 4 hrs lect, 2 hrs lab) Ojakangas
Stratigraphic principles and techniques used to study the sedimentary rock and fossil record in order to interpret geologic history. Depositional sedimentary environments related to tectonic settings and development of life through time.

Geol 3520. Structural Geology. (5 cr, \$3514; prereq 3326 or ¶3326, Math 1250 or equiv; 3 hrs lect, 4 hrs lab, field trips)
Analysis of primary and tectonic rock structures, rock deformation processes, and tectonic environment of their formation. Elementary stress and strain theory, mechanical behavior of rock. Fundamentals of global tectonics. Labs emphasize geologic map interpretation and structural analysis.

Geol 5000. Special Topics in Geology: (Various Titles to be Assigned). (1 to 3 cr [may be repeated for 6 cr max]; prereq #)
Study of topics not covered in regular curriculum. Topic announced before course offered.

Geol 5010. Advanced Earth Science for Teachers. (3 cr; prereq earth science sr or grad or #) Matsch
Investigative approach to teaching earth science, including aspects of astronomy, meteorology, oceanography, and geology in preparation for secondary school teaching of modern earth science curricula.

Geol 5050. Geological Computer Applications II. (3 cr; prereq 3185 or #)
Extension of 3185. Comprehensive hands-on coverage of use of Computer-Aided Drafting (CAD-AutoCad) and database (R-Base, Quattro) in geological research and studies. Integration of computer application with data acquisition, manipulation, and output.

Geol 5100. Field Geology. (9 cr; students must have health insurance; prereq 3100, 3326, Δ; held at Wasatch-Uinta Field Camp, Park City, Utah; 6 wks)
Geological mapping on aerial photographs and topographic maps. Field mapping techniques, rock descriptions, preparation of geologic maps and cross sections.

Geol 5143. Clastic Sediment Analysis. (2 cr; prereq 3326 or #; 1 hr discussion, 3 hrs lab) Mooers
Techniques for measuring particulate sediments, statistical analysis and interpretation of data, hydraulics of particulate transport.

Geol 5150. Precambrian Geology. (4 cr; prereq 3520 or #; field trips) Ojakangas, staff
Nature, distribution, origin, correlation, and special problems of the Precambrian with emphasis on the Lake Superior region. Term paper.

Geol 5181. Seminar: Stratigraphy-Sedimentation. (1 to 2 cr [may be repeated for 4 cr max]; prereq #) Ojakangas

Geol 5189. Seminar: Geochemistry. (1 to 2 cr [may be repeated for 4 cr max]; prereq 70 cr or grad or #) Brown, Grant
Advanced topics in geochemistry, especially geochronology, stable isotope geochemistry, solution geochemistry.

Geol 5191. Geologic Problems. (1 to 3 cr [may be repeated for 6 cr max], \$5190; prereq 70 cr or grad or #)
Individual research in lab or field problems.

Geol 5201. Hydrogeology. (4 cr, \$5200; prereq 3200, Math 1296 or #) Mooers
Introduction to the hydrologic cycle including precipitation, evaporation and runoff, groundwater recharge and discharge. Theory of groundwater flow. Occurrence and formation of underground water reservoirs. Sedimentology and stratigraphy of aquifers. Introduction to groundwater modeling.

Geol 5210. Applied Hydrogeology. (4 cr; prereq 5201 or #) Mooers
Practical applications of groundwater flow and contaminant transport theory to hydrogeologic problems; groundwater flow equations; well hydraulics and pump test analysis; computer models.

Geol 5211. Glacial and Quaternary Geology. (4 cr; prereq 3200 or #; 3 hrs lect, 2 hrs field lab) Matsch
Physics of glaciers (glaciology), including their erosional and depositional activities. Survey of geological and biological responses to the changing environment resulting from climatic fluctuations during the last 3 million years of earth history. Field studies on the glacial deposits of Minnesota.

Geol 5215. Contaminant Hydrogeology. (4 cr; prereq 5210, Math 3298 or #)
Theory, physical and chemical processes, and practical application of the movement of contaminants in groundwater, contaminant transport and modeling.

COURSE DESCRIPTIONS

Geol 5226. Geology of Waste Management. (3 cr, \$5225; prereq 5201 or #)

Geological aspects of waste disposal practices in the United States, including disposal of municipal and hazardous wastes, open dumps, landfills, incineration, cleanup, and remediation; superfund legislation; case studies of specific contamination problems within a geological context.

Geol 5230. Global Climate Change. (4 cr; prereq 3200 or #)

Analysis of past global change from climate proxy records in ocean and lake sediments, glacial ice, and tree rings. Impact of oceanic circulation on global climate patterns; climate cycles; El Niño; human influence on global climate.

Geol 5250. Environmental Impacts of Mining. (2 cr; prereq 3600, sr or grad or #; offered alt yrs) Green
Overview of various impacts of the mining industry on environment, concentrating on metal mining and issues relevant to Upper Midwest and Canada. Case histories of regional mining activities and proposals; government regulations; environmental impact studies.

Geol 5280. Seminar: Geomorphology-Glacial. (2 cr; prereq 3200, 5211 or #) Matsch, Mooers

Selected topics in geomorphology, glaciology, and Quaternary geology of North America, with emphasis on quantitative aspects of recent research in these fields.

Geol 5281. Seminar: Hydrogeology and Environmental Geology. (2 cr [may be repeated for 4 cr max]; prereq #) Mooers

Topics in hydrogeology and environmental geology reflecting student interests. Interactive discussions focus on review of selected current literature.

Geol 5305. Optical Mineralogy. (4 cr; prereq 3326 or #; 2 hrs lect, 4 hrs lab) Green

Principles and techniques for study and identification of crystalline substances, using polarizing microscope, immersion mounts, and thin sections.

Geol 5320. Introduction to Theoretical Petrology. (3 cr; prereq Math 1296 or 1596, Chem 1112 or #; 3 hrs lect) Grant

Basic thermodynamics pertinent to petrologic problems; graphical representation of phase equilibria; introduction to diffusion and heat flow.

Geol 5331. Petrology of Igneous Rocks. (5 cr; prereq 3323, 5305, 5320, 136 cr or grad or #; 3 hrs lect, 4 hrs lab) Green

Survey of major igneous rock-forming minerals and important igneous rock types and associations; phase relations in magmatic systems; genesis and evolution of magmas; textural and geochemical interpretation of igneous rocks.

Geol 5336. Physical Volcanology. (3 cr, \$5335; prereq 3324 or #; 2 hrs lect; 1 hr lab, field trip) Green
Morphology and development of volcanic formations and deposits; criteria for their recognition in ancient rock terranes. Types of eruptions and deposits; tectonic environments of volcanism; evolution of volcanoes; physical processes and controls of volcanism; and volcanic hazards. Short term paper.

Geol 5350. Petrology of Sedimentary Rocks. (4 cr; prereq 3326, 5305, #; 2 hrs lect, 4 hrs lab, field trip) Ojakangas

Provenance, associations, and classifications of sedimentary rocks, including sandstones, carbonates, muddy rocks, and others. Microscopic study of thin sections and grain mounts; statistical techniques. Interpretation of rock suites. Term paper.

Geol 5360. Sedimentary Environments of Deposition. (3 cr; prereq 3325 or #) R Ojakangas

Systematic study of modern terrestrial, mixed, and marine environments of deposition. Interpreting environments of deposition of ancient sedimentary rock units. Examples from the literature and instructor's experience.

Geol 5401. Inorganic Geochemistry. (3 cr; prereq [Math 1296 or equiv], Chem 1112, [Geol 3300 or 3320] or #; 3 hrs lect)

Review application of chemical principles to geological problems.

Geol 5411. Aqueous Geochemistry. (3 cr; prereq Chem 1112, #; 3 hrs lect) Grant

Principles of solution chemistry with application to chemical weathering, the hydrologic cycle, and hydrothermal systems.

Geol 5420. Analytical Methods in Geology. (3 cr; prereq 3326, Stat 3062 or equiv or #; 1 hr lect, 4 hrs lab) P Morton

Use of X-ray Diffraction (XRD) in mineralogy and geology; electron probe microanalysis; chemical analysis of geological samples using a direct coupled plasma spectrometer (DCP). Practical applications and data analysis.

Geol 5505. Advanced Structural Geology. (3 cr; prereq 3520, Phys 1109 or 1129, Math 1297 or 1597, 70 cr or grad or #; field trips)

Three-dimensional stress and strain theory, material behavior in geologic processes, origins of geologic structures, methods of structural analysis in areas of complex deformation.

Geol 5600. Economic Geology. (4 cr; prereq 3520; 3 hrs lect, 2 hrs lab) R Morton

Geologic description, distribution, and genesis of economic mineral deposits, relationship to plate tectonics, exploration techniques and criteria for finding new economic mineral deposits.

Geol 5605. Ore-Forming Processes. (4 cr; prereq 5600; 3 hrs lect, 2 hrs lab)

Geological processes leading to formation and genesis of a variety of economic mineral deposits. Mineralized and altered rocks in thin section and hand sample; computer modeling of ore deposit types.

Geol 5625. Ore Microscopy. (2 cr; prereq 3600, 70 cr or grad or #; 1 hr lect, 2 hrs lab) P Morton

Study and identification of opaque minerals using reflecting microscope.

Geol 5810. Introduction to Global Geophysics. (3 cr; prereq 3520 or #)

How geophysics has helped define the structure and dynamics of the Earth.

Geol 5820. Introduction to Exploration Geophysics. (3 cr; prereq 3520, Math 1297, Phys 1108 or #)

Review of theory and practical or geophysical techniques used in exploration.

Geol 8190. Geologic Research. (Cr ar; prereq #)

Geol 8666. Doctoral Pre-Thesis Credits. (1-18 cr [11 cr max per summer term]; prereq doctoral student who has not passed preliminary oral examination)

Geol 8777. Thesis Credits: Master's. (1-16 cr [11 cr max per summer term])
Thesis research and development.

Geol 8888. Thesis Credits: Doctoral. (1-36 cr [max 18 cr per qtr, 11 cr per summer term])
Doctoral dissertation research and preparation.

German (Ger)

College of Liberal Arts

Also see courses listed under Language (Lang) later in this section.

Ger 1301-1302. Beginning German I-II. (4 cr each, \$1111-\$1112; prereq one yr high school Ger or successful completion of 1301 or # for 1302)
Conversation and communicative course for students with little or no previous study of German. Emphasis on aural and oral skills; some emphasis on reading; grammar only as needed.

Ger 1501-1502-1503. College German I-II-III. (4 cr each; prereq successful completion of 1302 or equiv or two or more yrs high school Ger or # for 1501; successful completion of 1501 or # for 1502; successful completion of 1502 or # for 1503)
Consolidation and enrichment of previously acquired abilities in speaking and understanding German set within an introduction to written German and a survey of contemporary culture of the three German-speaking nations.

Ger 3001-3002. Advanced German I-II. (4 cr each, \$1233, \$3122-\$3123; successful completion of 1503 or equiv or # for 3001; successful completion of 3001 or # for 3002)
Development of German literacy within a culturally authentic contemporary context. Emphasis on writing and speaking plus complete review of grammar. Taught in German.

Ger 3006. Language Study Abroad. (1-5 cr [may be repeated for 15 cr max]; prereq Δ)
For students pursuing formal study of German in a German-speaking country, under the auspices of another college or university or by individual arrangement.

Ger 3305. Deutschland Heute. (4 cr; prereq 1503; offered alt yrs)
Civilization and culture of German-speaking countries since 1945.

Ger 3306. Germany Since 1945. (4 cr; may not count toward Ger major or minor)
Survey of culture, politics, and society of Germany from World War II to the EC and the new Europe of the 1990s.

Ger 3400. Culture and Civilization Study Abroad. (1-10 cr [may be repeated for 30 cr max]; prereq Δ)
For students pursuing formal study of German culture and civilization in a German-speaking country, under the auspices of another college or university or by individual arrangement.

Ger 3401. Proseminar in Literary Analysis. (4 cr; prereq 3001 or #3001 or #)
Techniques and tools for understanding and writing about poetry, fiction, and drama both as literary texts and cultural artifacts. Emphasis on writing critical essays in German.

Ger 3555. The German Novelle. (4 cr, \$5554; prereq completion of first quarter of adv Ger lang sequence with grade of C or better or #; offered alt yrs)
Reading and analysis of short fiction created in German-speaking countries from the late 1700s to the modern era. Representative authors.

Ger 3590. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq completion of Ger lang skills sequence with grade of C or better or #, Δ)
Students develop reading and research programs in consultation with the instructor.

Ger 5507. The German Theater. (4 cr, \$3506, \$5506; prereq completion of Ger lang sequence with grade of C or better or #; offered alt yrs)
Literary works meant for public presentation as created in German-speaking countries since the Reformation. Representative works by major playwrights are read and discussed in German.

Ger 5576. Contemporary German Literature. (4 cr, \$3573, \$5573; prereq completion of Ger lang sequence with grade of C or better or #; offered alt yrs)
Reading and analysis of 20th-century poetry and prose with emphasis on politically engaged writers active since the end of World War II.

Ger 5590. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq completion of Ger lang skills sequence with grade of C or better or #, Δ)
Students develop reading and research programs in consultation with the instructor.

Ger 5889. Literature in the Western Tradition. (4 cr, \$3889, \$Engl 3889, \$Engl 5889, \$Fr 3889, \$Fr 5889, \$Span 3889, \$Span 5889; prereq grad or # or Δ; offered through UC)
Comparison and contrast of major literary movements in the West and derivative cultures, including non-Western works. Taught in English, although language students may be asked to do some papers and readings in the foreign language.

Health (Hlth)

College of Education and Human Service Professions

Hlth 1000. Developing Wellness. (3 cr)
Developing a wellness lifestyle. Assessing present health behaviors and risk factors. Overview of outside factors that influence wellness.

Hlth 1104. Health Science Terminology. (1 to 3 cr)
Study of terms commonly used by people in the health sciences. Emphasis on learning basic prefixes and suffixes of medical terminology.

Hlth 1470. Human Nutrition. (3 cr, \$FamL 1470)
Study of human nutrition with emphasis on nature of nutrients in the diet, processing of nutrients in the body, nutritional aspects of physiology, and practical application of scientific knowledge.

COURSE DESCRIPTIONS

Hlth 1610. Emergency First Response. (3 cr, \$1601)

Basic skills and knowledge to respond correctly in first aid emergencies. Leads to American Red Cross Certification.

Hlth 1700. Advanced First Aid. (3 cr)

Principles of advanced first aid and accident prevention in the home and community; leads to the American Red Cross Advanced First Aid Certification.

Hlth 1701. Cardiopulmonary Resuscitation. (2 cr)

Techniques of basic heart-life support at the emergency scene: CPR principles involving one and two rescuers. Emphasis on stabilization of the patient at the scene of a life-threatening heart emergency.

Hlth 1800. Emergency Medical Care I. (4 cr; prereq #)

First of two courses in techniques of basic emergency medical service care. Includes emergency vehicle equipment, general operation, and record keeping; legal considerations concerning the EMT; airway obstruction and management; cardiac arrest and cardiopulmonary resuscitation; use of mechanical aids for respiratory and cardiac resuscitation; patient examination, vital signs, triage; shock and control of bleeding; soft tissue injuries.

Hlth 1801. Emergency Medical Care II. (4 cr; prereq 1800 or #)

Continuation of Emergency Medical Care I includes wound management; injuries to the musculoskeletal system; head, neck, and spine injuries; injuries to eye, chest, abdomen, and genitalia; medical/environmental injuries; emergency childbirth, lifting and moving patients; extrication. Courses 1800, 1801, and 1805, along with successful completion of a written and practical test administered by the Minnesota Department of Health, satisfy Minnesota's requirement for certification as an 81-hour emergency medical technician.

Hlth 1805. Emergency Care Practicum. (2 cr; prereq 1801 or #)

Experience of 25-30 hours spent between the emergency room of a local hospital and an ambulance service. Adequate performance in 1800, 1801, and 1805 completes the emergency care EMT sequence and makes the student eligible for the state EMT test administered by the Minnesota Department of Health.

Hlth 1903. Applied Human Anatomy. (5 cr, \$1901, \$BIol 1012; prereq Hlth Ed or PE major or Δ)

Introduction to human gross anatomy. Examination of skeletal, muscular, nervous, circulatory, respiratory, and excretory systems. Directed to applications in health and physical education. Demonstrations with predissected specimens.

Hlth 1905. Principles of Human Physiology. (5 cr, \$PHsl 1043; prereq one qtr each of college biol [BIol 1102 or BIol 1111 or BIol 1112], chem, anatomy [1903 or BIol 1012])

Physiological mechanisms of human cells, organs, and organ systems; function, control, and coordination of body systems.

Hlth 1906. Human Physiology Laboratory. (1 cr; prereq 1905 or ¶1905, #; 2 hrs lab)

Noninvasive lab procedures in human physiology with emphasis on metabolism, muscular, cardiovascular, respiratory, and electro-physiology.

Hlth 3101. Community Health. (3 cr)

Variables related to the study of health, disease, and infirmity; community health principles; the individual's responsibility for maintaining and promoting of community health programs.

Hlth 3103. Readings in Health. (2-4 cr; prereq 3322, #)

Special complementary work and investigation in student's field of interest; coordination of staff and available resources for the school health program.

Hlth 3115. Consumer Health Education. (3 cr)

Overview of concepts of marketing, analysis, selection, and decision making regarding health care, products, services, and providers.

Hlth 3116. Epidemiology in Community Health. (3 cr; prereq 3101, BIol 1102, Hlth Ed candidate or #)

Disease in human populations and health problems affecting morbidity and mortality in the United States. Principles and methods of epidemiological analysis.

Hlth 3117. Principles of Sex Education. (4 cr; prereq Hlth Ed candidate or #)

Planning and implementing comprehensive sex education programs in various settings. Sexual physiology, sociocultural aspects of sexuality, birth control and family planning, prevention of STDs/HIV, teen pregnancy prevention, and other current topics. Emphasis on how community and family values affect sex education.

Hlth 3118. Women's Health Issues. (3 cr; offered through UC)

Survey of various health issues as they relate to American women. Analysis of roles of women as patients and as health care providers. Language, politics, and economics of women's health care.

Hlth 3150. Health Program Evaluation. (3 cr, \$HPER 3150; prereq Hlth candidate or #)

Evaluation of health education programs; organization, analysis, and presentation of data; preparation of program evaluation reports.

Hlth 3170. Practicum: Peer Education. (1-4 cr [may be repeated for 4 cr max]; prereq Δ; offered through UC)

Development of personal and group skills in promoting healthy lifestyles through a peer education program affiliated with the Student Health and Counseling Center. Plan and implement health education programs for the student community. Staff the SHCC outreach facility.

Hlth 3202. Drug Education. (2 cr; prereq 90 cr, admission to EdSe or Hlth Ed or BAA Exer Sci or CSD program or #)

Physiological and psychological effects of various drugs on human systems. Investigation of reasons and pressures for drug use by students. Appraisal and assessment of school's role in education, prevention, intervention, and treatment of drug abuse.

Hlth 3322. Foundations of Health Education. (4 cr; prereq 1000, Hlth Ed candidate or #)

History and philosophy of health education; professional associations; basic functions of school and community health education programs; and program planning.

Hlth 3401. Health Education Methods and Materials. (4 cr; prereq 3322, Hlth Ed candidate or #) Various teaching methods for school and community health educators. Selecting content, stating goals and objectives, and developing learning opportunities for health instruction. Competency-based health education and evaluation of health instruction.

Hlth 3450. Health Promotion Programming. (3 cr; prereq Hlth Ed candidate or #) Health promotion program planning applied to work sites, hospitals, schools, and other agencies/institutions. Practical application of educational, organizational, and environmental activities designed to support healthy behavior. Assessing, goal setting, budgeting, and evaluating by developing a program proposal.

Hlth 3600. Wilderness Emergency Care. (5 cr, \$1700; offered through UC) Emergency procedures to care for ill or injured persons outdoors. Planning, equipment, and evacuation procedures for wilderness emergencies.

Hlth 3900. Independent Study. (1-6 cr each offering [may be repeated for 6 cr max]; prereq #) Opportunity for upper division students to undertake an independent project that would serve to further their knowledge base and/or professional competencies.

Hlth 3901. Special Topics: (Various Titles to be Assigned). (1-3 cr [may be repeated for 6 cr max]; prereq #)

Hlth 3950. Internship in Health Education. (1-15 cr [may be repeated for 15 cr max]; prereq 3322, 3401, Hlth Ed candidate, #, Δ) Supervised experience in community health-related organization.

Hlth 5150. Wellness Education. (3 cr) Analysis of concepts and measures of high-level wellness and holistic health.

Hlth 5160. Early Childhood and Elementary School Health Programs. (3 cr; prereq ECh or EIEd or kindergarten EIEd major with 80 cr or # or Δ) Survey of school health program with in-depth study of selected health education curricula and topic areas, including alcohol, tobacco, drugs, communicable disease, and nutrition. Development of strategies and methods for teaching controversial areas.

Hlth 5166. Teaching "Growing Healthy" Curriculum. (1-6 cr [may be repeated for 6 cr max in combination with 5165]; prereq sr or grad or adult spec or #) Trains teachers to use "Growing Healthy" curriculum in elementary grades. Provides teaching techniques. Explains and demonstrates materials, stations, activities, and worksheets.

Hlth 5172. Readings In Health. (1-4 cr each offering [may be repeated for 4 cr max]; prereq #) Special complementary readings and discussion in a student's main area of interest in the health field.

Hlth 5340. Teaching Death Education. (3 cr; offered through UC) Materials and methods for teaching death education; review of research and current literature regarding content; exploration of death, dying, grief, and bereavement as they relate to teaching.

Hlth 5500. Environmental Health. (3 cr; prereq Hlth Ed candidate or #) Biological, physical, and sociological aspects of environmental health. Emphasis on concepts and processes important for understanding environmental health problems and possible solutions.

Hlth 5901. Special Topics: (Various Titles to be Assigned). (1-3 cr each offering [may be repeated for 6 cr max]; prereq #) Geared toward graduate students. Various health-related problem areas with an emphasis on facilitating positive attitudinal and behavioral changes within the student.

Hlth 5950. Independent Study. (1-6 cr [may be repeated for 6 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq adult spec or grad, #) Directed independent study, readings, research, or projects in a particular area of interest. Approved degree program plan and approved project proposal should be completed before course is taken by graduate students.

Health, Physical Education & Recreation (HPER)

College of Education and Human Service Professions

HPER 3000. Organization and Administration of Health, Physical Education, and Recreation Programs. (3 cr; prereq Hlth Ed or PE or Exer Sci candidate or #) Theoretical and practical basis of administrative process and organizational structure of HPER programs.

HPER 3100. Risk Management for Health, Physical Education, and Recreation Programs. (3 cr; prereq Phy Ed or Exer Sci or Rec candidate or #) Proactive approach to managing risks associated with conducting health, physical education, and recreation programs. Emphasis on planning for a safe environment.

History (Hist)

College of Liberal Arts

Hist 1207. Dawn of Modern Europe. (4 cr, \$1204) Early history of the modern era: Renaissance, Reformation, Age of Reason, French Revolution and its impact, the Napoleonic imperium.

Hist 1208. Europe in the Modern Age. (4 cr, \$1206) Making of the present era studied through analysis of economic and technological revolution, collision of ideologies, imperialist expansion, revolutions, and wars.

Hist 1304. American Heritage. (4 cr, \$1301, \$1302) Evolution of the United States from colonial origins into a modern nation. Emphasis on frontier and agrarian heritage, constitutional development, emergence of modern U.S. political system, expansion of democracy, and cultural diversity. Colonial period to 1877.

Hist 1305. American Challenges. (4 cr, \$1303) Historical roots of the major challenges facing Americans today: global responsibility as a world power; the quest for political, economic, and social justice; and community and family changes in modern society; 1877 to present.

COURSE DESCRIPTIONS

Hist 3005. Special Topics: (Various Titles to be Assigned). (1-4 cr)
Upper division classroom course treating historical subjects not included in the regular curriculum.

Hist 3015. Internship in History. (2-3 cr [may be repeated for 6 cr max]; prereq jr, #)
Supervised opportunity to pursue local or regional history under auspices of local museums, historical societies, commemorative commissions. Written and oral presentation of completed project.

Hist 3016. Directed Readings in History. (1-4 cr [may be repeated for 16 cr max]; prereq Δ)
Individual study of material below the research level or formal study of history at an accredited foreign institution.

Hist 3110. Makers of the Renaissance Era. (4 cr; offered alt yrs)
Renaissance as an historical movement in Italy and northern Europe. Emphasis on leaders of cultural change such as Dante, Petrarch, Erasmus, and More.

Hist 3111. The Age of the Reformation. (4 cr; offered alt yrs)
Century of revolutions in politics, society, and thought from Luther to wars of religion.

Hist 3241. Europe in Revolution: 1789-1848. (4 cr, §3216)
European Enlightenment, Ancient Regime, French Revolution and Napoleon, rise of nationalism, liberalism, beginnings of socialism.

Hist 3242. Europe in Ascendance: 1848-1914. (4 cr, §3225, §3217)
European history from 1848 to 1914: the 1848 Revolution; nation building and nationalist movements; political and social reform; socialist movements; intellectual trends; the new imperialism and international politics.

Hist 3243. Europe in Crisis in the 20th Century. (4 cr, §3226, §3227)
Causes, conduct, and consequences of World Wars I and II from European perspective.

Hist 3245. Science and Society, 1500 to Present. (4 cr)
Explores a series of creative moments in the development of science and scientific methods within their broader social and cultural contexts.

Hist 3256. The Making of Modern Britain. (4 cr)
Whig constitution and shaping of modern British government, imperial expansion overseas, impact of American and French Revolutions, economic revolution, Victorian reforms and democracy, Irish problem, zenith of the Empire, Britain in two world wars, social transformations, Labour, and the welfare state.

Hist 3263. History of Early Russia. (4 cr)
Focus on Kievan Russia, Mongol Period, and rise of northern centers culminating in the dominance of Moscow.

Hist 3264, 3265. History of Russia. (4 cr each)
3264: Time of Troubles to Alexander III. 3265: Alexander III to 1964.

Hist 3266. History of Soviet and Post-Soviet Union. (4 cr)
Politics, society, and culture in Brezhnev and Gorbachev eras. Rise of Yeltsin as national leader, collapse of Soviet Union, and evolution of Soviet successor states; 1964 to present.

Hist 3270. Soviet Cinema and Society. (4 cr)
History and development of Soviet cinema; main directors and how their work reflected Soviet society.

Hist 3314, 3315. 19th-Century America. (4 cr each)
3314: Early national period, Jacksonian era, development of sectional controversy to 1860. 3315: Civil War, Reconstruction, late 19th century.

Hist 3316. American Genesis. (4 cr)
Study of the development of a distinctive American culture, character, and national identity, with emphasis on the colonial and early national periods, 1607-1820.

Hist 3330. American Reform Movements. (4 cr, §3326)
Characteristics, motivations, ideas, methods, and effects of reformers from American Revolution to present. Emphasis on social change as it relates to reform processes.

Hist 3357. Women in American History. (4 cr)
Roles and contributions of women in American life from colonial period to present.

Hist 3361. The American City. (4 cr)
American urbanization from the colonial town to the modern metropolis, emphasizing social and cultural problems peculiar to cities and the impact of the city on American civilization.

Hist 3364. Social History in America. (4 cr, §3358, §3359)
Role of social class in U.S. evolution of various forms of popular culture. Family, labor, and ethnic issues.

Hist 3367. Civil Rights Movements, Recent America. (4 cr, §1367)
Survey of the struggles by ethnic minorities to secure equal human rights in the United States since World War II, with emphasis on Afro-American activities in the South.

Hist 3384, 3385. American Foreign Relations. (4 cr each)
3384: Revolution to 1953. 3385: From 1953 to present.

Hist 3461. Traditions of East Asia to 1800. (4 cr, §3459)
History of China, Japan, and Korea before 1800 with emphasis on their sociopolitical and cultural development. Impact of belief systems such as Confucianism, Daoism, Buddhism, and Shintoism.

Hist 3462. History of Modern Japan. (4 cr, §3460)
History of Japan since 1800: Commodore Perry's mission to Japan, Meiji Revolution, Japan's expansion in Asia, World War II, developments in the postwar era.

Hist 3463. History of Modern China. (4 cr, §3460)
China's history from the Opium War to the Great Proletarian Cultural Revolution and Deng Xiaoping's capitalist reform.

Hist 3464. History of Modern Asia. (4 cr)
Comparative history of South Asian, East Asian, and Southeast Asian nations since the 17th century. Background on ancient Asian cultures challenged and enriched by Western influences in different ways.

Hist 3465. History of Cold War. (4 cr)
Main developments of the Cold War; its impact on relations between East and West and between industrial nations and the Third World; its impact on domestic politics and social developments of various nations.

Hist 3500. Colloquium for Majors. (1-2 cr [1 cr for attendance; 2 cr attendance, presentation]; prereq Δ, Hist/Teaching Soc Studies major/minor; attendance at 5 dept-approved lectures/discussions over 1-yr period; regis only during qtr of 5th lect)
Lecture and discussion groups on a variety of topics.

Hist 3510. Pre-Colonial Africa. (4 cr)
Political, cultural, and socioeconomic developments in pre-colonial Africa to 1800. Emphasis on slave trade, Islamic revolution, and European commercial penetration.

Hist 3511. Modern Africa. (4 cr)
Africa, 1800 to present. Colonial conquest and domination, African resistance, nationalism, and problems of independence.

Hist 5008. Directed Research. (4 cr [may be repeated for 12 cr max; no more than 4 cr may be applied to a Graduate School program]; prereq #)
Individual research on a historical topic.

Hist 5905. History Seminar. (4 cr; (may be repeated for 8 cr max); prereq #; 3 hrs lect, 1 hr student/faculty consultation per wk)
Advanced study and individual research on a selected historical topic or theme; designed as the senior capstone course for students majoring in history.

Humanities and Classics (HmCI)

College of Liberal Arts

HmCI 1001. The Classical Heritage of Greece and Rome. (4 cr, \$Hist 1001, \$Hum 1001)
Introduction to the ancient Greek and Roman world through readings, lecture, and visual work. Discussion of historical and cultural contexts involved. Includes characteristics of the idea of "Classicism" which the Renaissance discovered and promoted.

HmCI 1002. The Renaissance and its Legacy. (4 cr, \$Hum 1002)
Exploration of major ideas of European Renaissance such as "the Renaissance Man," the classical revival and humanism, with illustrations of how these have continued to inform and inspire people of the modern world.

HmCI 1003. Revolutionary Change and the Humanities. (4 cr, \$Hum 1003)
Considers sweeping changes in the arts and humanities brought about by scientific, social, and industrial revolutions. Focuses on the challenges to positivism, nationalism, and colonialism by relativism and cultural pluralism.

HmCI 1021. Classical Mythology. (4 cr, \$Hum 1021)
Readings in the myths of the Greeks and the Romans, with special attention to those that have influenced Western culture.

HmCI 1022. The Bible as Literature. (4 cr, \$Hum 1022)
Readings from the Old and New Testaments and the Apocrypha, examining them as literary works of their time and as the sources of topics, persons, and themes in the expression of later fine arts and literatures.

HmCI 1023. Folklore. (4 cr, \$Hum 1023)
Contemporary definitions of folklore and folk life studies; introduction to current interpretive approaches to verbal and nonverbal traditional cultures. Readings in folktales, myths, narrative poetry, and in cultivated arts based on folk materials. Field research project required.

HmCI 3001. Special Topics In Humanities. (2-8 cr [may be repeated for 12 cr max], \$Hum 3001; prereq 40 cr or #)
Various topics to be assigned.

HmCI 3007. The Late Roman and Medieval Worlds. (4 cr)
Reorganization of the late Roman world from Diocletian to the ninth century A.D. Study of the origins of feudalism and the medieval experience.

HmCI 3020. The Age of the Heroes: Homer and His World. (4 cr, \$Hum 3020)
Organization and development of the Greek world from the fourth millennium B.C. to 700 B.C. Descriptive study of the Minoan and Mycenaean worlds emphasizing a critical evaluation of the archaeological, mythological, and artistic significance of Homer.

HmCI 3022. The Historical Jesus. (4 cr; prereq 40 cr or #)
Survey of work done by the Jesus Seminar, most notably their detailed commentary on the canonical gospels and the work on the historical Jesus by John Dominic Crossan, co-founder and co-director of the Jesus Seminar.

HmCI 3023. U.S. Folklore and Folk Culture. (4 cr, \$AmS 5150; prereq 40 cr or #)
Historical and contemporary folk culture, including folk music, song, and art; folk narrative (folk tales, modern legends, and jokes); belief, custom, and superstition.

HmCI 3028. Women in the Classical World. (4 cr, \$3018; prereq 40 cr or #)
Lives, social roles, statuses, and literary/mythical depictions of women in the classical world, from Bronze Age Greece through imperial Rome.

HmCI 3030. The Roman Republic. (4 cr, \$Hist 1056, \$Hist 3030)
Study of Republican Rome from origins through collapse in 44 B.C., with emphasis on cultural and political attributes, leading figures, and causes of its demise.

HmCI 3033. Medieval Literature in its Cultural Context. (4 cr, \$1485)
Survey of forms of life, thought, and art from earliest literary texts in English, French, German, and Italian to 15th century; reading and discussion of appropriate selections in modern English translation; relationship of literature to its social backgrounds and major aesthetic movements, especially in visual arts.

COURSE DESCRIPTIONS

HmCI 3035. The Music and Lives of the Beatles. (3 cr, \$Hum 3035; prereq 30 cr or #)
Examination of impact on our culture of music and lives of the Beatles. Their music; influence on music, fashion, and attitudes; Beatles' movies; interrelationship with political and social movement; later careers; their legacy.

HmCI 3038. From Fiction to Film. (4 cr, \$Hum 3038, \$Engl 3590, \$Engl 3593)
Reading of novels and viewing of films adapted from original works.

HmCI 3040. The Roman Empire. (4 cr, \$Hist 3040, \$Hist 3056)
Study of Imperial Rome from Age of the Caesars through 550 A.D., with emphasis on politics of pax Romana, rise and spread of Christianity, and Roman legacy to the modern world.

HmCI 3051. Science and Civilization. (4 cr, \$Hum 3051; prereq 30 cr or #)
Nontechnical survey of critical periods and/or themes in the history of science and their interconnections with other cultural issues.

HmCI 3055. The Ancient Near East. (4 cr, \$Hist 1056, \$Hist 3055)
History of the Ancient Near East from birth of civilization in Egypt and Mesopotamia (c. 3100 B.C.) to arrival of Alexander (330 B.C.). Review of the ancient cultures of Egypt, Babylonia, Assyria, the Hittites, Persia, Syria, and Palestine.

HmCI 3091. Project in the Humanities. (2 cr, \$Hum 3091; offered every qtr by arrangement)
Original paper or project under the guidance of the humanities and classics minor adviser. Primarily for humanities and classics minors.

HmCI 3150. Ancient Egyptian Culture. (4 cr, \$Hum 1025)
Study of the history, culture, and arts of ancient Egypt as they are known through the archaeological record.

HmCI 3160. Egyptian Literature and Language. (4 cr; prereq 3150 or #)
Exploration of ancient Egyptian civilization through primary texts in religious, historical, secular, and technical literature. Elementary Egyptian vocabulary; opportunities provided to learn to read and write hieroglyphic.

HmCI 3220. Science Fiction. (4 cr, \$Hum 1421)
Study of selected science fiction short stories, novels, films, videos, and music that explore the impact of the physical, biological, and social sciences in producing changing views of human nature, values, institutions, and societies.

HmCI 3230. Utopian Images. (4 cr, \$Hum 1003)
Exploration of ways humans imagine a better existence in a finer world, with examples from such expressive forms as utopian treatises, science fiction, pastoral poetry and art, religious traditions, landscape architecture, urban designs.

HmCI 3240. Women and Men in Popular Culture. (4 cr, \$3036, \$Hum 3036; prereq 40 cr or #)
Analysis of popular culture texts (literature, television, advertisements, music) and audiences to understand cultural construction of gender as reflected in representations of masculinity and femininity. Introduction to range of methods for cultural analysis.

HmCI 3250. Great Depression and the Arts. (4 cr, \$AmS 3170; prereq 40 cr or #)
Interaction of arts, economics, and politics in American literature, theatre, film, photography, painting, and music during the 1930s.

HmCI 3260. The South in American Culture. (4 cr, \$AmS 3150, \$AmS 3260, \$AmS 5120; prereq 40 cr or #)
Southern life and culture from pre-Civil War through recent times, with emphasis on the distinctiveness of southern culture and the contrast between its historical reality and its place in popular mythology.

HmCI 3270. Popular Culture in the 1960s. (4 cr, \$AmS 3180; prereq 40 cr or #)
Interrelationships among the arts, popular culture, politics, and social change as found in literature, theatre, film, photography, painting, and music in the United States during the 1960s.

HmCI 3280. Civil Rights as a Cultural Phenomenon. (4 cr, \$AmS 3450; prereq 40 cr or #; offered through UC)
U.S. civil rights era including the political, social, educational, religious, literary, and cultural forces that emerged during the movement.

HmCI 3290. American Prose Fiction to Film. (4 cr, \$AmS 3410; prereq 40 cr or #)
Comparative study of several American novels and the films adapted from them, considering the differences between the prose fiction and film narratives.

HmCI 3333. From Homer to Alexander: Archaic and Classical Greece. (4 cr, \$Hist 3020)
Early history of the Greek world from Heroic Age to death of Alexander the Great 850-323 B.C.

HmCI 3343. Perspectives on Africa. (3 cr; offered through UC only)
Perspectives on political, sociocultural, and economic aspects of Africa viewed in the context of the continent's triple heritage: its indigenous life, Islamic admixture, and wider contacts. Historical development and contemporary synthesis.

HmCI 3590. Independent Study. (1-4 cr [may be repeated for 12 cr max]; prereq #)
Study of topics in humanities and classics in a tutorial setting.

HmCI 5001. Special Topics in Humanities and Classics. (1-4 cr [may be repeated for 8 cr max]; prereq 90 cr or grad or #)
Topics announced in *Class Schedule*.

HmCI 5110. The Classical Heritage in the Modern World. (4 cr; prereq 90 cr, grad or #; offered through UC only)
Explores ancient Greek and Roman contributions to the modern world through readings, lectures, and visual presentations. Discussion of historical and cultural contexts. Develops the idea of Classicism that the Renaissance discovered and promoted.

HmCI 5120. The Renaissance Legacy in the Modern World. (4 cr; prereq 90 cr, grad or #; offered through UC only)
Explores major ideas of the European Renaissance (e.g., "the Renaissance Man," classical revival, humanism) as well as the effect of other cultures of the period, with illustrations of how these continue to influence the modern world.

HmCI 5130. Technology, Revolution, and the Humanities. (4 cr; prereq 90 cr, grad or #; offered through UC only)
Sweeping changes in the arts and humanities brought about by technology and scientific, social, and industrial revolutions. Focuses on challenges to positivism, nationalism, and colonialism by technology, relativism, and cultural pluralism.

HmCI 5210. Architecture and Human Values. (4 cr)
Languages of world architecture; how the built environment communicates values of different societies, institutions, and persons of the past and present.

HmCI 5333. Medieval Literature in its Cultural Context. (4 cr; prereq 90 cr or #)
Study of the forms of life, thought, and art from the fall of the Roman Empire to the 16th century through selected literary texts in Latin, English, French, German, and Italian in modern English translations. Relationship of literature to its social backgrounds and to major aesthetic movements.

HmCI 5590. Independent Study. (1-4 cr [may be repeated for 12 cr max]; prereq #)
Students devise reading and research programs in consultation with the instructor.

Industrial Engineering (IE)

College of Science and Engineering

IE 1010. Introduction to Manufacturing Engineering. (4 cr, \$3000; prereq 1025 or Engr 1025, Math 1296 or #; 2 hrs lect, 4 hrs lab)
Methods used to design and manufacture products. Student teams study how manufacturers plan and perform operations to convert raw materials into finished products using acceptable manufacturing methods.

IE 1025. Introduction to Engineering Design. (4 cr, \$Engr 1025; 1 hr lect, 6 hrs lab)
Graphic communication techniques needed in engineering design. Visual projections, representation of form and shape in a CAD system, engineering specifications of functional features, tolerance systems, and manufacturing considerations.

IE 3005. Introduction to Material Science for Engineers. (4 cr, \$Chem 3010; prereq Chem 1140 or #; 3 hrs lect, 2 hrs lab)
Structures and properties of engineering materials with emphasis on metals, composites, polymers, and ceramics.

IE 3014. Machining. (3 cr; prereq Engr 3016, Phys 1109, BIE candidate or Δ ; 2 hrs lect, 2 hrs lab)
Tool geometry and cutter materials. Tool wear and elementary metal-cutting theory. Cutting speeds and feedrates. Grinding processes. Coolants and lubricants.

IE 3015. Machine Tools and Mechatronics. (3 cr; prereq 3014, Engr 3036, BIE candidate or Δ ; 2 hrs lect, 2 hrs lab)
Classification of design features of machine tools and ancillary equipment. Automatic and N.C. machines, computer-aided manufacturing. Integration of mechanical, electrical, and computer-controlled elements.

IE 3016. Tool Design. (4 cr; prereq 3015, 3372, BIE candidate or Δ ; 2 hrs lect, 4 hrs lab)
Jigs and fixtures, press tooling. Casting and injection molds. Patterns and cores. Preset tooling. Tooling costs and impact of N.C. machine tools on tool design.

IE 3021. Production Processes I. (4 cr; prereq Chem 3010 or IE 3005, Engr 3016, Phys 1109, Stat 3562, BIE candidate or Δ ; 3 hrs lect, 2 hrs lab)
Manufacturing properties of metals, ceramics, and plastics.

IE 3040. Industrial Health and Safety. (3 cr; prereq BIE candidate or Δ ; 3 hrs lect)
Machine guarding and safety procedures. Hazards, protective clothing, and first aid equipment. Legal requirements.

IE 3061. Production Systems. (4 cr; prereq 3021, 3070, \mathcal{I} ChE 3651, BIE candidate or Δ ; 3 hrs lect, 2 hrs lab)
Basic manufacturing systems; continuous and discrete: job shops, flow, and cellular systems: GT, JIT and CIM. Plant location and layout, process and methods analysis, design for production, design for quality. Production scheduling and control, forecasting, reliability and maintainability of manufacturing systems.

IE 3070. Operations Research I. (3 cr, \$Math 5101; prereq Math 3320; 3 hrs lect)
Optimization. Linear programming, simplex method, sensitivity analysis, duality. Network models. Application of computers to operations research.

IE 3111. Introduction to Engineering Management. (4 cr, \$3110; prereq IE, ChE, ECE major or pre-engr student or Δ ; 4 hrs lect)
Skills needed to make an engineer more effective. Team participation, time management, presentations, decision making, planning, organization, leadership, motivation, control, and use of common software for problem solving, project management, and presentations.

IE 3120. Industrial Labor and Law. (4 cr; prereq BIE candidate or Δ ; 4 hrs lect)
Working with labor and unions in industrial setting: incentives, control of work force, payment plans, problems. Engineering ethics for industrial engineers. Legal considerations: government laws and regulations, liability, environmental engineering for industry.

IE 3301. Ergonomic Design. (4 cr; prereq Stat 3562, BIE candidate or Δ ; 3 hrs lect, 2 hrs lab)
Human limitations, "human-machine" relationship. Workstation design, operator comfort and performance. Controls, instrumentations, and safety considerations.

IE 3316. Engineering Quality Control. (4 cr; prereq Stat 3562, BIE candidate or Δ ; 3 hrs lect, 2 hrs lab)
Statistical quality control in manufacturing; modeling process quality, control charts, process capability, acceptance sampling methods, reliability.

IE 3323. Automation and Robotics. (4 cr; prereq Math 3380, BIE or BCompE or BECE candidate or Δ ; 3 hrs lect, 2 hrs lab)
Hard automation: transfer lines, bowl feeders. Programmable automation: robots, grippers, programming, kinematics, path control, sensors, actuators, control, applications.

COURSE DESCRIPTIONS

IE 3331. Production Processes II. (4 cr; prereq 3021, BIE candidate or Δ ; 3 hrs lect, 2 hrs lab)
Engineering principles of metal casting, welding, and fabrication methods. Manufacturing processes for metals, plastics, and ceramics.

IE 3350. Project. (6 cr, \$3355, \$3356, \$3360; prereq BIE candidate, Δ)
Senior project in industrial engineering supervised by faculty.

IE 3355. IE Team Design I. (3 cr, \$3350, \$3360; prereq IE sr, Δ)
Team-based design and problem analysis for a regional industry. Emphasis on problem definition, root cause analysis, and development of alternative designs. Enrollment in IE 3356 in subsequent quarter required.

IE 3356. IE Team Design II. (3 cr, \$3350, \$3360; prereq 3355, Δ)
Team-based design and problem analysis for a regional industry. Emphasis on continued design of alternative solutions, analysis of alternatives, and recommendations for implementation. Enrollment in IE 3355 in preceding quarter required.

IE 3360. Industrial Internship. (6 cr, \$3350, \$3355, \$3356; prereq BIE candidate, Δ)
Internship carried out in industry; supervised by industrial engineering faculty.

IE 3372. CAD/CAM. (5 cr; prereq Engr 1025, Math 3380, BIE candidate or Δ ; 2 hrs lect, 6 hrs lab)
Introduction to computer-aided design manufacturing. Work on computer-aided design station.

IE 5070. Operations Research II. (3 cr; prereq 3070, BIE candidate or Δ ; 3 hrs lect)
Queueing theory, exponential and non-exponential distributions, finite and infinite queues, queueing disciplines, applications. Markov processes, decision models. Simulation, model formulation and construction, experimental design, drawbacks.

IE 5150. IE Simulation. (4 cr; prereq [3061, 3070] or [3061, #], CS 1621 or CS 1641, BIE candidate or Δ ; 3 hrs lect, 2 hrs lab)
Simulation in manufacturing and engineering; study of the design and use of computer-based integrated systems in the allocation and control of plant, equipment, human resources, and materials.

IE 5160. Production Management. (4 cr; prereq 3061, 3110 or 3111, BIE candidate or Δ ; 3 hrs lect, 2 hrs lab)
Examination of production management responsibilities in the technological firm; how to meet quality, quantity, timing, and specification requirements. Process, project, inventory, quality, and system management for manufacturing and technological service enterprises.

IE 5800. Special Topics: (Various Titles to be Assigned). (1-5 cr [may be repeated for 12 cr max]; prereq Δ ; satisfies technical elective for IE major)
Current and special topics in industrial engineering of interest to students, which are not available in the regular curriculum. May involve specialties of the department or visiting faculty.

IE 5920. Independent Study in Industrial Engineering. (1-5 cr; prereq Δ)
Individual investigation, research, studies, or surveys of problems.

Interdisciplinary Archaeological Studies (InAr)

College of Science and Engineering

InAr 5005. Geoarchaeology. (4 cr; prereq grad or #; offered alt yrs)
Systematic review of current research on application of geology to the solution of archaeological problems.

InAr 5009. Cultural Resource Management. (4 cr; prereq grad or #; offered alt yrs)
Survey of cultural resource management archaeology, state and federal law, with practice problems.

InAr 5100. Topics in Archaeology: (Various Titles to be Assigned). (4 cr; prereq grad or #)
Topics vary.

InAr 5676. Field Research in Archaeology. (1-15 cr; prereq Anth 1602 or Anth 1612, #)
Archaeologic field excavation, survey, and research in historic and prehistoric sites in Minnesota.

InAr 8001. Archaeologic Method and Theory. (4 cr; prereq grad or #; offered alt yrs)
Contemporary theoretical and methodological issues and approaches in archaeology.

InAr 8003. Archaeologic Science. (4 cr; prereq grad or #; offered alt yrs)
Review and evaluate the application of natural science methods to problems in archaeology.

InAr 8100. Interdisciplinary Seminar. (4 cr; prereq grad or #; offered alt yrs)
Applications of interdisciplinary studies in archaeology. Interdisciplinary projects.

InAr 8200. Directed Readings. (Cr ar; prereq #)
Independent reading program directed by IAS staff.

InAr 8300. Directed Research. (Cr ar; prereq #)
Independent research directed by IAS staff.

InAr 8666. Doctoral Pre-Thesis Credits. (1-18 cr [11 cr max per summer term]; prereq doctoral student who has not passed preliminary oral examination)

InAr 8777. Thesis Credits: Master's. (1-16 cr [11 cr max per summer term]; prereq grad)

InAr 8888. Thesis Credits: Doctoral. (1-36 cr [18 cr max per qtr, 11 cr max per summer term]; prereq doctoral candidate)

Interdisciplinary Studies (IS)

College of Liberal Arts

IS 3001. Interdisciplinary Methods Seminar. (3 cr; prereq interdisciplinary studies major or #)
Definitions, history, and philosophy of interdisciplinary research, writing, learning, and teaching. Readings in major types of interdisciplinary work; preliminary methods for interdisciplinary projects.

IS 3050. Senior Project. (2-15 cr; A-F only)
Enrollment restricted to interdisciplinary studies majors. An agreement that specifies the nature of the project, the amount of work, and the number of credits must be approved by two advisers and filed with the director of interdisciplinary studies.

IS 5101. Special Topics in Liberal Studies: (Various Titles to be Assigned). (1-4 cr [may be repeated]; prereq 90 cr or grad or Δ)
Topics and credits announced in *Class Schedule*.

IS 8001. Introduction to Liberal Studies. (1-4 cr [may be repeated for 12 cr max]; prereq grad or #; MLS candidates must regis for min 8 cr in two or more qtrs)

IS 8500. Seminar: Ethics and the Human Condition. (4 cr; prereq □)
Explores applications of values and ethical considerations emerging from humanistic study to problems of the modern world.

IS 8590. Directed Study. (1-4 cr [may be repeated for 8 cr max]; prereq grad in Liberal Studies or Δ; offered through UC only)
Individualized research under the supervision of the director of the Master of Liberal Studies program.

International Business (IntB)

School of Business and Economics

IntB 3101. International Business. (4 cr; prereq SBE candidate or □)
Identification of position of the United States in world trade; impact of international trade on national businesses and policies; business and employment opportunities in international business.

International Studies (IntS)

College of Liberal Arts

IntS 1017. Introduction to the Soviet Union and its Successor States. (4 cr)
Survey of basic elements of Soviet life; geographical setting and peoples; Marxism, Leninism; background to 1917 revolution; history and politics; economic conditions; literature and cultural life; foreign policy; Gorbachev and post-1984 changes.

IntS 1020. Special Topics. (1-4 cr [may be repeated simultaneously or sequentially for 8 cr max])
Special topic identified at time course offered.

IntS 1066. An Introduction to Britain. (4 cr)
Interdisciplinary survey of British Isles, including examination of major geographic, historical, social, and cultural features of region.

IntS 1070. An Introduction to Scandinavia. (4 cr)
Interdisciplinary survey of Scandinavia and its people, including examination of major historical, social, political, and cultural features of region.

IntS 1101. International Study. (1-5 cr [may be repeated simultaneously or sequentially for 15 cr max]; prereq Δ)
For students who want to take an independent study course while traveling or living in a foreign country. Course must be approved by supervising faculty member and director of international studies.

IntS 3100. International Study. (1-5 cr [may be repeated simultaneously or sequentially for 15 cr max]; prereq Δ)
For students who want to take an independent study course while traveling or living in a foreign country. Course must be approved by supervising faculty member and director of international studies.

IntS 3120. Special Topics: (Various Titles to be Assigned). (1-4 cr [may be repeated simultaneously or sequentially for 8 cr max])
Special topic identified when course offered.

IntS 3121. Special Topics. (Various Titles to be Assigned). (1-4 cr [may be repeated simultaneously or sequentially for 8 cr max])
Special topic identified when course offered.

IntS 3125. International Internship. (1-8 cr [may be repeated for 12 cr max; no more than 4 cr may be applied to IntS major]; prereq 70 cr, Δ)
Supervised work experience involving an international interaction.

IntS 3166. Study in England Evaluation. (1 cr; prereq #)
Self-examination of the study abroad experience in Britain.

IntS 3167. Study in Sweden Evaluation. (1 cr; prereq #)
Self-examination of the study abroad experience in Sweden.

IntS 3168. Study in France Evaluation. (1 cr; prereq #)
Self-examination of the study abroad experience in France.

IntS 5100. Seminar in International Studies. (4 cr; prereq Pol 1050, 90 cr incl 12 upper div cr approved IntS courses or #)
Analysis and supervised research and writing on selected topics in international studies.

IntS 5800. Independent Study. (1-5 cr [may be repeated for 10 cr max]; prereq 12 cr IntS, #)
Advanced study and research under faculty member supervision.

IntS 5900. Special Topics: (Various Topics to be Assigned). (1-5 cr [may be repeated for 10 cr max]; prereq 70 cr incl 12 cr IntS or #)
Detailed examination of contemporary international studies topics.

Journalism (Jour)

College of Liberal Arts

A journalism minor is offered through the Department of Communication.

Jour 1101. Introduction to Mass Communication. (4 cr, §1100)
Introduction to theories, research, regulation, and ethical concerns surrounding contemporary mass media. Identification of the American media's role within the international marketplace. Survey of contemporary media content, industry structures, technology, and delivery systems, including newspapers, magazines, radio, television, HDTV, cable, satellite, video, film, advertising, and public relations.

Jour 3100. Reporting. (3 cr; prereq Comp 1100 or Comp 1120, typing skill of 30 wpm)
Fact gathering and journalistic writing. Problems of judgment in handling news. Students use word-processing capabilities of microcomputers during lab exercises in journalistic writing.

Jour 3110. Publications Editing. (3 cr; prereq 3120)
Lectures and lab in selection and editing of news-editorial content of newspapers and magazines. Newspaper makeup; magazine format.

Jour 3115. Television-Radio News Writing. (3 cr; prereq 3100; offered through UC)
Techniques of writing news for television and radio.

Jour 3120. Public Affairs Reporting. (3 cr; prereq 3100)
Reporting and editing news of courts and municipal and county agencies.

Jour 3125. Public Relations. (3 cr; prereq 3100; offered through UC)
Historical development of public relations principles and practices, and practical application of those principles. Critique of public relations in society.

Jour 3130. Ethical Problems in the News Media. (3 cr)
Investigation into contemporary problems created by adversary relationship between journalists and several institutions within our society, particularly government. Definition of role of journalist in free society.

Jour 3135. Mass Communication Law. (3 cr)
Basic law of defamation, contempt, privacy, obscenity, and other legal rules affecting journalistic practice.

Jour 3140. Advanced Reporting. (3 cr; prereq 3120)
Advanced problems in material gathering and specialized reporting.

Jour 3150. History of Journalism. (3 cr)
Development of newspapers and periodicals from early beginnings in Europe to present day; rise of radio and television; relation of communications developments to political, economic, and social trends in United States.

Jour 3155. Rights, Responsibilities of Media. (3 cr; prereq 80 cr or #)
History of freedom of expression in United States through study of landmark court cases involving First Amendment.

Language (Lang)

College of Liberal Arts

Lang 1101-1102. Beginning Foreign Language I-II. (1-5 cr each [may be repeated with different languages])
Introduction to one of the less frequently taught languages.

Lang 1103. Beginning Foreign Language III. (1-5 cr [may be repeated with different languages]; prereq completion of two yrs of same language in high school or 1102)
Introduction to one of the less frequently taught languages.

Lang 1111-1112-1113-1114-1115-1116.
Language Study Abroad I-II-III-IV-V-VI. (1-5 cr each [may be repeated for each lang studied]; prereq Δ; for study abroad programs)

For students studying beginning and intermediate language abroad, in a country where that language is formally spoken, under the auspices of another college or university or by individual arrangement with prior approval by the Department of Foreign Languages and Literatures.

Lang 3005. Special Topics in Languages. (1-5 cr [may be repeated for 8 cr max]; prereq Fr 3002 or Ger 1503 or Span 3002 or #; offered in study-abroad programs)
Selected topics, not currently offered, that deal with genres, periods, specific authors, cultural movements of Germanic, Hispanic, and Francophone worlds.

Lang 3010. Directed Study. (1-4 cr [may be repeated for 8 cr max]; prereq #, Δ)
Students plan their program of study in conference with their instructor in an area not already covered by regular courses.

Lang 3801. Teaching Nonnative Language. (4 cr; prereq 24 cr of a foreign language or #)
Theory and practice of teaching basic nonnative language skills and cultural concepts at any educational level. Applicable also to teachers of English as a foreign language.

Limnology (Lim)

College of Science and Engineering

Lim 5001. Limnology I. (4 cr, prereq course in physics, chemistry, calculus, 15 cr upper division sciences or engineering, #)
Physical processes in lakes and watersheds. Origins, climatic setting, heat budgets, physical properties of water, circulation dynamics, waves, optics, acoustics. Students with no prior training in geology will be expected to undertake additional background reading.

Lim 5002. Limnology II. (4 cr, prereq 5001)
Chemical and biological processes in lakes and watersheds. Biogeochemical cycling of solutes, dissolved gases, nutrients, contaminants. Biological communities organic matter cycling. Students with no prior training in biology will be expected to undertake additional background reading.

Lim 5003. Limnology III. (4 cr, prereq 5002)
Biological and geological processes in lakes and watersheds. Trophic dynamics, ecosystem level and watershed-level integration of biota with chemical and physical processes. Sedimentary processes, geochronology, paleolimnology.

Linguistics (Ling)

College of Liberal Arts

Ling 1811. Introduction to Language. (4 cr, §Engl 1811)

Practical study of the nature of language.

Ling 3101. Introduction to Phonology. (4 cr)

Introduction to fundamentals of linguistics science. Emphasis on phonology as treated in descriptive linguistics.

Ling 3102. Introduction to Morphology and Syntax. (4 cr)

Introduction to fundamentals of linguistics science. Emphasis on morphology and syntax as treated in descriptive linguistics.

Ling 3590. Independent Study in Linguistics. (1-4 cr [may be repeated for 8 cr max]; prereq #, coordinator consent)

Directed reading and/or research in a topic in linguistics.

Ling 5831. Sociolinguistics. (4 cr, §Engl 5831)

Communicative behavior in social groups, especially the conventions of dialects and stylistic variation, linguistic interference, and paralinguistic behavior of dominant cultures and subcultures.

Ling 5842. Applied Linguistics. (4 cr, §Engl 5842; prereq 3101 or Engl 5811 or #)

Applications of linguistic theory to reading and writing.

Ling 5852. Practicum in Teaching Linguistics. (4 cr, §Engl 5852; prereq 8 cr of linguistics, Δ)

Supervised teaching in introductory linguistics courses. Experience in preparation for and in conduct of classes, in consultations with students, and in testing.

Ling 8590. Independent Study in Linguistics. (1-4 cr [may be repeated for 8 cr max]; prereq #, coordinator consent)

Directed reading and/or research in a topic in linguistics.

Management Studies (MgtS)

School of Business and Economics

MgtS 3030. Organization Environments. (4 cr; prereq SBE candidate or □)

Business as part of larger system—economic, political, social. Emphasis on external environment—economics, culture, government, technology, international relations, labor—within which business operates. Business ethics and social responsibility.

MgtS 3304. Organizational Management. (4 cr; prereq SBE candidate or URS-Public Policy and Adm major or approved Acct/Bus Adm minor or □)

Introduction to, and critical analysis of, traditional and contemporary management models and practices. Managerial processes of planning and decision making, organization design and culture, individual and group behavior, leading and motivating, and controlling systems to achieve individual and organizational outcomes.

MgtS 3330. Organization Studies. (4 cr; prereq 3304, SBE candidate or approved Acct/Bus Adm minor or □)

Survey of organization theories and their application to organizational structuring, coordination, control, job design, organizational decision making, leadership, and organizational development.

MgtS 3356. Small Business Management. (4 cr; prereq 3304, 3701, 3804, Acct 3001, FMIS 3140, [FMIS 3201, FMIS 3301 (or FMIS 3305)], FMIS 3611, 120 cr, SBE candidate or Acct/Bus Adm minor or □)

Integration course focusing on problems, concerns, and opportunities associated with management of small firm. Students required to present written and oral planning and analysis reports for small business situations.

MgtS 3362. Strategic Management. (4 cr; prereq 3304, 3701, 3804, Acct 3001, FMIS 3140, [FMIS 3201, FMIS 3301 (or FMIS 3305)], FMIS 3611, 120 cr, SBE candidate or □)

Integration of basic functions of marketing, finance, production, and behavioral sciences. Emphasis on examination of organizational environments and development and implementation of competitive strategies that respond to social, political, and economic conditions from the perspective of top management.

MgtS 3374. Part-Time Internship. (4 cr, §3375, §3376, §FMIS 3375, §FMIS 3376; prereq 120 cr, SBE candidate, #)

Written job description must be obtained and approved before internship begins. Complete a minimum of 150 hours of supervised work experience in public agency, private business, or other organization after junior year. Prepare papers during and following the internship experience.

MgtS 3376. Internship in Management (Full Time). (6 cr; prereq sr BBA candidate, business core [except 3362], Δ)

Following written approval of proposal, student engages in supervised program of full-time work experience in public agency, private business, or other organization. Advance, concurrent, and follow-up written and oral presentations required.

MgtS 3701. Principles of Marketing. (4 cr; prereq SBE candidate or approved Acct/Bus Adm minor or □)

Marketing as process of exchange management. Emphasis on conceptual tools necessary to deal with both strategic marketing management issues and tactical management of product, price, promotion, and distribution.

MgtS 3724. International Marketing. (4 cr; prereq 3701, SBE candidate or approved Acct/Bus Adm minor or □)

Marketing across national boundaries; effects of foreign economic, legal/political, and sociocultural environments on multinational marketing strategies.

MgtS 3731. Marketing Research. (4 cr; prereq 3701, SBE candidate or approved Acct/Bus Adm minor or □)

Emphasis on improving skills of conducting secondary research, designing a primary research study, and analyzing and reporting results of a research study.

COURSE DESCRIPTIONS

MgtS 3740. Fundamentals of Selling. (4 cr; prereq SBE candidate or approved Acct/Bus Adm minor or □) Theory and practice of personal selling as used by organizations to develop long-term partnerships with customers. Emphasis on marketing, planning, communication, and presentation skills.

MgtS 3762. Consumer Behavior. (4 cr, \$5762; prereq 3701, SBE candidate or approved Acct/Bus Adm minor or □) Buyer behavior and implications for marketing strategy. Emphasis on information processing concepts, influences on behavior, and decision-making processes from both conceptual and pragmatic perspectives.

MgtS 3771. Business-to-Business Marketing. (4 cr; prereq 3701, SBE candidate or approved Acct/Bus Adm/Econ minor or □) Marketing goods and services to organizations. Emphasis on differences between marketing to organizations and consumers. Derived demand, long-term trade relationships, contact, negotiations, channels, promotion, physical distribution, product development, markets.

MgtS 3781. Advertising and Marketing Communications. (4 cr, \$5752; prereq 3701, SBE candidate or approved Acct/Bus Adm/Econ minor or □) Promotional planning. Emphasis on planning for advertising, sales promotion, public relations/publicity, direct marketing, and personal selling. Importance of integrated marketing communications to organizations.

MgtS 3790. Marketing Management and Strategy. (4 cr, \$3761; prereq 3701, 3731, one other marketing course, 120 cr, SBE candidate or Acct/Bus Adm minor or □) Planning, directing, and controlling an organization's marketing activity, including formulating marketing objectives, strategy, and tactics. Interpretation of information in decision making and strategy formulation. Case analysis used to develop marketing problem-solving, communication, and organization skills.

MgtS 3801. Leadership. (4 cr; prereq SBE candidate or approved Acct/Bus Adm minor or □) Nature and character of effective leadership; importance of leadership in organizations; traditional and contemporary views of leadership.

MgtS 3802. Organization Behavior. (4 cr; prereq 3304, SBE candidate or approved Acct/Bus Adm minor or □) Focus on employee in organizational context. Exploration of organizational influences (structure, technology, leadership, job design, goal conditions, reward systems), employee attitudes, motivation, and work-related behavior from theoretical and empirical perspective.

MgtS 3804. Human Resource Management. (4 cr; prereq SBE candidate or ECh/Econ/Geol with mining option/URS-Public Policy and Adm majors or approved Acct/Bus Adm/Econ minor or □) Introduction to theory and practice of human resource management in private and public organizations. Organizational, legal, and ethical influences on major personnel functions, including planning, staffing, training, performance appraisal, compensation, and labor-management relations.

MgtS 3808. Staffing Work Organizations. (4 cr; prereq 3804, SBE candidate or approved Acct/Bus Adm minor or □) Examination of theory and practice of staffing work organizations. Emphasis on design and implementation of staffing systems, legal requirements, and career planning.

MgtS 3822. Interpersonal and Group Relations. (4 cr; prereq 3304, SBE candidate or approved Acct/Bus Adm minor or □) Examination and application of knowledge of human behavior in organizations to superior-subordinate and peer relations. Topics may include communication, counseling, conflict, delegation, informal groups, organizational politics, group decision making, and performance appraisal.

MgtS 3851. Training and Development. (4 cr; prereq 3804, SBE candidate, URS major, approved Acct/Bus Adm/Econ minor or □) Design, implement, and evaluate human resource development systems. Elements of program planning and delivery: learning theory, needs analysis, objectives, training methods and coaching, presentational skills and techniques, assessment processes, and transfer strategies.

MgtS 3880. Human Resource Issues and Trends. (4 cr; prereq 3804, SBE candidate or approved Acct/Bus Adm/Econ minor or □) Develop, implement, and assess organizational human resource strategies in response to evolving socioeconomic pressures and organizational challenges.

MgtS 3970. Independent Study. (1-4 cr; prereq Δ) For students wishing to do special work in strategic, organizational, human resource, or marketing management that extends beyond, or in greater depth than, regular course offerings.

MgtS 3976. Management Field Studies. (4 cr; prereq SBE candidate with 120 cr, Δ) Teams of two to four students provide "hands-on" management assistance, analysis, and other consulting to existing small businesses or economic development agencies.

MgtS 3977. Management of Community Projects. (1-4 cr; prereq 3304, 3804, SBE candidate or Econ Major/Bus Adm minor with 120 cr, #) Design and administer a community-related project. Identify a worthy, charitable cause, establish contact, obtain authorization, create and implement a plan for assistance. Project report must address the recruitment, organization, motivation, logistical facilitation, supervision, and evaluation of a substantial volunteer effort. Journal, oral presentation, and written report required.

MgtS 3981. Seminar: Topics in Management Studies. (1 to 4 cr [may be repeated for 12 cr max]; prereq SBE candidate or □) Contemporary management problems in functional areas of strategic, organizational, human resource, or marketing management.

MgtS 5762. Consumer Behavior. (4 cr, \$3762; prereq 3701, SBE candidate with 120 cr or grad or □) Buyer behavior and implications for marketing strategy. Emphasis on information processing concepts, influences on behavior, and decision-making processes from both conceptual and pragmatic perspectives. Students requiring graduate credit must complete additional coursework.

MgtS 5840. Labor Relations. (4 cr; prereq 3804, SBE candidate with 120 cr or Econ major/minor with 90 cr or grad or □)
 Nature of and basis for contractual relationships between employers and unions. Background of labor movement. Emphasis on union organizing, nature of bargaining relationships, and development of labor law; current practices of employers and employee representatives; and significant trends in private and public sector labor relations.

MgtS 5862. Organization Change and Development. (4 cr; prereq 3304, 3804 or equiv, SBE candidate with 120 cr or grad or □)
 Causes, goals, and results of planned organizational change. Examination of assumptions, values, contingency factors, ethical considerations, models, and intervention strategies for organization development and renewal.

MgtS 5872. Compensation Systems. (4 cr; prereq 3804, SBE candidate with 120 cr or grad or □)
 Theory, design, and practice of employee compensation systems. Topics include motivation to work, labor market models, economic and institutional forces influencing employer compensation policies and practices, supplemental forms of compensation, and compensation administration practices.

MgtS 8011. International Business Environment. (3 cr; prereq Econ 1004, Econ 1005 or equiv, grad or □)
 Theoretical and managerial concepts of international trade, multinational business organizations, and transnational business policies and practices.

MgtS 8111. Business, Government, and Society. (3 cr; prereq BLaw 1106 or equiv, grad or □)
 Examination of advanced legal problems bearing on management's operating policies and legal relationships among business, consumers, government, labor, and agriculture. Problems of business ethics.

MgtS 8311. Policy Formulation and Implementation. (3 cr; Prereq 8711, 8811, FMIS 8611, Econ 8411, Acct 8512, grad or Δ)
 Development of senior management framework for identifying opportunities, defining problems, and formulating strategy and policy. Integration of functional areas (marketing, production, finance, accounting) for strategic implementation.

MgtS 8401. Administrative Internship. (3 cr; prereq MBA student with 12 cr grad courses, □; no cr toward minimum 45 cr of MBA degree)
 Student works full time for one quarter or two summer terms in administrative assignment in approved program in public agency, private business, or other organization. Written and oral reports of activities and learning required.

MgtS 8711. Marketing Management. (3 cr; prereq 3701 or equiv, grad or □)
 Planning, directing, and controlling marketing organization. Marketing management concepts.

MgtS 8801. Organization Behavior and Human Performance. (3 cr; prereq 3304 or equiv, grad or □)
 Examination of models of employee work-related responses (satisfaction, work-related motivation, work-related behaviors) and their organizational determinants (job design, leadership, goal setting).

MgtS 8811. Management of Human Resources. (3 cr; prereq 3804 or equiv, grad or □)
 Human resource and personnel decisions involving selection, placement, career planning, training and development, compensation, evaluation, and control of human performance. Human-choice decision making in framework of contemporary federal-state employment policy and resolution of industrial conflict.

MgtS 8901. Research Methodology. (3 cr; prereq 18 cr of required MBA courses or □)
 Nature of research in management. Objectives, research design. Research tools, application. Data collection, interpretation. Research project.

MgtS 8911. Management Research. (1-6 cr [may be repeated for 6 cr max, must complete 6 cr for MBA degree]; prereq 8901, grad)
 Research project required for M.B.A. degree. Must be approved by student's graduate adviser and research committee.

MgtS 8970. Independent Study. (1-3 cr [may be repeated for 6 cr max]; prereq grad, Δ)
 For students wishing to pursue special study in areas useful to individual programs and objectives in management, human resource management, or marketing that extend beyond, or in greater depth than, regular course offerings.

Mathematics (Math)

College of Science and Engineering

See also Statistics (Stat).

Math 1001. Elementary Algebra. (5 cr [cr cannot be applied to a degree]; prereq SSP 1003 or math placement into 1001 or Δ)
 Emphasizes basic manipulative skills and problem-solving techniques. Number systems; equations and inequalities and their graphs. Exponents and polynomials; rational expressions; linear systems; roots and radicals; quadratic equations.

Math 1002. Geometry. (4 cr [cr cannot be applied to a degree]; prereq 1001 or equiv; offered through UC)
 Plane and solid geometry. Brief introduction to analytic geometry. Intended for students who have not taken high school geometry or who need additional background in geometry.

Math 1003. Intermediate Algebra. (5 cr [cr cannot be applied to a degree]; prereq 1001, 1002 or math placement into 1003 or Δ; #1210)
 Introduction to arithmetic of complex numbers; function concept; inequalities; polynomial and rational functions; curve sketching; systems of two and three linear equations; matrices and determinants; selected topics from the theory of equations; logarithmic and exponential functions; sequences.

Math 1141. Mathematics for Elementary Education I. (5 cr; prereq pre-EIEd or pre-kindergarten/EIEd or EIEd or kindergarten/EIEd major, [1002, 1003] or math placement into 1210 or 1250 or Δ; 4 hrs lect, 2 hrs lab)
 Subject matter for effective teaching at elementary school level. Emphasizes problem solving, structure of number systems, and properties of geometric figures. Includes use of microcomputers in mathematics.

COURSE DESCRIPTIONS

Math 1156. Finite Mathematics. (4 cr; prereq 1003 or math placement into 1210 or 1250 or Δ) Counting theorems, elementary probability, conditional probability, Bayes' theorem, matrices, determinants, graphical and algebraic methods for solving systems of linear equations and inequalities, and introduction to linear programming. Not recommended for students who plan to major in mathematics.

Math 1160. Calculus: A Short Course. (4 cr, \$1296, \$1596H; prereq [1002, 1003] or math placement into 1210 or 1250 or Δ) Abbreviated treatment of calculus for students who do not need fuller study given in sequence beginning with Math 1296. Emphasizes applications in business and social sciences. Not suitable for many preprofessional programs or majors in mathematics.

Math 1210. Trigonometry. (3 cr, \$1250, \$1297, \$1597H; prereq [1002, 1003] or placement into 1210 or 1250 or Δ ; ∇ 1003 or ∇ 1296 or ∇ 1596H) Introduction to trigonometric functions and their inverses, identities, triangle trigonometry, and applications.

Math 1250. Precalculus Analysis. (5 cr, \$1296, \$1596H; prereq [1002, 1003] or math placement into 1210 or 1250) Inequalities, analytical geometry; relations, functions, and graphs; exponential, logarithmic, and trigonometric functions; complex numbers and De Moivre's Theorem; permutations, combinations, binomial theorem, and mathematical induction.

Math 1296. Calculus I. (5 cr, \$1596H; prereq 1250 or math placement into 1296) First part of standard introduction to calculus of functions of single variable. Limits, continuity, derivatives and their applications, indeterminate forms.

Math 1297. Calculus II. (5 cr, \$1597H; prereq 1296 or 1596H) Second part of standard introduction to calculus of functions of single variable. Definite and indefinite integrals, techniques of integration, transcendental functions, exponentials and logarithms, applications to geometry and physics.

Math 3025. Mathematics Tutorial Project. (1-2 cr [may be repeated for 4 cr max]; prereq 1297, Δ) Students, supervised by a mathematics faculty member, serve as tutors for primarily 1xxx mathematics courses.

Math 3210. Cultural Impact of Mathematics and Computers. (3 cr; prereq 3298, 3320, #) Examination of the origin, development, and cultural impact of selected mathematical ideas and the computer. May be taken as a directed-readings course in the summer.

Math 3241. Fundamentals of Mathematics. (3 cr; prereq 3298 or 3598H, BAS Math major or #) Introduction to foundations, fundamental concepts, and history of mathematics.

Math 3298. Calculus III. (5 cr, \$3598H; prereq 1297 or 1597H) Completion of study begun in Math 1296 and Math 1297. Improper integrals, hyperbolic functions, analytic geometry, polar coordinates, sequences and series, Taylor's theorem, partial derivatives.

Math 3320. Vectors and Matrices. (4 cr; prereq 1160 or 1296 or 1596H) Solving systems of linear equations, matrix algebra, linear independence and span of a set of vectors, real vector spaces and subspaces, basis and dimension, rank of a matrix, linear transformations, Gram-Schmidt orthogonalization, determinants, eigenvalues and eigenvectors.

Math 3350. Calculus IV. (5 cr; prereq 3298, 3320; 4 hrs lect, 2 hrs lab) Calculus of two or more variables plus Green's, Stokes', and the divergence theorems. Labs using graphics/symbolic manipulation software.

Math 3380. Differential Equations I. (5 cr; prereq 3298, 3320; 4 hrs lect, 2 hrs lab) Solutions of first-order equations, linear equations of second and higher orders, systems of equations, operator methods, Laplace transform method, series solutions, existence and uniqueness of solutions, and applications. Labs using computer software.

Math 3441. Contemporary Geometry. (4 cr; prereq 3298 or 3598H) Foundations of Euclidean geometry, Euclid's parallel postulate and its implications. Absolute geometry. Non-Euclidean geometries of Lobachevsky and Riemann, their relative consistency with Euclidean geometry, and their applicability to physical space. Abstract axiom systems and models.

Math 3445. Symmetry and the Art of M. C. Escher. (4 cr; prereq 1002 or $\frac{1}{2}$ yr high school geometry or #; offered in Birmingham, England) Basic symmetries: reflection, rotation, translation, and a glide-reflection. Point symmetry, symmetry of repeating patterns. Discovery of symmetry in nature and human works.

Math 3530. Numerical Methods. (4 cr; prereq 1297 or 1597 or 1597H, 3320, proficiency in FORTRAN or Pascal; 3 hrs lect, 2 hrs lab) Computer representation of numbers and unit round-off. Introduction to numerical interpolation, approximation, integration, and solution of linear and nonlinear equations. Implementation of algorithms using computer software.

Math 3555. Discrete Mathematics. (4 cr; prereq 3320, CS 1502 or CS 1621) Introduction to mathematical logic, predicates and quantifiers, review of set theory, functions, proof techniques, writing proofs, induction and recursion, permutations, combinations, binomial coefficients, relations, equivalence relations, graphs, and trees.

Math 3699. Intermediate Analysis. (4 cr; prereq 3298 or 3598H) In-depth study of fundamental notions such as limit, convergence, continuity, differentiability, and integrability on which all reflective study of the calculus must rest.

Math 3940. Internship. (1-3 cr; prereq Math major, 90 cr, Δ) Practical, independent project in commercial, government, or industrial setting. Department approval required before beginning project.

Math 3941. Seminar for Majors. (1 cr; prereq Math major, Δ ; regis only during qtr of sixteenth point)
Exposure to mathematics-related UMD colloquia. Sixteen points required; one point for attending a colloquium; one point for writing an acceptable report on a colloquium (at least four points must be earned through writing); up to eight points for giving a colloquium.

Math 3950. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq Δ)
Special projects not available in the regular curriculum.

Math 3960. Actuarial General Mathematics. (2 cr [cr cannot be applied to Math major or minor]; prereq 3350)

Problem-solving techniques in calculus and linear algebra needed in actuarial work.

Math 3970. Special Topics. (1 to 3 cr [may be repeated for 6 cr max]; prereq Δ)
Directed individual reading and/or research in mathematics to be arranged with the instructor and the head of the department before registration.

Math 5101. Linear Programming. (4 cr, $\$IE$ 3070; prereq 3320)

Motivation problems, modeling, theory of the simplex method, duality and sensitivity analysis, large-scale problems, complexity, and Karmarkar algorithm.

Math 5326. Linear Algebra I. (3 cr [grad cr cannot be applied to MS in applied and computational math]; prereq 3320 or #)

Solving linear systems over fields, finite and infinite dimensional vector spaces over fields, coordinates, change of basis, properties of linear transformations, isomorphisms, eigenvalues and eigenvectors, diagonalization, similarity, and applications.

Math 5327. Linear Algebra II. (3 cr; prereq 5326)
Inner product spaces, orthogonal bases and projections, least-square approximations, isometries, spectral theory, the singular-value decomposition, the pseudo inverse, bilinear and quadratic forms, polynomial actions on matrices and linear operators, elementary canonical forms, minimal polynomials, generalized eigenvectors, the Jordan form.

Math 5370. Operational Mathematics. (3 cr; prereq 3380)

Laplace transforms, Fourier transforms, difference operators, numerical methods and the use of these techniques in solving difference, differential, and integral equations.

Math 5380. Partial Differential Equations. (3 cr; prereq 3380)

Introduction to the study of partial differential equations, emphasizing the use of Fourier series, Green's functions, and other classical techniques.

Math 5381. Partial Differential Equations: Computational Techniques. (4 cr; prereq 5380 or #; 3 hrs lect, 1 hr lab)

Continuation of Math 5380 with advanced topics on generalized Fourier series, boundary value problems, computational difference techniques, and adaptive mesh techniques. Numerical applications using computer facilities.

Math 5382. The Finite Element Method. (4 cr; prereq 3380 or #)

Variational formulations of partial differential equations; Galerkin approximation; errors in approximation and interpolation; applications to problems from engineering and science.

Math 5385. Differential Equations II. (3 cr; prereq 3380 or 3381, 3699 or #)

Existence and uniqueness, systems of equations with matrix methods, eigenvalues and eigenvectors, fundamental matrices, systems of autonomous equations, phase plane, periodic solutions and limit cycles, Poincare-Bendixson theory. Emphasis on applications and modeling.

Math 5386. Mathematical Modeling in Differential Equations I. (3 cr; prereq 3380 or 3381, 3699, CS 1501 or #)

Theory and applications of ordinary differential equations, emphasizing mathematical modeling.

Math 5390. Special Functions. (3 cr; prereq 3380)

Study of Bessel's, Legendre's, and other special functions that arise in Sturm-Liouville problems and the use of such functions in solving differential equations.

Math 5534. Numerical Linear Algebra. (4 cr; prereq 5326, CS 1501 or #; 3 hrs lect, 2 hrs lab)

Solution of systems of linear equations. Pivoting and scaling. Error propagation. Iterative refinement. Eigenvalue/eigenvector calculation. Motivational applications.

Math 5535. Numerical Analysis: Approximation and Quadrature. (4 cr; prereq 3380 or 3381, CS 1501 or #; 3 hrs lect, 1 hr lab)

Machine representation of numbers, sources of error, polynomial and spline interpolation, numerical integration, and solution of ordinary differential equations.

Math 5536. Numerical Analysis: Nonlinear Systems and Optimization. (4 cr; prereq 3380 or 3381, CS 1501 or #; 3 hrs lect, 1 hr lab)

Root-finding techniques, solution of nonlinear systems, convergence criteria, extrapolation, unconstrained optimization, nonlinear least squares.

Math 5670. Abstract Algebra I. (4 cr; prereq 3298 or 3598H, 3320 or equiv)

Introduction to algebraic systems and applications; permutation groups; isomorphisms; direct products; cosets.

Math 5671-5672. Abstract Algebra II-III. (3 cr each; prereq 5670)

Theory of groups, rings, and fields, including applications, homomorphisms, quotient structures, polynomial rings, extension fields, finite fields, special topics.

Math 5690. Fractal Geometry. (4 cr; prereq core program in Math, 3699 or #)

Topological concepts from metric spaces, contractions and fixed points, construction of fractals, chaotic dynamics on fractals, fractal dimension, and topics from fractal interpolation, Julia sets, Mandelbrot sets, measures.

COURSE DESCRIPTIONS

Math 5695. Discrete Dynamical Systems and Chaos. (4 cr; prereq 3380 or 3381 or #; 3 hrs lect, 2 hrs lab)

Introduction to map iteration in one and two real variables and one complex variable. Topics include fixed and periodic points, symbolic dynamics, deterministic chaos, invariant manifolds, bifurcations, the Mandelbrot set, and Julia sets. Population models and Newton's method are applications.

Math 5701-5702. Real Variables I and II. (3 cr each; prereq 3699)

Sequences of real numbers; limits, Cauchy sequences, summability. Series of real numbers; tests for convergence, rearrangements, summability, and the class L^p . Metric spaces; continuous functions, connectedness, completeness, compactness. Functions. Contractions and Banach fixed-point theorem; Picard existence theorem for differential equations.

Math 5760. General Topology. (3 cr; prereq 3699 or #)

Introduction to fundamentals of general topology basic to modern analysis. Set theory, Euclidean spaces, metric spaces, topological spaces, continuity, connectedness, compactness, product spaces, axiom of choice, generalized convergence.

Math 5765. Graph Theory. (3 cr; prereq 3320)

Study of finite graphs, directed and undirected, including topics such as connectivity, traversability, planarity, colorability, and matrix representations.

Math 5766. Enumerative Combinatorics. (3 cr; prereq 3555)

Permutations, combinations, binomial coefficients, inclusion-exclusion, recurrence relations, ordinary and exponential generating functions, Catalan numbers.

Math 5767. Combinatorial Designs and Their Applications. (3 cr; prereq 3555, ¶5670 or #)

Introduction to block designs, difference sets, finite geometries, Steiner systems, Latin squares, and Hadamard matrices. Discussion of applications to design of experiments, construction of codes, data synchronization, digital image processing, and digital lenses.

Math 5820. Complex Variables. (3 cr; prereq 3699, 3350 or #)

Complex numbers, analytic functions, contour integration, elementary functions and their geometry. Cauchy's integral theorem and its consequences. Laurent expansions and residue theorem.

Math 5830. Theory of Numbers. (3 cr; prereq 3298 or 3598 or 3598H)

Prime and composite numbers, Euclid's algorithm, congruences, Fermat's little theorem, quadratic reciprocity, factoring algorithms, and the RSA cryptosystem.

Math 5950. Independent Study. (1-4 cr [may be repeated for 8 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq Δ)
Special projects not available in the standard curriculum.

Math 5970. Special Topics. (1-3 cr [may be repeated for 6 cr max]; prereq Δ)
Directed reading and/or research in mathematics.

Math 5980. Honors Project. (2-3 cr [grad cr cannot be applied to MS in applied and computational math]; prereq consent of the Mathematics and Statistics Honors Program Committee)

Each student who wishes to participate in the Mathematics and Statistics Honors Program is required to take this course. The student must complete a research project under the supervision of a faculty adviser.

Math 5984. Algebraic Coding Theory. (3 cr; prereq 5670 or ¶5670)

Study of linear, dual, Hamming, Golay, BCH, and cyclic codes; weight enumerators.

Math 8534-8535. Scientific Computation I-II. (4 cr each; prereq grad, 5534, CS 5510 or Δ ; 3 hrs lect, 1 hr lab)

Vector and parallel algorithms for numerical linear algebra and their implementation.

Math 8701-8702. Real Analysis I-II. (3 cr each; prereq 5701-5702)

Rigorous development of abstract measure spaces, measurable functions, and the corresponding theory of integration. Lebesgue measure and the Lebesgue integral will be developed as a particular model.

Math 8777. Thesis Credits: Master's. (1-16 cr [11 cr max per summer term]; prereq grad)
Thesis research and development.

Math 8970. Special Topics. (1-3 cr [may be repeated for 6 cr max]; prereq #)

Course content variable and subject to approval (on a case-by-case basis) by the Graduate Curriculum Committee.

Math 8980. Graduate Seminar. (3 cr; prereq #)

General survey of applications of discrete, continuous, and stochastic modeling techniques. Intended for first-year graduate students in applied and computational mathematics program.

Math 8990. Graduate Research. (1-4 cr [may be repeated for 12 cr max]; prereq #)
Student can earn credit for performing original research in graduate-level mathematics or statistics.

Medical and Molecular Physiology (PhsI)

School of Medicine

PhsI 5202. Readings in Physiology. (Cr ar; prereq 5927, 5928, 5929 or 5601, #) Wittmers
Topics in physiology selected for each student; written reviews are prepared and discussed.

PhsI 5203. Research in Physiology. (Cr ar; prereq Δ) Wittmers

Introduction and use of lab techniques and equipment used for research in various specialties of physiology including neurophysiology, cardiovascular physiology, endocrinology, respiratory and transport processes, electrophysiology, and renal physiology.

PhsI 5211. Literature Seminar. (1-4 cr; prereq 5927 or #) Wittmers

Oral presentation of written literature review and research data. Specific subject content of student presentations reflect research interests and results of thesis research.

PhsI 5601. Physiology of Organ Systems. (5 cr; prereq [Biol 3154, Biol 3245], [Chem 3311 or Chem 5336] or #)

Survey of physiologic functions and interrelationships of organ systems (musculoskeletal, cardiovascular, renal, respiratory, nervous, endocrine, and reproductive) in mammals. Framework for understanding physiological processes allowing students to integrate knowledge gained at the molecular level with functions of the whole organism.

PhsI 5927, 5928, 5929. Human Physiology. (2/6/6 cr, §5907-5908-5909; prereq 5601, #; not open to med students) Wittmers

Comprehensive overview of human physiology. Major organ systems covered both as individual systems and an integrated approach to human physiology provided.

PhsI 8401. Physiology of Aging. (2 cr; prereq 5927, 5928, 5929 or 5601, #) Heller

Overview of several theories concerning the physiological processes that appear to set the limits of maximum human life span.

PhsI 8405. Muscle Physiology. (2 cr; prereq 5927, 5928, 5929 or 5601, #) Stauffer

Overview of physiological processes involved in muscle contraction from subcellular events to nerve controlled function of whole muscle (skeletal, cardiac, and smooth muscle).

PhsI 8415. Topics in Endocrinology. (2 cr; prereq 5927, 5928, 5929 or 5601, #) Haller

Selected topic of current endocrine research interest examined in depth: historical background, questions posed by current research, and implications of current research for future development in the area.

PhsI 8441. Transport Processes. (2 cr; prereq 5927, 5928, 5929, #) Haller, Wittmers

In-depth, quantitative approach to transport processes in biological systems.

PhsI 8666. Doctoral Pre-Thesis Credits. (1-18 cr [11 cr max per summer term]; prereq doctoral student who has not passed preliminary oral examination)

PhsI 8777. Thesis Credits: Master's. (1-16 cr [11 cr max per summer term])
Thesis research and development.

PhsI 8888. Thesis Credits: Doctoral. (1-36 cr [max 18 cr per qtr, 11 cr per summer term])
Doctoral dissertation research and preparation.

Medical Microbiology and Immunology (MicB)

School of Medicine

MicB 5545. Immunobiology. (3 cr; prereq Biol 3245 or #) Johnson

The immune system. Aberrations resulting in immune disorders.

MicB 5553. Problems in Medical Microbiology and Immunology. (1-5 cr [may be repeated for 10 cr max]; open to med students as an elective and to qualified upper div and grad students with #) Adams, Hawley, Johnson, Lukasewycz, Ziegler
Independent study on tutorial basis. Emphasis on basic and clinical microbiology problems under study at the School of Medicine, including immunology. Investigative work and/or appropriate reading arranged with tutorials consistent with interests and capabilities of individual students.

MicB 5701. Basic Microbiology. (3 cr; prereq regis med or #) Adams, Hawley, Johnson, Ziegler
Basic characteristics of bacteria, viruses, fungi, and parasites including morphology, growth, metabolism, replication, and genetics.

MicB 5702. Infectious Diseases. (7 cr; prereq regis med or #) Hawley, Johnson, Ziegler

Attributes of pathogenicity, interaction with host defenses; diagnosis and control of medically important microorganisms in reference to their involvement with various organ systems.

MicB 8554. Advanced Immunology and Immunobiology. (2 cr; prereq #) Johnson

Detailed study of mechanisms involved in immunologic defense as related to structure of lymphoid tissue; cellular and molecular interactions and consequences of immunologic interactions. Emphasis on concepts and current reading.

MicB 8777. Thesis Credits: Master's. (1-16 cr [11 cr max per summer term])

Thesis research and development.

MicB 8888. Thesis Credits: Doctoral. (1-36 cr [18 cr max per qtr, 11 cr per summer term])
Doctoral dissertation research and preparation.

Medicine (Med)

School of Medicine

Med 3998. Topics in Human Biology and Behavior. (Cr ar; prereq #) Ziegler
Advanced undergraduate students can study in depth normal human biology and behavior. During the academic year, the student may elect to enroll in one or several subtopics of the following: gross anatomy, histology, developmental anatomy, neuroanatomy, biochemistry, microbiology, physiology, biometry and biostatistics, psychology, and sociology. No basic science clinical correlation will take place. Special examinations will be prepared for undergraduate students.

Med 5011. Alcoholism and Physicians. (4 cr; prereq regis med or #) Elliott, Knych, Laudergeran, Wittmers
Alcoholism in American society. Social-psychological, pharmacological, physiological, and clinical aspects of alcoholism emphasized through clinical and didactic learning experiences.

Med 5023. Seminars in Indian Health. (1 cr [cr cannot be applied to a Graduate School program]; prereq regis med or #)
Causes of morbidity and mortality among American Indians.

Med 5222. Cardiovascular Science. (4 cr; prereq regis med or grad) Heller, Leino, Mohrman, and Prohaska
Integrated comprehensive overview of anatomical, biochemical, and physiological aspects of the heart, blood vessels, and blood. Emphasis on normal structural and functional features of the cardiovascular system and processes underlying regulatory mechanisms. Lectures, supplemental reading material, and scheduled exercises including clinical correlates. Designed for medical students.

Music (Mu)

School of Fine Arts

Applied music courses numbered 5300 through 5399 cannot be applied to a Graduate School program. No more than 3 cr music courses numbered 5500 through 5599 may be applied to a graduate program.

Mu 0000. Recital Attendance. (No cr; regis required each qtr for music majors and minors when enrolled in applied instruction)
Attendance at scheduled musical events.

Mu 1002. Introduction to Music. (4 cr; not for music major or minor unless specified by adviser; 3 hrs lect, 1 hr listening per wk)
The layperson's listening process with various aesthetic, historical, and structural studies to develop understanding and enjoyment of music.

Mu 1005. Beethoven to the Beatles. (4 cr)
Survey of 19th- and 20th-century classical, jazz, rock, pop, and ethnic music genres.

Mu 1106-1107-1108. Jazz Improvisation. (1 cr each; prereq 1114 or #)
Study and development of improvisational facility as used in the jazz idiom.

Mu 1114-1115-1116. Basic Music Theory. (4 cr each; prereq concurrent regis in 1424 or equiv or passed piano proficiency; 3 hrs lect, 2 hrs lab per wk)
Study of basic diatonic material and structure with an introduction to chromatic material. Analysis of vocal and instrumental scores; creative writing coordinated with ear-training, sight-singing, and elementary keyboard harmony.

Mu 1124-1125-1126. Intermediate Theory. (4 cr each; prereq 1116, concurrent regis in 1424 or equiv or passed piano proficiency; 3 hrs lect, 2 hrs lab per wk)
Basic chromatic material and structure with an introduction to later material. Analysis of vocal and instrumental scores; creative writing coordinated with ear-training, sight-singing, and elementary keyboard harmony.

Mu 1127. Composition I. (2 cr [may be repeated for 6 cr max]; prereq 1116 or #)
Creative writing; individual assignments in various contexts.

Mu 1202. Survey of Music Literature. (4 cr, \$1002 unless Δ; 3 hrs lect, 1 hr listening per wk)
Study of representative works from significant composers in the history of music for students who have had some previous study in music.

Mu 1209. Jazz Studies. (4 cr)
Exploring the evolution of this art form through its foremost creators, with examination of the social problems in America that fostered its origin and shaped its development.

Mu 1260. Ethnic and Folk Music of the World. (4 cr; 3 hrs lect, 1 hr listening per wk)
Survey of the music of selected cultures.

Mu 1270. Survey of American Music. (4 cr; 3 hrs lect, 1 hr listening per wk)
Folk, popular, and art music in America from colonial times to the present.

Mu 1300. Group Instruction in Applied Music. (1 cr [may be repeated for 6 cr max]; for the non-music major at the beginning and intermediate levels)
Development of the individual's musical performance skills through group instruction.

Mu 1311. Voice. (Cr ar [may be repeated]; prereq Δ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1312. Voice. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1321. Piano. (Cr ar [may be repeated]; prereq Δ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1322. Piano. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1325. Jazz Piano. (Cr ar [may be repeated]; prereq Δ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1326. Jazz Piano. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1331. Organ. (Cr ar [may be repeated]; prereq Δ ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1332. Organ. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1341. Harpsichord. (Cr ar [may be repeated]; prereq Δ ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1342. Harpsichord. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1351. Strings. (Cr ar [may be repeated]; prereq Δ ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1352. Strings. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1357. Harp. (Cr ar [may be repeated]; prereq Δ ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1358. Harp. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1361. Woodwinds. (Cr ar [may be repeated]; prereq Δ ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1362. Woodwinds. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1371. Brass. (Cr ar [may be repeated]; prereq Δ ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1372. Brass. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1381. Percussion. (Cr ar [may be repeated]; prereq Δ ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1382. Percussion. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1391. Classical Guitar. (Cr ar [may be repeated]; prereq Δ ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1392. Classical Guitar. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1395. Jazz Guitar. (Cr ar [may be repeated]; prereq Δ ; music major fee-waiver students only; 1 hr group lesson, 1 private lesson)
Individual or group lessons.

Mu 1396. Jazz Guitar. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1398. Pop Styles Guitar. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 1418. Diction. (1 cr [may be repeated for 3 cr max]; prereq voice major or #)
Proper enunciation of languages commonly found in vocal literature.

Mu 1424. Piano Class. (1 cr [may be repeated for 6 cr max]; prereq music major or #)
For the music major working toward the departmental piano proficiency requirement.

Mu 1441. Introduction to Vocal and Instrumental Techniques. (2 cr)
Principles and techniques of sound production and acoustics common to instrumental and vocal pedagogy. Beginning group instruction in voice and vocal pedagogy.

Mu 1442. Instrumental Techniques: Percussion and Brass I. (2 cr; prereq Mu major, 1441 or #)
Beginning group instruction and pedagogy on instruments in the percussion and brass families.

Mu 1443. Instrumental Techniques: Single Reeds and Brass II. (2 cr; prereq Mu major, 1442 or #)
Beginning group instruction and pedagogy on instruments in the brass and single reed families.

Mu 1444. Instrumental Techniques: Strings, Flute and Double Reed. (2 cr; prereq Mu major, 1443 or #)
Beginning group instruction and pedagogy on instruments in the string, flute, and double reed families.

Mu 1501. Concert Band. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of transcribed and original concert literature.

Mu 1503. Jazz Ensemble. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of big band literature.

Mu 1505. Symphonic Wind Ensemble. (1 cr [may be repeated for 6 cr max]; instructor determines placement)
Study and performance of symphonic wind ensemble and contemporary band literature by a select group.

Mu 1510. Chamber Singers. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of vocal chamber music.

Mu 1511. University Singers. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
A select group for the study and performance of representative choral literature from all periods. A tour of the region is usually taken during winter quarter and extended tours may be taken during spring break or summer.

COURSE DESCRIPTIONS

Mu 1518. Jazz Choir. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of vocal jazz music.

Mu 1519. Concert Chorale. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of representative choral literature from all periods.

Mu 1544. Chamber Music. (1 cr [may be repeated]; prereq #)
Study and performance of chamber music literature, classical, and/or jazz.

Mu 1551. Orchestra. (1 cr [may be repeated for 12 cr max]; open to performers with high school experience in strings, brass, woodwind or percussion; instructor determines placement)
Reading and concert preparation of representative musical literature.

Mu 1552. University Chamber Orchestra. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of chamber orchestra literature.

Mu 1611. Music Fundamentals. (2 cr; for the non-music major)
Elements of notation, keyboard, and reading skills.

Mu 1711. Sound Reinforcement and Recording. (2 cr)
Study of electronic sound reinforcement and recording equipment and their use in musical performance.

Mu 1791. Fundamentals of Conducting. (2 cr; prereq 1115, ¶1424 or equiv or passed piano proficiency, Mu major or #)
Beginning instruction in conducting and choral techniques.

Mu 3102. Jazz Theory. (3 cr; prereq 1126 or #)
Study of theoretical concepts and stylistic application of jazz. Includes ear training, dictation, sight-singing, jazz vocabulary and its use.

Mu 3103. Jazz Arranging. (2 cr [may be repeated for 4 cr max]; prereq 1126, 3102 or #)
Study of transpositions, voicings, and arranging concepts for the large jazz ensemble.

Mu 3104. Jazz Composition. (2 cr [may be repeated for 4 cr max]; prereq 1126 or #)
Study and development of composition in the jazz idiom.

Mu 3112. Instrumental Arranging. (3 cr; prereq 3143 or #)
Idiomatic scoring for instruments; individual assignments in the problems and possibilities of various combinations.

Mu 3118. Contrapuntal Techniques. (3 cr; prereq 1126)
Practice in the use of linear devices in canons, inventions, fugues.

Mu 3127. Composition II. (2 cr [may be repeated for 6 cr max]; prereq 1127 or #)
Creative writing in advanced traditional contexts.

Mu 3141. Twentieth-Century Electronic Techniques. (2 cr; prereq 1126, 80 cr, Mu major or #)
Introduction to using electronic instruments.

Mu 3142. Twentieth-Century Harmonic Techniques. (2 cr; prereq 1126, 80 cr, Mu major or #)
Study of vertical dimensions in 20th-century music.

Mu 3143. Twentieth-Century Formal Techniques. (2 cr; prereq 3142, 80 cr, Mu major or #)
Overview of form in music, examination of structure in 20th-century music.

Mu 3151. MIDI Applications I. (2 cr; prereq 3141, #)
Theoretical and applied study in the use of elements of musical instrument digital interface.

Mu 3152. MIDI Applications II. (2 cr; prereq 3151, #)
Creative application of theoretical knowledge acquired in 3151.

Mu 3200. Medieval and Renaissance Music. (4 cr; prereq 1202, 60 cr or #; 3 hrs lect, 2 hrs lab)
Major concepts in history of music from Pythagoras to Palestrina. Emphasis on theoretical development of musical systems, forms, and styles.

Mu 3201. Baroque and Classic Music. (4 cr; prereq 1202, 60 cr or #; 3 hrs lect, 2 hrs lab)
Selected studies in major composers, forms, and styles from 1580 to 1800. Emphasis on music of Monteverdi, J. S. Bach, and Amadeus Mozart. Major genres include madrigal, opera, concerto, suite, sonata, cantata, and symphony.

Mu 3202. Romantic and Modern Music. (4 cr; prereq 1202, 60 cr or #; 3 hrs lect, 2 hrs lab)
Study in musical genres influential from 1800 to the present. Emphasizes dualistic nature of arts in the 19th century by comparing figures such as Wagner and Verdi, Berlioz and Brahms, and others. Special emphasis on 20th-century American music, especially East and West Coast styles pervasive after World War II.

Mu 3223. Topics in Music: (Various Titles to be Assigned). (1 to 6 cr [may be repeated for 12 cr max])
Selected studies in music with changing topics as defined by type, period, or composer.

Mu 3244. Large Jazz Ensemble Literature. (3 cr; prereq 1125 or #)
Development of literature and performance practices of the Big Band and symphonic works of jazz composers.

Mu 3247. Art Song Literature. (2 cr; prereq 1116, 40 cr, Mu major or #; offered alt yrs)
Survey of the art song with emphasis on German, French, and English compositions and composers.

Mu 3248. Opera Literature. (2 cr; prereq 1116, 40 cr, Mu major or #; offered alt yrs)
Survey of opera with emphasis on solo and ensemble literature from the great Italian, German, French, English, and American traditions.

Mu 3263. Evolution and Analysis of Jazz Styles. (2 cr; prereq 1126 or #)
In-depth analytical investigation of the styles and evolution of the art music commonly known as jazz.

Mu 3264. Evolution and Analysis of Commercial Styles. (2 cr; prereq 1126 or #)
Investigation of structural, technical, and stylistic aspects of popular commercial music, particularly of the late 20th century.

Mu 3265. Evolution and Analysis of Film and Theatre Music. (2 cr; prereq 1126 or #)
Investigation of historical, structural, technical, and stylistic aspects of film and theatre music, especially of the late 20th century.

Mu 3300. Recital. (1 cr [may be repeated for 3 cr max]; prereq Δ)
Individual programs.

Mu 3327. The Art of Accompanying. (1 cr [may be repeated for 3 cr max]; prereq #)
Role of the accompanist; musical, psychological, and technical problems; class and lab, with individual assignments.

Mu 3401. Jazz Rhythm Section Class. (1 cr; prereq #)
Theoretical and applied methods for the instruments of the jazz rhythm section.

Mu 3424. Jazz Keyboard Class. (1 cr [may be repeated for 6 cr max]; prereq 1126, passed piano proficiency or #)
Study of theoretical and applied performance technique in keyboard jazz.

Mu 3502. Music Production Practicum. (1-2 cr [may be repeated for 8 cr max], \$3500, \$3501; prereq #; 30 hrs min per cr)
Supervised experience in the practical aspects of preparing and presenting a music production.

Mu 3521. Opera Workshop. (1 cr [may be repeated]; prereq #)
Production techniques and performances of solo and ensemble opera literature, standard and modern.

Mu 3522. Performance Practicum. (1 cr; [may be repeated for 3 cr max]; prereq #)
Perform a significant role in a musical production.

Mu 3607. Jazz Band Methods. (2 cr; prereq 1503, Mu major or minor, jr standing)
Study of the techniques and materials necessary to organize and develop a jazz band in the junior and senior high school.

Mu 3621. Elementary School Music Teaching. (3 cr; prereq 1002 or 1202 or 1260 or 1270, 1611, 80 cr, EEd major or #)
Practical methods including purposes, program organization, lesson planning, and newer materials with actual demonstration of methods and discussion of typical classroom problems.

Mu 3626. Music for Early Childhood. (2 cr; prereq Educ 1000, Ech 1025 or # [except for piano pedag majors])
Planning appropriate music activities for preschool children; development of musical skills necessary to lead activities.

Mu 3636. Teaching General Music: Elementary. (3 cr; prereq 80 cr, Mu major or #)
Methods and materials for classroom music, grades K-6.

Mu 3637. Teaching General Music: Secondary. (3 cr; prereq 80 cr, Mu major or #)
Teaching methods and materials for general music classes, grades 7-12.

Mu 3661. Applied Music Teaching. (1 cr [may be repeated once for cr]; prereq #)
Procedures and materials for class and individual instruction in approved fields of applied music; evaluation of solo literature; discussion of approved and experimental pedagogical practices; lesson observation and supervised student teaching.

Mu 3700. Introduction to Music Industry. (3 cr; prereq #)
Study of developing commercial applications and trends in the music industry, including basic concepts of business and marketing.

Mu 3706-3707-3708. Intermediate Jazz Improvisation. (1 cr each; prereq 1108 or #)
Continued study and development of improvisational facility acquired in 1108.

Mu 3792. Choral Conducting. (2 cr; prereq 1116, 1791, 40 cr, Mu major or #; offered alt yrs)
Conducting, score study, rehearsal techniques, and vocal pedagogy as related to the choral rehearsal.

Mu 3793. Choral Teaching Methods I. (3 cr; prereq 1124, 3792, 40 cr, Mu major or #)
Methods and materials for teaching vocal ensembles, with special emphasis on elementary and middle/junior high school performing groups.

Mu 3794. Choral Teaching Methods II. (3 cr; prereq 1125, 3793, 40 cr, Mu major or #; offered alt yrs)
Methods and materials for teaching vocal ensembles, with special emphasis on high school performing groups.

Mu 3796. Instrumental Teaching Methods I. (3 cr; prereq 80 cr, Mu major or Δ)
Methods and materials for teaching beginning instrumental students: role and extent of instrumental music in school curriculum; current philosophies concerning instrumental music education; recruiting and scheduling; administrative tasks, concert literature, and rehearsal techniques for beginning band and orchestra.

Mu 3797. Instrumental Teaching Methods II. (3 cr; prereq 3796, 80 cr, Mu major or Δ)
Advanced topics in teaching instrumental music; development of school band and orchestra; concert literature for secondary school band and orchestra; administrative tasks for secondary instrumental music teachers; developing and training marching band.

Mu 3798. Instrumental Conducting I. (1 cr; prereq 1791, 80 cr incl 6 from major ensembles, Mu major or #)
Techniques, reading and interpretation of full and condensed orchestral, band, and vocal scores; lab practice in rehearsal procedures.

Mu 3799. Instrumental Conducting II. (1 cr; prereq 3798, 80 cr, Mu major or #)
Techniques, reading and interpretation of full and condensed orchestral, band, and vocal scores; lab practice in rehearsal procedures.

Mu 3810. African Roots Of American Music. (4 cr)
Investigation of traditional African music and culture and its influences on American musical styles.

Mu 3820. The Power of Music. (3 cr)
Examining music, as used throughout history, as a force that has had both positive and negative effects upon our physical, mental, and spiritual health.

COURSE DESCRIPTIONS

Mu 3900. Internship in Music. (1-2 cr [may be repeated for 6 cr max]; prereq Δ)
Participation in music tutoring or recognized campus/community activity related to the student's musical program and career objectives.

Mu 3910. Field Study in Music. (1-6 cr [may be repeated for 6 cr max]; prereq #)
Off-campus travel, research, and creative activities in a specialized area of music. Credit allowed will depend on nature and scope of the study. Advance planning and supervision of planning necessary.

Mu 3990. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq #)
Directed study in areas of special interest to the student, to be arranged with instructor before registration.

Mu 5127. Composition III. (2 cr [may be repeated for 6 cr max]; prereq 3127)
Creative writing in 20th-century contexts.

Mu 5140. Computer Applications for Music Educators. (3 cr; prereq 90 cr or #)
Training in use of microcomputers for music educators. Software applications such as spreadsheets, databases, music CAI, and music printing programs. Software for Apple, Macintosh, and IBM-PC used.

Mu 5174. Advanced Orchestration. (2 cr; prereq 3112)
Orchestra instruments and a practical study of the art of symphonic scoring.

Mu 5201. Advanced Music History. (3 cr [may be repeated for 9 cr max]; prereq 3200, 3201, 3202)
Directed music history study specializing in composer, genre, or period.

Mu 5223. Topics in Music: (Various Titles to be Assigned). (1 to 6 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq #)
Selected studies in music with changing topics as defined by type, period, or composer.

Mu 5242. Advanced Choral Literature. (3 cr; prereq 3794 or #)
Study of representative choral literature from various periods of music history.

Mu 5243. Piano Literature. (3 cr; prereq #)
Study of representative piano literature from various periods of music history.

Mu 5311. Voice. (Cr ar [may be repeated]; music major fee-waiver students only; 1 hr group lesson, 1 private lesson; prereq Δ)
Individual or group lessons.

Mu 5312. Voice. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 5321. Piano. (Cr ar [may be repeated]; music major fee-waiver students only; 1 hr group lesson, 1 private lesson; prereq Δ)
Individual or group lessons.

Mu 5322. Piano. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 5331. Organ. (Cr ar [may be repeated]; music major fee-waiver students only; 1 hr group lesson, 1 private lesson; prereq Δ)
Individual or group lessons.

Mu 5332. Organ. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 5351. Strings. (Cr ar [may be repeated]; music major fee-waiver students only; 1 hr group lesson, 1 private lesson; prereq Δ)
Individual or group lessons.

Mu 5352. Strings. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 5357. Harp. (Cr ar [may be repeated]; music major fee-waiver students only; 1 hr group lesson, 1 private lesson; prereq Δ)
Individual or group lessons.

Mu 5358. Harp. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 5361. Woodwinds. (Cr ar [may be repeated]; music major fee-waiver students only; 1 hr group lesson, 1 private lesson; prereq Δ)
Individual or group lessons.

Mu 5362. Woodwinds. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 5371. Brass. (Cr ar [may be repeated]; music major fee-waiver students only; 1 hr group lesson, 1 private lesson; prereq Δ)
Individual or group lessons.

Mu 5372. Brass. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 5381. Percussion. (Cr ar [may be repeated]; music major fee-waiver students only; 1 hr group lesson, 1 private lesson; prereq Δ)
Individual or group lessons.

Mu 5382. Percussion. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 5391. Classical Guitar. (Cr ar [may be repeated]; music major fee-waiver students only; 1 hr group lesson, 1 private lesson; prereq Δ)
Individual or group lessons.

Mu 5392. Classical Guitar. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

Mu 5395. Jazz Guitar. (Cr ar [may be repeated]; music major fee-waiver students only; 1 hr group lesson, 1 private lesson; prereq Δ)
Individual or group lessons.

Mu 5396. Jazz Guitar. (1 cr [may be repeated]; for students who do not qualify for fee waiver)
Individual or group lessons.

- Mu 5501. Concert Band. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of transcribed and original concert literature.
- Mu 5503. Jazz Ensemble. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of big band literature.
- Mu 5505. Symphonic Wind Ensemble. (1 cr [may be repeated for 6 cr max]; instructor determines placement)
Study and performance of symphonic wind ensemble and contemporary band literature by a select group.
- Mu 5510. Chamber Singers. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of vocal chamber music.
- Mu 5511. University Singers. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
A select group for the study and performance of representative choral literature from all periods. A tour of the region is usually taken during winter quarter and extended tours may be taken during spring break or summer.
- Mu 5518. Jazz Choir. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of vocal jazz music.
- Mu 5519. Concert Chorale. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of representative choral literature from all periods.
- Mu 5544. Chamber Music. (1 cr [may be repeated]; prereq #)
Study and performance of chamber music literature, classical, and/or jazz.
- Mu 5551. Orchestra. (1 cr [may be repeated for 12 cr max]; open to performers with high school exper in strings, brass, woodwinds, or percussion; instructor determines placement)
Reading and concert preparation of representative musical literature.
- Mu 5552. University Chamber Orchestra. (1 cr [may be repeated for 12 cr max]; instructor determines placement)
Study and performance of chamber orchestra literature.
- Mu 5610. Advanced Studies in Jazz Education. (3 cr [may be repeated for 9 cr max]; prereq tchg exper or #)
Study of selected topics related to the development of a jazz ensemble in a total music program.
- Mu 5623. Topics in Music Education. (1 to 6 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq #)
Selected topics in various areas of music education: philosophical, historical, pedagogical.
- Mu 5625. Piano Pedagogy I. (2 cr, prereq 1321, #)
Principles and materials for teaching the elementary piano student.
- Mu 5626. Piano Pedagogy II. (2 cr, prereq 1321, #)
Principles and materials for teaching the intermediate piano student.
- Mu 5627. Piano Pedagogy Practicum. (2-6 cr [may be repeated for 6 cr max; prereq 1321, #])
Supervised teaching of piano students.
- Mu 5628. Advanced Piano Pedagogy. (3 cr; prereq 5627 or #)
Principles and materials for teaching the advanced piano student.
- Mu 5629. Piano Performance Practices. (3 cr; prereq #)
Interpretation of music for the piano from various style periods.
- Mu 5711. Sound Reinforcement and Recording. (2 cr; prereq #)
Study of electronic sound reinforcement and recording equipment and its use in musical performance.
- Mu 5810. African Roots of American Music. (4 cr, §3810; prereq 80 cr or #)
Traditional African music and culture and its influences on American musical styles.
- Mu 5890. Advanced Conducting. (3 cr; prereq #)
Advanced studies in score reading, analysis, styles, and rehearsal techniques related to performance. Develops professional skills in conducting. Outside project required.
- Mu 5910. Field Study in Music. (1-6 cr; [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq #)
Off-campus travel, research, and creative activities in a specialized area of music. Credit allowed depends on nature and scope of study. Supervised advance planning required.
- Mu 5990. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq jr or sr or grad, #)
Directed study in areas of special interest to the student, to be arranged with instructor before registration.
- Mu 8222. Music Bibliography and Research. (3 cr; prereq grad)
Introduction to music education research methods, techniques, and materials.
- Mu 8223. Advanced Topics in Music: (Various Titles to be Assigned). (1-3 cr [may be repeated for 6 cr max]; prereq grad)
Selected studies in music, including music history, theory, literature, composition, conducting, music performance practice.
- Mu 8300. Recital. (1 cr; prereq 8334 or ¶8334, audition, grad, #)
Individual programs.
- Mu 8334. Graduate Applied Music: Major Instrument. (1-2 cr [may be repeated for 12 cr max]; prereq advanced proficiency, grad, Δ)
Individual lessons; ½ hr per week per credit.
- Mu 8338. Graduate Applied Music: Secondary Instrument. (1 cr [may be repeated for 12 cr max]; prereq intermediate proficiency, grad, Δ)
Individual lessons; ½ hour per week.
- Mu 8601. Foundations of Music Education. (3 cr; prereq grad)
Philosophical, historical, psychological foundations of music education.
- Mu 8623. Advanced Topics in Music Education: (Various Titles to be Assigned). (1-3 cr [may be repeated for 6 cr max]; prereq grad, #)
Selected topics in music education philosophy, history, or pedagogy.

Mu 8650. Leadership in Music Education. (3 cr; prereq grad)

Techniques, theories, and models of music and arts leadership; supervising music/arts personnel, facilities, budgets, curricular programs, and policies.

Mu 8890.* Problems in Music Education. (Cr ar [may be repeated for 9 cr max]; prereq major adviser consent for Plan B project)

Directed project(s) in theoretical and practical problems in music education.

Mu 8990. Independent Study. (1-3 cr; [may be repeated for 6 cr max]; prereq grad, #)

Directed study in areas of special interest to the student, to be arranged with the instructor before registration.

Pharmacology (Phcl)

School of Medicine

Phcl 3001. Drugs and Health. (3 cr; prereq Chem 1110-1111-1112, organic chemistry course or equiv, Phsl 1043 or #) Eisenberg, Knych, Regal, Trachte
Elementary course in pharmacology. Examines actions and use of drugs in selected health conditions.

Phcl 5101-5102-5103. Pharmacology. (7/5/5 cr; prereq regis med or #) Eisenberg, Knych, Regal, Trachte, Wallace
Analysis of the effects of pharmacologic agents on living systems; major classes of drugs; concepts of chemotherapy; characteristic pharmacologic agents, their reactions, and therapeutic applications.

Phcl 5204. Pharmacology Seminar. (1 cr; prereq #)
Presentation of selected research problems and current journal articles.

Phcl 5411. Advanced Pharmacology. (2 cr; prereq 5101, 5102 or equiv or #) Eisenberg, Knych, Regal, Trachte, Wallace
Comprehensive lectures and discussions of principles of drug disposition; drug receptor interactions; mechanism of action of selected drugs with particular emphasis on current advances and methodologies.

Phcl 5501. Problems in Pharmacology. (Cr ar [may be repeated for 10 cr max; no more than 6 cr can be applied to a Graduate School program]; open to med students as an elective and to qualified upper div and grad students with #)
Independent study on a lecture or tutorial basis. Investigative work, lecture material, and/or appropriate reading and discussions designed according to the interest and capabilities of the individual students.

Phcl 8666. Doctoral Pre-Thesis Credits. (1-18 cr [11 cr max per summer term]; prereq doctoral student who has not passed preliminary oral examination)

Phcl 8777. Thesis Credits: Master's. (1-16 cr [11 cr max per summer term])
Thesis research and development.

Phcl 8888. Thesis Credits: Doctoral. (1-36 cr [18 cr max per qtr, 11 cr per summer term]; prereq grad)
Doctoral dissertation research and preparation.

Philosophy (Phil)

College of Liberal Arts

Phil 1001. Problems of Philosophy. (4 cr)
Introduction to philosophy through examination of several classic philosophical problems such as the existence of God, nature of knowledge, free will versus determinism, relation of mind and body, character of moral responsibility, organization of society, and adoption of a world view.

Phil 1003. Ethics and Society. (4 cr)
Examination of classic theories addressing the questions of whether morality is subjective or objective and how we should determine what is right or wrong. Examination of particular moral issues such as euthanasia, abortion, nuclear deterrence, capital punishment.

Phil 1007. Philosophy and World Religions. (4 cr)
Comparative philosophical examination of the teachings and practices of several major world religions selected from ancient polytheism, Christianity, Judaism, Islam, Taoism, Buddhism, Hinduism, and various Native American and African religions.

Phil 1008. Critical Thinking. (4 cr)
Examination of patterns of reasoning encountered in everyday life, including advertising, editorials, and politics. Use of language in formulating arguments; differences between deductive and inductive arguments; how to detect and avoid mistakes in reasoning.

Phil 1018. Logic. (4 cr)
Introduction to symbolic logic. Nature of language, species of arguments, informal vs. formal arguments, techniques of translation, methods of sentential logic, and methods of predicate logic.

Phil 3001. Existential Literature. (3 cr; prereq Comp 1120, 40 cr or #)
Themes of love, death, boredom, and alienation through plays and novels of such 19th- and 20th-century authors as Kafka, Dostoyevsky, Barth, Sartre, Camus, Murdoch, and Fowles.

Phil 3110. American Philosophy. (4 cr)
General characteristics of American philosophy, with special emphasis on the period since 1870, including Peirce, James, Royce, and Dewey.

Phil 3118. Selected Topics. (3 cr [may be repeated for 9 cr max]; prereq 1001 or #)
In-depth examination of a particular philosopher or of a particular problem in philosophy. Specific course content announced in *Class Schedule*.

Phil 3222. Medical Ethics. (4 cr)
Examination of values underlying the health care professions and ethical dilemmas in medical contexts. Examination of patients' rights and autonomy, medical paternalism, confidentiality, truth-telling, euthanasia.

Phil 3230. Theories of Law and Punishment. (4 cr; offered alt yrs)
Nature of law, natural law theory, legal positivism and their relationship to traditional and contemporary theories of punishment; deterrence, reform, retribution, rehabilitation, social defense, restitution.

Phil 3242. Values and Technology. (4 cr; prereq 90 cr or Δ)

Examination of philosophical problems related to science and technology. Differences between pure science, applied science, and technology. Moral issues concerning practice and impact of science and engineering, such as those created by computer use.

Phil 3250. Feminist Issues in Philosophy. (3 cr; prereq 1001 or #)

Examination of recent criticism by feminist philosophers and substantive feminist contributions, including gender bias in philosophical theories, relations between gender and morality, effects of patriarchal thinking on social and political theory, prospects for philosophy of human liberation.

Phil 3260. Philosophy of Sex and Love. (4 cr, §1020)
Philosophical examination of central concepts relating to sex and romantic love: normalcy, deviance, and perversions; nature of romantic love; relation of sex to romantic love.

Phil 3280. Ethical Theory. (3 cr; prereq 1001 or 1003 or #)
Characteristics and criteria of value statements; the justification of moral standards; examination of some 20th-century ethical theories.

Phil 3290. Current Social Political Philosophy. (4 cr; prereq 1001 or 1003 or #)

Detailed philosophical analysis of recent writings about social and political concepts such as freedom, democracy, socialism, communism, fascism, and anarchy.

Phil 3301. Greek Philosophy. (4 cr; prereq 30 cr or #)
Examination of Greek philosophy from the pre-Socratic era through Socrates, Plato, and Aristotle, including philosophy of nature, possibility and limits of human knowledge, happiness, and the good life.

Phil 3302. Philosophy of the Middle Ages. (4 cr; prereq 3301 or #)
Early Christian philosophy of Augustine and Aquinas, in contrast to Renaissance and Reformation philosophy.

Phil 3303. The Birth of Modern Philosophy. (4 cr; prereq 40 cr or #)
Impact of science and secularity on the rationalism of Descartes, Spinoza, Leibniz, and the empiricism of Locke, Berkeley, and Hume.

Phil 3304. Romanticism and Alienation. (4 cr; prereq 3303 or #)
Response of late 18th- and 19th-century philosophers to empiricist/rationalist controversies; emphasis on epistemological, metaphysical, social, and political views of Kant, Hegel, Marx, and Nietzsche.

Phil 3325. Environmental Ethics. (4 cr; prereq 45 cr or Δ)
Examination of the moral dimension of the relationship between humans and the earth's natural environment. Pollution, energy policy, economics, law, and environment; endangered species; rights of nonhumans; preservation and conservation; obligations toward future generations; ethical theory and environment.

Phil 3421. Oriental Philosophies. (4 cr; prereq 5 cr Phil or #)
Overview of Hinduism, Buddhism, Confucianism, and Taoism. Analysis of the basic concepts of the Indian and Chinese civilizations.

Phil 3651. Advanced Logic. (4 cr; prereq 1018 or Math 1296 or #)

Dimensions of language; relation of logic to ordinary language and to mathematics; calculus of propositions, classes, and relations; properties of formal deductive systems.

Phil 3900. Colloquium for Majors. (1 cr; prereq Δ, Phil major/minor; attendance at 10 dept-approved lectures/discussions over 4-yr period; regis only during qtr of 10th lect)

Lecture and discussion groups on variety of philosophical topics; required reading; places and topics to be announced.

Phil 5200. Aesthetics. (3 cr)

The possibility of a definition of art or of the aesthetic experience is examined through a survey of classic aestheticians; attention is given to the philosophy of art criticism. Research paper required of graduate students.

Phil 5300. Philosophy of Language. (4 cr; prereq 8 cr Phil)

Possible topics include the relation of language to thought, meaning and truth, speech acts and performative utterances, descriptions and reference, propositional attitudes, possible worlds, private languages, natural languages, artificial languages, and empirical linguistics.

Phil 5400. Theory of Knowledge. (4 cr; prereq 8 cr Phil)

Introduction to theory of knowledge interpreted broadly to encompass perceptual, deductive, inductive, and other modes of knowledge. Beginning with standard conception of knowledge as warranted true belief, explores the strengths and weaknesses of alternative accounts.

Phil 5560. Philosophy Of Science. (4 cr; prereq 1008, 1018 or #)

Introduction to fundamental problems of empirical science, including the nature of theories and laws, the structure of explanations and predictions, and problems of testability and confirmation. Topics vary. Research paper required of graduate students.

Phil 5570. Philosophy of Psychology. (4 cr; prereq Phil 1001 or Psy 1003, 90 cr)

Current philosophical issues surrounding psychology: behaviorism, dualism, and mind/brain identity theories, computer models of cognition, and functionalism.

Phil 5900. Seminar in Philosophy. (4 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq 12 cr Phil or #)

Detailed examination of major topics or philosophical works. See department for details.

Phil 5910. Intern Teaching Assistantship.

(2 cr [cr cannot be applied toward Graduate School program]; prereq #, Δ)

Practical experience in assisting teaching of philosophy. Students serve as interns assisting instructor in administration of a course. Application deadline one week before beginning of registration for the following quarter.

Phil 5990. Independent Study. (1-5 cr [may be repeated for 10 cr max]; prereq #; cannot be used to satisfy requirements for Phil major or minor)

Work in problems of special interest to the student, to be arranged with instructor in advance of registration. Written work required. Students may take Phil 5990 in conjunction with another philosophy course.

Physical Education (PE)

College of Education and Human Service Professions

Courses numbered 1199 through 1799, unless designated by a double asterisk, fulfill liberal education requirements.

- PE 1200. Swimming. (1 cr; prereq #)
- PE 1208. Scuba Diving. (1 cr)
- PE 1220. Technical Swimming. (1 cr; prereq 1200, #)
Improve existing swimming skills; expand knowledge and performance in added techniques; improve endurance and fitness through drills and training techniques.
- PE 1240. **Lifeguarding Today. (2 cr; prereq ability to swim 500 yds, #)
Provides knowledge and minimum skills necessary to qualify as a non-surf lifeguard. Meets current American Red Cross standards. CPR and first aid instruction.
- PE 1244.** Water Safety Instructor. (3 cr, \$1242; prereq 17 yrs old, knowledge and skill based on Emergency Water Safety Standard, basic lifeguarding or lifeguard training plus Level VI swim program proficiency, #)
Knowledge, skills, and strategies to teach American Red Cross swimming and water safety courses.
- PE 1300. Ballroom Dance. (1 cr; offered through UC)
- PE 1302. Folk Dance. (1 cr; offered through UC)
- PE 1312. Square Dance. (1 cr; offered through UC)
- PE 1400. Badminton. (1 cr)
- PE 1402. Tennis. (1 cr)
- PE 1410. Golf. (1 cr)
- PE 1414. Bowling. (1 cr)
- PE 1500. Cross-Country Skiing. (1 cr)
- PE 1502. Alpine Skiing. (1 cr)
- PE 1504. Skating. (1 cr)
- PE 1506. Sailing. (1 cr)
- PE 1507. Flatwater Kayaking. (1 cr; offered through UC)
Flatwater kayaking techniques. Includes history, safety, kayak design, basic braces, paddle strokes, and maneuvering in flatwater conditions.
- PE 1508. Canoeing. (1 cr)
- PE 1510. Whitewater Kayaking. (1 cr; prereq 1507 or #; offered through UC)
Rescue techniques, bracing, paddle strokes, maneuvering skills, examination of water hydraulics for use in whitewater conditions. Practical experience on local rivers and lakes. Successful completion results in certification from the American Canoe Association and American Red Cross.
- PE 1512. Fishing Skills. (1 cr)
- PE 1520. Alpine Ski Instructor's Course. (2 cr)

- PE 1530. Rock Climbing. (1 cr)
History, techniques and safety, equipment, knots, basic belay systems, route finding, face and crack climbing, identification of environmental hazards.
- PE 1600. Physical Fitness. (1 cr)
- PE 1601. Aerobics. (1 cr)
Cardiovascular fitness including aerobic exercise and hydro-aerobics. Physical development through cardiovascular training, muscle strengthening, and stretching.
- PE 1612. Karate. (1 cr)
Science and art of karate.
- PE 1614. Self-Defense. (1 cr)
Techniques of self-defense, including instruction in different throws, counters, and other means of repelling an attack.
- PE 1616. Weight Training. (1 cr)
Theory and practice of weight training.
- PE 1620. Aikido. (1 cr)
Movement, theory, and practice of the defensive martial art Aikido.
- PE 1702. Soccer. (1 cr)
- PE 1706. Volleyball. (1 cr)
- PE 1708. Basketball. (1 cr)
- PE 1800. Officiating Football. (1 cr; prereq coaching certification candidate or #)
Introduction to theory and practice of football officiating.
- PE 1802. Officiating Basketball. (1 cr; prereq coaching certification candidate or #)
Introduction to theory and practice of basketball officiating.
- PE 1804. Officiating Volleyball. (1 cr; prereq coaching certification candidate or #; offered through UC)
Introduction to theory and practice of volleyball officiating.
- PE 1806. Officiating Ice Hockey. (1 cr; prereq coaching certification candidate or #; offered through UC)
Introduction to theory and practice of ice hockey officiating.
- PE 1808. Officiating Swimming. (1 cr; prereq coaching certification candidate or #; offered through UC)
Introduction to theory and practice of swimming officiating.
- PE 1812. Officiating Track and Field. (1 cr; prereq coaching certification candidate or #; offered through UC)
Introduction to theory and practice of track and field officiating.
- PE 1814. Officiating Baseball and Softball. (1 cr; prereq coaching certification candidate or #; offered through UC)
Introduction to theory and practice of baseball and softball officiating.
- PE 1816. Officiating Soccer. (1 cr; prereq coaching certification candidate or #; offered through UC)
Introduction to the theory and practice of soccer officiating.
- PE 1901. Varsity Football. (1 cr [may be repeated for 4 cr max]; prereq #)
- PE 1903. Varsity Soccer. (1 cr [may be repeated for 4 cr max]; prereq #)

PE 1905. Varsity Basketball. (1 cr [may be repeated for 4 cr max]; prereq #)

PE 1907. Varsity Ice Hockey. (1 cr [may be repeated for 4 cr max]; prereq #)

PE 1911. Varsity Wrestling. (1 cr [may be repeated for 4 cr max]; prereq #)

PE 1913. Varsity Cross-Country. (1 cr [may be repeated for 4 cr max]; prereq #)

PE 1917. Varsity Volleyball. (1 cr [may be repeated for 4 cr max]; prereq #)

PE 1919. Varsity Track. (1 cr [may be repeated for 4 cr max]; prereq #)

PE 1921. Varsity Tennis. (1 cr [may be repeated for 4 cr max]; prereq #)

PE 1925. Varsity Baseball. (1 cr [may be repeated for 4 cr max]; prereq #)

PE 1927. Varsity Softball. (1 cr [may be repeated for 4 cr max]; prereq #)

PE 3117. Sport and the American Society. (3 cr)
In-depth examination of critical issues and controversies of sport in modern society.

PE 3126. Elementary School Physical Education. (4 cr, \$1326; prereq admission to EEd program or Δ)
Developing elementary school physical education program for elementary school classroom teacher, with emphasis on planning appropriate curriculum guide and teaching developmental movement experiences.

PE 3220. Individual Sports Training Programs. (2 cr; prereq 1600 or #)
Training procedures for individual sports such as distance running, cross-country skiing, and triathlon. Principles of aerobic and anaerobic training, weight training, cross-training, nutritional considerations, and overtraining applied to individual sports.

PE 3470. Principles of Sports Nutrition. (3 cr; prereq Hlth 1470 or #)
Physiological principles of sports nutrition, nutritional demands, and dietary requirements for physically active people. Effects of body composition and weight distribution on health and physical performance; principles of weight regulation.

PE 5470. Sports Nutrition. (3 cr, \$FamL 5470; prereq Hlth 1470 or FamL 1470, 3470 or #)
Relationship between nutrients and special demands of physically active people. Body composition assessment. Caloric and fluid needs determination. Training, pre- and post-event meal planning. Focus on practical application of nutrition principles for specific populations (e.g., children, diabetics, elderly, elite athletes).

Physical Education Professional (PEP)

College of Education and Human Service Professions

PEP 1000. Teaching Elementary Games. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching elementary games.

PEP 1002. Teaching Stunts and Tumbling. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching stunts and tumbling.

PEP 1004. Teaching Rhythms. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching rhythms.

PEP 1070. Elementary Physical Education Methods. (4 cr, \$PE 3326; prereq 1000, 1002, 1004, BAS PE major or #)
Analysis of philosophy, objectives, program, methods, evaluation, and developmental motor patterns for elementary school physical education.

PEP 1071. Clinical Experience: Elementary. (1 cr; prereq BAS PE major or #; offered concurrently with 1070)
Supervised clinical teaching experience with responsibilities that include planning, managing, and implementing instructional experiences for elementary school children.

PEP 1100. Teaching Apparatus. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching gymnastic apparatus.

PEP 1200. Teaching Track and Field. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching track and field.

PEP 1300. Teaching Ballroom Dance. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching ballroom dance.

PEP 1302. Teaching Folk Dance. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching folk dance.

PEP 1304. Teaching Square Dancing. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching square dance.

PEP 1400. Teaching Tennis. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching tennis.

PEP 1500. Teaching Cross-Country Skiing. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching cross-country skiing.

PEP 1504. Teaching Skating. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching skating.

COURSE DESCRIPTIONS

PEP 1600. Teaching Physical Fitness and Weight Training. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching physical fitness and weight training.

PEP 1700. Teaching Soccer. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching soccer.

PEP 1710. Teaching Volleyball. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching volleyball.

PEP 1720. Teaching Basketball. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching basketball.

PEP 1730. Teaching Softball. (1 cr; prereq PE or Exer Sci or Rec major or #)
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching softball.

PEP 3000. Foundations of Physical Education. (5 cr; prereq Exer Sci or PE major or #)
Examination of the historical, philosophical, sociological, scientific foundations, and career opportunities within physical education and its subdisciplines.

PEP 3010. Adapted Physical Education. (3 cr; prereq 3000, PE or Exer Sci candidate or #)
Developmental/Adapted Physical Education for children with disabilities.

PEP 3020. Motor Learning. (3 cr, \$PE 3113; prereq EHS 1050 or Psy 3331, BAA or BAS PE candidate or Δ; 2 hrs lect, 2 hrs lab)
Factors affecting motor learning; theories of learning and their application to the learning of physical skills; motor learning at beginning and advanced skill levels.

PEP 3030. Human Biomechanics. (4 cr, \$PE 3118; prereq [Hlth 1901 or Hlth 1903], [Hlth 1905 or Phsl 1043], [3-5 cr from Math 1156-1333 or #], BAA or BAS PE candidate or Δ)
Application of neurophysiological, anatomical, and physical principles to human movement.

PEP 3040. Physiology of Exercise. (4 cr; prereq Hlth 1905, PE or Exer Sci or Rec candidate or #; 3 hrs lect, 2 hrs lab)
Physiological responses and adaptations to acute and chronic exercise.

PEP 3103. D/APE for the Sensory and Orthopedically Impaired. (3 cr; prereq 3010, PE candidate or #; offered alt yrs)
Examination of orthopedic and sensory disabilities. Emphasis on psychological needs, methods, and programmatic necessities.

PEP 3105. D/APE for the Developmentally Delayed. (3 cr; prereq 3010, PE candidate or #; offered alt yrs)
Examination of mentally retarded, emotionally disturbed, and learning disabled populations. Emphasis on instructional methodologies related to adapted physical education.

PEP 3400. Exercise Testing and Prescription. (3 cr, \$PE 3210; prereq 3040 or PE 3200, PE candidate or Δ; 2 hrs lect, 2 hrs lab)
Physical fitness programming for adults; principles of exercise testing and prescription.

PEP 3500. Facilities Management. (3 cr; prereq HPER 3000, BAS or BAA PE candidate or Δ)
Theory and practice of managing sports facilities.

PEP 3600. Sport Injury Assessment and Management. (4 cr, \$CC 3116; prereq 3000, [Hlth 1901 or Hlth 1903], Hlth 1905, PE candidate or Δ)
Assessment and management of sports-related trauma; injuries to the axial region and lower and upper extremities; use of therapeutic modalities; legal considerations.

PEP 3610. Therapeutic Exercise. (3 cr; prereq 3010, PE or Exer Sci candidate or #)
Principles of therapeutic exercise for rehabilitation of acute and chronic injuries.

PEP 3701. Assessment Strategies in School Physical Education. (5 cr, \$3700, \$PE 3119; prereq BAS PE candidate or Δ)
Cognitive and motor performance test selection, construction, administration, evaluation, and statistical strategies; organization and analysis of test scores; grading theory and procedures.

PEP 3710. Motor Development. (4 cr; prereq 3010, PE candidate or #)
Motoric dimension of development and perception; emphasis on characteristics and needs during motor skill acquisition; evaluation of motor and perceptual motor deficiencies.

PEP 3711. Clinical Experience: Developmental. (1 cr; prereq BAS PE degree candidate or #; offered concurrently with 3710)
Supervised clinical teaching experience focusing on developmental levels of students with responsibilities that include planning, managing, and implementing developmental experiences for elementary and secondary school children.

PEP 3720. Physical Education Curriculum. (3 cr, \$PE 3122; prereq [1070 or PE 3326], [3000 or PE 3000], PE 3111, BAS PE candidate or Δ)
Curricula for teaching physical education.

PEP 3730. Secondary Physical Education Methods. (4 cr, \$PE 3123; prereq 3720 or PE 3122, BAS PE candidate or #)
Analysis of philosophy, objectives, program, methods, and evaluation for secondary school physical education.

PEP 3731. Clinical Experience: Secondary. (1 cr; prereq BAS PE degree candidate or #; offered concurrently with 3730)
Supervised clinical teaching experience with responsibilities that include planning, managing, and implementing instructional experiences for secondary school children.

PEP 3750. Movement Experience for the Young Child. (2 cr, \$PE 3314; prereq [3020 or PE 3113], [3710 or PE 3110], BAS PE candidate or Δ; offered through UC)
Movement patterns, planning, instruction in early childhood education.

PEP 3820. Independent Study in Physical Education. (3-15 cr [may be repeated for 15 cr max]; prereq PE candidate, # or Δ)
Research or study in selected non-curricular area of physical education.

PEP 3900. Practicum: Physical Education. (1-3 cr [may be repeated for 6 cr max]; prereq PE candidate, # or Δ)

Supervised in-school experience in teaching or related function (excluding coaching).

PEP 3940. Physical Education Internship. (4-15 cr [may be repeated for 15 cr max]; prereq [3040 or PE 3200], [3400 or PE 3210], PE candidate or Δ)

Supervised experience in agency, hospital, or business setting.

PEP 3970. Supervised Teaching: College. (2 cr, SPE 3124; prereq [3720 or PE 3122], [3730 or PE 3123], BAS PE candidate or Δ)

Supervised teaching experience in a college setting.

PEP 5100. Foundations of Adapted Physical Education. (3 cr, SPE 5100; prereq 3010 or PE 3100, PE candidate with 120 cr or adult spec or grad or Δ)

Goals, needs, interests, and adjustments of handicapped individuals in physical education.

PEP 5101. Programming in Adapted Physical Education. (3 cr, SPE 5101; prereq 5100 or PEP 5100, PE candidate with 120 cr or adult spec or grad or Δ)

Programming and adaptation of methods, materials, and physical activities to meet the needs of the atypical student applied to specific handicaps in selected activity areas.

PEP 5102. Assessment in Adapted Physical Education. (3 cr, SPE 5102; prereq 5100 or PE 5100, PE candidate with 120 cr or adult spec or grad or Δ ; offered alt yrs)

Application of assessment process or development sequences, using diagnostic/prescriptive screening procedures and evaluation techniques for a developmental adapted program.

PEP 5200. Psychology of Coaching. (3 cr, SPE 5136; prereq 3020 or PE 3113, PE candidate with 120 cr or adult spec or grad or Δ)

Psychological concepts applied to coaching and teaching motor skills, including motivation, aggression, anxiety, and personality variances.

PEP 5290. Research in Motor Learning. (3 cr, SPE 5113; prereq 3020 or PE 3113, PE candidate with 120 cr or adult spec or grad or Δ ; offered alt yrs)

Directed lab research in the area of motor learning.

PEP 5300. Techniques in Computerized Videography. (3 cr, SPE 5118, SPE 5120; prereq 3030 or PE candidate with 120 cr or adult spec or grad or #) Basic analysis of sport, dance, and aquatics through use of high-speed videography.

PEP 5310. Research in Computerized Videography. (3 cr, SPE 5119; prereq 5300, PE candidate with 120 cr or adult spec or grad or #) Applied research in motion analysis of sport, dance, and aquatics through use of high-speed videography.

PEP 5400. Experimental Exercise Physiology. (3 cr, SPE 5123; prereq [3040 or PE 3200], PE candidate with 120 cr or adult spec or grad, concurrent regis in 5410 or Δ ; offered alt yrs)

Techniques of assessing physiological responses and adaptations to exercise.

PEP 5410. Applied Physiology. (3 cr, SPE 5122; prereq [3040 or PE 3200], PE candidate with 120 cr or adult spec or grad, concurrent regis in 5400 or Δ ; offered alt yrs)

Advanced study and research in exercise physiology.

PEP 5500. Administration of Interscholastic Athletics. (3 cr, SPE 5111; prereq [HPER 3000 or #], PE candidate with 120 cr or adult spec or grad or Δ) Administrative theory and practice related to interscholastic athletics.

PEP 5600. Prevention, Care of Athletic Injuries. (3 cr, SPE 5620; prereq [CC 3116 or PE 3600 or #], PE candidate with 120 cr or adult spec or grad or Δ)

Recognition, principles, and responsibilities related to athletic injuries in secondary and college programs; demonstration and practice in training techniques.

PEP 5810. Readings. (1-4 cr [may be repeated for 9 cr max]; prereq PE or Exer Sci candidate with 120 cr or adult spec or grad or #)

Study of varying topics by reading specific books, journal articles, etc. Topics selected based on student interests or academic preparation.

PEP 5820. Independent Study. (1-6 cr [may be repeated for 12 cr max]; prereq PE or Exer Sci candidate with 120 cr or adult spec or grad or #)

Directed research and study in selected area of physical education.

PEP 5910. Internship in D/APE for the Developmentally Delayed. (3 cr, SPE 5107; prereq [3010 or PE 3100], [5100 or PE 5100 or #], PE candidate with 120 cr or adult spec or grad or Δ)

Opportunity to teach developmentally delayed individuals in a school or community situation.

PEP 5912. Internship in D/APE for the Sensory and Orthopedically Impaired. (3 cr, SPE 5108; prereq [3010 or PE 3100], [5100 or PE 5100 or #], PE candidate with 120 cr or adult spec or grad or Δ)

Opportunity to teach sensory or orthopedically delayed individuals in a school or community situation.

Physics (Phys)

College of Science and Engineering

Phys 1010. Ideas in Physics. (3 cr; will not satisfy requirements for majors or minors in Phys)

Descriptive, nonmathematical survey of basic concepts in physics from Newton to the present, including concept of energy in mechanics, electricity, and heat; need for relativity and quantum theories; atoms, nuclei, and radiation.

Primarily for liberal arts students; not for preprofessional preparation.

Phys 1101-1102, 1103. Introduction to Physics. (5 cr each, \$1004 for 1101, \$1005 for 1102, \$1006 for 1103; prereq Math 1003, Math 1210 or equiv; 4 hrs lect, 2 hrs lab)

Noncalculus general physics course primarily for certain preprofessional fields and engineering technology. Topics in mechanics, heat, sound, light, electricity, magnetism, and modern physics.

COURSE DESCRIPTIONS

Phys 1106. Solving Physics Problems. (3 cr; prereq ¶Math 1296; 3 hrs lect)
Practice in applying mathematical and reasoning skills to physics problems.

Phys 1107-1108-1109. General Physics. (5 cr each; primarily for science majors and engineers; prereq ¶Math 1297 for 1107; 1137H may be substituted for 1107, cannot get cr for both; 4 hrs lect, 2 hrs lab)
Calculus-level general physics sequence. 1107: mechanics; 1108: heat, waves, electrostatics; 1109: circuits, magnetism, optics.

Phys 1109H. Honors General Physics. (5 cr, §1109, §1129; prereq 1108, Math 1297, Δ ; 4 hrs lect, 2 hrs lab)
Calculus-level general physics with honors laboratory. Topics in magnetism, AC circuits, wave motion, sound, light, optics. Lecture same as 1109.

Phys 3007. Intermediate General Physics. (4 cr; prereq ¶1109, Math 3298; 4 hrs lect)
Topics in mechanics, thermodynamics, and electromagnetism.

Phys 3010. Oscillations. (3 cr; prereq 1109; 3 hrs lect)
Studies of waves and vibrations, superposition of periodic motions, free vibrations of physical systems, forced vibrations, resonance phenomena with examples from electricity, optics, and mechanics; progressive waves, boundary effects, interference.

Phys 3041. Introductory Laboratory Electronics. (4 cr, §3040; prereq 1109; 3 hrs lect, 3 hrs lab)
Introduction to electronics for scientific applications. Analog electronics, DC and AC circuits, linear and non-linear devices, integrated circuits. Transducers. Digital electronics.

Phys 3071. Physics Laboratory. (2 cr, §3070; prereq 3500 or #; 4 hrs lab ar)
Experiments selected to provide experience with both concepts and techniques in physics.

Phys 3098. Physics Tutorial Project. (0-2 cr [may be repeated for 4 cr max; only 2 cr applicable toward Phys major]; prereq 1109, Δ)
Tutoring students in 1xxx and 3xxx physics courses under supervision of a physics staff member.

Phys 3500. Modern Physics. (4 cr, §5101; prereq 1109; 3 hrs lect, 1 hr problems per wk)
Descriptive course; quantum mechanics, hydrogen atom, multielectron atoms, molecular structure, quantum statistics, thermal radiation, solid state physics, nuclear physics.

Phys 3700. Independent Study. (1-3 cr [may be repeated for 6 cr max]; prereq Δ)
Directed individual study arranged with instructor and department head before registration.

Phys 3981. Physics Seminar. (1 cr, §3099; prereq Δ)
Preparation and presentation of written and oral reports on approved physics topic or research project.

Phys 5045. Advanced Laboratory Electronics. (4 cr, §5044; prereq 3041, 1 qtr Pascal or FORTRAN or #; 2 hrs lect, 5 hrs lab)
Applications of microcomputers to lab data acquisition. A/D and D/A conversion methods. Computer-based analysis methods. Signal processing techniques.

Phys 5102-5103. Modern Physics. (4 cr each; prereq 3500 or 5101; 4 hrs lect)
Selected topics in modern physics, including special relativity, quantum mechanics, and applications.

Phys 5107. Thermal Physics. (4 cr; prereq 3500 or ¶5101; 4 hrs lect)
Elements of statistical physics, thermodynamics.

Phys 5109. Statistical Physics. (4 cr; prereq 5107; 3 hrs lect plus independent study)
Principles of statistical physics applied to equilibrium properties of classical and quantum systems.

Phys 5119. Optics. (4 cr; prereq 1109 or 1109H or #; 4 hrs lect)
Fundamentals of physical optics.

Phys 5123. Theoretical Mechanics. (4 cr; prereq 3010, Math 3380; 3 hrs lect plus independent study)
Theoretical mechanics, including Lagrangian and Hamiltonian functions, symmetries and conservation laws, with examples from relativity and electrodynamics, and introducing relevant mathematics.

Phys 5124. Mathematical Methods. (4 cr; prereq 5123; 3 hrs lect plus independent study)
Systematic development of mathematical techniques in mechanics and electromagnetic theory.

Phys 5125. Electromagnetic Theory. (4 cr; prereq 5124; 3 hrs lect plus independent study)
Electric and magnetic fields, Maxwell's equations and applications, radiation.

Phys 5141-5142. Computational Physics and Modeling. (4 cr each; prereq 3500 or ¶5101, CS 1511 or CS 1622, Math 3380 or Math 3381; 3 hrs lect, 2 hrs lab)
Application of numerical methods to problems in classical and quantum physics, with emphasis on ordinary and partial differential equations. Computer modeling of physical systems.

Phys 5150-5151. Introduction to Solid-State Physics. (3 cr each; prereq 5103, 5107; 3 hrs lect)
Solid structure, thermal, and electronic properties of solids and solid surfaces.

Phys 5170. Classical Mechanics. (3 cr; prereq ¶5125 or #; 3 hrs lect)
Advanced study of classical mechanics: Hamiltonian and Lagrangian formulations for discrete and continuous systems, relativistic particles in electromagnetic fields, canonical transformations.

Phys 5174. Electrodynamics. (4 cr; prereq 5125 or #; 3 hrs lect plus independent study)
Maxwell's equations, relativity and electrodynamics, radiation and scattering of electromagnetic waves.

Phys 5176-5177-5178. Quantum Mechanics. (4 cr each; prereq 5103, 5125; 3 hrs lect plus independent study)
Schrödinger equation, operator formulation, angular momentum, symmetries, perturbation theory, scattering, identical particles, interaction with electromagnetic field.

Phys 5700. Independent Study. (1-3 cr [may be repeated for 6 cr max]; prereq approval by dept director of graduate studies, #)
Special studies, useful in individual graduate programs, not available in regular course offerings.

Phys 8200. Research In Physics. (Cr ar [may be repeated for cr])

Phys 8777. Thesis Credits: Master's. (1-16 cr [max 11 cr per summer term])
Thesis research and development.

Political Science (Pol)

College of Liberal Arts

Pol 1011. American Government and Politics. (4 cr, \$1010)

Principles of American national government. Survey of the American governmental system, structure, operations, and services; constitutionalism, federalism, civil liberties, parties, pressure groups, and elections.

Pol 1050. International Relations. (4 cr)

Introduction to contemporary international politics: levels of analysis; the international system; nation-state behavior; foreign policy decision making; economic and defense policy issues.

Pol 1500. Introduction to Comparative Politics. (4 cr)

Survey of the politics of selected countries chosen to reflect alternative styles of politics and forms of government; examples of Western liberal democratic, Communist and post-Communist, and Third World systems.

Pol 1610. Politics and Society. (4 cr, \$1600, \$3601, \$3635)

General survey of major contemporary political ideologies, including liberalism, conservatism, socialism, Marxism, fascism, feminism, anarchism, ecologism, and liberation ideologies.

Pol 3001. Introduction to American Public Policy. (4 cr; prereq 60 cr incl 1011 or #)

Introduction to concept of public policy, approaches to policy study, and context of policy process. Discussion of policy issues; emphasis on economy, energy, environment, business, agriculture, and other domestic policy issues.

Pol 3020. State Government. (4 cr; prereq 1011, 60 cr or #)

The states in the American federal system; governmental institutions and processes; intergovernmental relations. Special reference to Minnesota.

Pol 3030. Urban Government and Politics. (4 cr; prereq 1011, 60 cr or #)

Legal, administrative, political, and social aspects of American local government; emphasis on intergovernmental relations and regional cooperation.

Pol 3040. Women and Politics. (4 cr, \$3801; prereq 60 cr or #)

Women's political status; implications of women's role in political process; women as political actors; feminist critique and vision of politics.

Pol 3070. Civil Liberties. (4 cr; prereq 1011, 60 cr or #)

Separation of church and state, death penalties, abortion, First Amendment rights, affirmative action. Legal, moral, and political implications of human rights.

Pol 3080. Environment and Politics. (4 cr; prereq 1011, 60 cr or #; offered through UC)

American natural resource problems with special attention to conservation activities on the national, state, and local levels; development of conservation agencies in Minnesota.

Pol 3105. Non-Governmental Internship: American. (1-8 cr [may be repeated for 12 cr max; no more than 4 cr of 3105, 3114, 3405, 3414, 3505, 3514, 3605, and/or 3614 may be applied to satisfy general upper div Pol major requirements]; prereq jr, Pol major, #)

Supervised, scheduled work assignments in the performance of American political functions in nongovernmental organizations; full- or part-time employment. Not all outside work is eligible; see department head for requirements.

Pol 3109. Intern Teaching in Political Science: American Government. (1-2 cr [may be repeated for 4 cr max; no more than 4 cr of 3109, 3409, 3509 and/or 3609 may be applied to satisfy general upper div Pol major requirements], \$3900; prereq sr, Pol major, #) Experience teaching American governmental processes and systems in the Department of Political Science. Students serve as intern teachers assisting course instructor.

Application deadline one week before beginning of registration for the following quarter. Grade of at least B+ must be obtained in the course for which the student interns.

Pol 3113. Special Topics in American Government: (Various Titles to Be Assigned).

(1-4 cr [3113, 3413, 3513 and/or 3613 may be repeated for 8 cr max], \$3902; prereq 60 cr incl 8 cr Soc Sci or #) Contemporary topics in American governmental systems and processes. Course content announced in *Class Schedule*.

Pol 3114. Government Internship: American Government. (1-8 cr [may be repeated for 12 cr max; no more than 4 cr of 3105, 3114, 3405, 3414, 3505, 3514, 3605 and/or 3614 may be applied to satisfy Pol major requirements], \$3710; prereq jr, #)

Supervised, scheduled work assignments in the performance of governmental functions in American governmental systems and processes; full- or part-time employment.

Pol 3120. Congress and the Presidency. (4 cr, \$3160, \$3325, \$5160, \$5320, \$5325; prereq 1011, 60 cr or #)

Functioning and structure of the United States Congress and presidency; characteristics and selection of members of congress and the presidency, roles they play, how they interact with each other as well as others in the policy-making process.

Pol 3130. The Judicial Process. (4 cr, \$3330, \$5330; prereq 1011, 60 cr or #; offered alt yrs)

Structure of the American judiciary; judge selection; litigation process; influences on judicial decision; impact of and compliance with decisions.

Pol 3140. American Political Parties and Elections. (4 cr; prereq 1011, 60 cr or #)

American two-party system; structures and functions of political parties in America; nominations and elections of government officials.

Pol 3150. American Constitutional Law I. (4 cr, \$3110, \$3111; prereq 1011, 60 cr or #)

Judicial review; national powers over commerce, taxing, and spending; presidential power; state powers to tax and regulate; regulation of economic and property interests; the Fourteenth Amendment and due process.

Pol 3151. American Constitutional Law II. (4 cr, \$3110, \$3111; prereq 1011, 60 cr or #)

Rights of the accused; freedom of expression and association.

COURSE DESCRIPTIONS

Pol 3152. American Constitutional Law III. (4 cr, \$3110, \$3111; prereq 1011, 60 cr or #)
Freedom of religion; equal protection; state action and personal rights; other civil rights; military, war, and foreign affairs powers.

Pol 3170. Political Interest Individuals and Groups. (4 cr, \$5170; prereq 1011, 60 cr or #)
Role of interest groups and individuals who lobby government to influence public policy. Internal dynamics of groups; strategies of lobbying and its regulation.

Pol 3200. Methodology and Analysis. (4 cr; \$1700; prereq 60 cr or #)
Theory and methods of conducting political research, including theory construction, concept formulation, survey research and sampling design, basic statistical analysis, and measurement of relationships.

Pol 3221. Introduction to Public Administration. (4 cr, \$3220; prereq 1011, 60 cr or #)
Introduction to internal operations of bureaucratic organizations and role of the latter in government policymaking. Capability of modern bureaucracy in meeting its own goal of technical efficiency and impact of bureaucratic forms of organization on a democratic society.

Pol 3310. Public Opinion and Propaganda. (4 cr; prereq 1011, 60 cr or #)
Role of public opinion and propaganda in the political system; acquisition and measurement of opinion; persuasion and the use of propaganda techniques by candidates, pressure groups, and others.

Pol 3400. Topics in World Politics. (4 cr, \$3450 [may be repeated for 8 cr max; no more than 4 cr may be applied to satisfy requirements for department field concentration]; prereq 1050, 60 cr or #)
Detailed examination and analysis of selected contemporary issues in world politics and international relations. Policy recommendations dealing with each issue.

Pol 3402. American Foreign and Defense Policy. (4 cr, \$3002, \$3065; prereq 1011 or 1050, 60 cr or #)
Institutions and processes that determine U.S. foreign and defense policies; major developments; contemporary issues; effects on domestic politics.

Pol 3405. Non-Governmental Internship: International. (1-8 cr [may be repeated for 12 cr max; no more than 4 cr of 3105, 3114, 3405, 3414, 3505, 3514, 3605, and/or 3614 may be applied to satisfy general upper div Pol major requirements]; prereq jr, Pol major, #)
Supervised, scheduled work assignments in the performance of international political functions in nongovernmental organizations; full-or part-time employment. Not all outside work is eligible; see department head for requirements.

Pol 3409. Intern Teaching in Political Science: International. (1-2 cr [may be repeated for 4 cr max; no more than 4 cr of 3109, 3409, 3509 and/or 3609 may be applied to satisfy general upper div Pol major requirements], \$3900; prereq sr, Pol major, #)
Experience teaching international relations in the Department of Political Science. Students serve as intern teachers assisting course instructor. Application deadline one week before beginning of registration for the following quarter. Grade of at least B+ must be obtained in the course for which the student interns.

Pol 3413. Special Topics in International Relations: (Various Titles to Be Assigned). (1-4 cr [3113, 3413, 3513 and/or 3613 may be repeated for 8 cr max], \$3902; prereq 60 cr incl 8 cr Soc Sci or #)
Contemporary topics in international relations. Course content announced in *Class Schedule*.

Pol 3414. Government Internship: International Relations. (1-8 cr [may be repeated for 12 cr max; no more than 4 cr of 3105, 3114, 3405, 3414, 3505, 3514, 3605 and/or 3614 may be applied to satisfy Pol major requirements], \$3710; prereq jr, #)
Supervised, scheduled work assignments in the performance of governmental functions in international relations; full- or part-time employment.

Pol 3415. International Law. (4 cr, \$3420, \$3421; prereq 1050, 60 cr incl 12 cr Soc Sci or #)
Nature and sources of international law; study of cases, writers, and treaties that define content of international law, subjects; human rights; protection of aliens; extradition; territorial questions; diplomatic agents; international agreements; pacific settlement of disputes; law of war and war crimes.

Pol 3424. Power Politics. (4 cr; prereq 1050, 60 cr incl 12 cr Soc Sci or #)
Critical examination of the power politics tradition in international thought and its contemporary significance.

Pol 3425. Comparative Foreign Policies. (4 cr; prereq 1050, 60 cr incl 12 cr Soc Sci or #)
Examination of foreign policy of countries other than the superpowers. Great Britain, Canada, and Ireland examined and others considered when appropriate and necessary.

Pol 3426. Politics of International Organization. (4 cr; prereq 1050, 60 cr incl 12 cr Soc Sci or #)
Investigation of the development, operations, and significance of international organizations in contemporary international politics.

Pol 3451. Theories of International Relations. (4 cr, \$IntS 5200; prereq 1050 or IntS 1010, 60 cr incl 12 cr Soc Sci or #)
Examination of historical and contemporary theories of international relations. Contending theorist views analyzed and assessed.

Pol 3460. International Political Economy. (4 cr; prereq 1050, 60 cr or #)
Relationship between politics and economics at international level, focusing on international trade and monetary policies, politics of economic growth and development, role of transnational corporations, and relations between rich and poor states.

Pol 3505. Non-Governmental Internship: Comparative. (1-8 cr [may be repeated for 12 cr max; no more than 4 cr of 3105, 3114, 3405, 3414, 3505, 3514, 3605, and/or 3614 may be applied to satisfy general upper div Pol major requirements]; prereq jr, Pol major, #)
Supervised, scheduled work assignments in the performance of comparative political functions in nongovernmental organizations; full- or part-time employment. Not all outside work is eligible; see department head for requirements.

Pol 3509. Intern Teaching in Political Science: Comparative Politics. (1-2 cr [may be repeated for 4 cr max; no more than 4 cr of 3109, 3409, 3509 and/or 3609 may be applied to satisfy general upper div Pol major requirements], §3900; prereq sr, Pol major, #) Experience teaching comparative politics in the Department of Political Science. Students serve as intern teachers assisting course instructor. Application deadline one week before beginning of registration for the following quarter. Grade of at least B+ must be obtained in the course for which the student interns.

Pol 3510. Russian and Soviet Politics and Government. (4 cr; prereq 60 cr incl 12 cr Soc Sci or #) Reform and revolution in Tsarist Russia; political leadership and Soviet development under Lenin and Stalin; political issues in the post-1953 Stalinist system: conservatives and reformers from Khrushchev to Gorbachev; dissolution of the USSR and its aftermath; recreating the Russian polity.

Pol 3513. Special Topics in Comparative Politics: (Various Titles to Be Assigned). (1-4 cr [3113, 3413, 3513 and/or 3613 may be repeated for 8 cr max], §3902; prereq 60 cr incl 8 cr Soc Sci or #) Contemporary topics in comparative politics. Course content announced in *Class Schedule*.

Pol 3514. Government Internship: Comparative Politics. (1-8 cr [may be repeated for 12 cr max; no more than 4 cr of 3105, 3114, 3405, 3414, 3505, 3514, 3605 and/or 3614 may be applied to satisfy Pol major requirements], §3710; prereq jr, #) Supervised, scheduled work assignments in the performance of governmental functions in comparative politics; full- or part-time employment basis.

Pol 3517. Western European Political Systems. (4 cr, §3516; prereq 60 cr incl 12 cr Soc Sci or #) Comparative analysis of development and operation of political-government institutions and processes in selected Western European countries; political and ideological patterns and trends; problems of democratic politics; policy issues in advanced industrial societies and the future of the "welfare state."

Pol 3520. Chinese Government and Politics. (4 cr; prereq 60 cr incl 12 cr Soc Sci or #) Imperial China and the "Western impact" in the 19th century. Twentieth-century transitions: Republican, Nationalist, and Communist revolutions. Maoist and post-Maoist politics and policies: traditional, developmental, and ideological variables. Deng Xiaoping, political succession, and problems of future development.

Pol 3560. Latin American Governments and Politics. (4 cr; prereq 60 cr incl 12 cr Soc Sci or #) Analysis of government institutions/processes in Latin American nations. Regional differences; colonialism/imperialism; military populist, Marxist regimes; government repression, political conflict, revolution; models of development and role of the state; debt crisis, structural adjustment; democratization; international relations.

Pol 3570. Third World and Development. (4 cr; prereq 1050 or 1500 or 12 cr Soc Sci, 60 cr or #) Nature of political development; individual and institutional causes and consequences of development; political economy of Third World.

Pol 3600. Political Concepts. (4 cr, §1600; prereq 60 cr or #) Analysis of fundamental political concepts, including but not limited to justice, liberty, equality, power, democracy, political obligation, and community. Perspectives of diverse political philosophies and cultures.

Pol 3605. Non-Governmental Internship: Theory. (1-8 cr [may be repeated for 12 cr max; no more than 4 cr of 3105, 3114, 3405, 3414, 3505, 3514, 3605, and/or 3614 may be applied to satisfy general upper div Pol major requirements]; prereq jr, Pol major, #) Supervised, scheduled work assignments in the performance of political theory functions in nongovernmental organizations; full- or part-time employment. Not all outside work is eligible; see department head for requirements.

Pol 3609. Intern Teaching in Political Science: Political Theory. (1-2 cr [may be repeated for 4 cr max; no more than 4 cr of 3109, 3409, 3509 and/or 3609 may be applied to satisfy general upper div Pol major requirements], §3900; prereq sr, Pol major, #) Experience teaching political theory in the Department of Political Science. Students serve as intern teachers assisting course instructor. Application deadline one week before beginning of registration for the following quarter. Grade of at least B+ must be obtained in the course for which the student interns.

Pol 3610. Political Economy: An Introduction. (4 cr; prereq 60 cr incl 8 cr Soc Sci or Econ or Bus or #) Examination of the relationship between politics and economics and the ways they affect each other, focusing on political and economic values/goals and their role in shaping public policy; policies and policymaking in selected national systems; the international economy.

Pol 3613. Special Topics in Political Theory: (Various Titles to Be Assigned). (1-4 cr [3113, 3413, 3513 and/or 3613 may be repeated for 8 cr max], §3902; prereq 60 cr incl 8 cr Soc Sci or #) Contemporary topics in political theory. Course content announced in *Class Schedule*.

Pol 3614. Government Internship: Political Theory. (1-8 cr [may be repeated for 12 cr max; no more than 4 cr of 3105, 3114, 3405, 3414, 3505, 3514, 3605 and/or 3614 may be applied to satisfy Pol major requirements], §3710; prereq jr, #) Supervised, scheduled work assignments in the performance of governmental functions in political theory; full- or part-time employment.

Pol 3620. Feminist Theory. (4 cr; prereq 1600 or 1610 or WS 1000, 60 cr or #) Historical and conceptual examination of feminist political theory from 18th century to present.

Pol 3625. Democratic Theory. (4 cr; prereq 1600 or 1610, 60 cr or #) Foundations, concepts, and implications of democracy; democracy and economic order; liberty and authority; equality; representation; participation; majority rule; critics of democracy.

Pol 3640. Theory and Practice of Non-Violence. (4 cr; prereq 60 cr or #) Examination of theories and practices of non-violence; nature of violence; philosophical bases, tactical strategies, and legitimate use of non-violence for conflict resolution and social change.

COURSE DESCRIPTIONS

Pol 3651. Classical Political Thought. (4 cr, \$5653; prereq 60 cr or #)

Justice and the political community; classical Greek thought and early medieval thought, concentrating on Plato, Aristotle, Augustine, and Aquinas.

Pol 3652. Early Modern Political Thought. (4 cr, \$5655; prereq 60 cr incl 1600 or 1610 or #)

The individual and the state; political thought of the Enlightenment; Machiavelli, Hobbes, Locke, Hume, Rousseau, Wollstonecraft.

Pol 3653. Recent Political Thought. (4 cr, \$5657; prereq 60 cr incl 1600 or 1610 or #)

Political thought from French Revolution to the present; examination of works of major political philosophers including J. S. Mill, Marx, and 20th-century philosophers.

Pol 3910. Honors Seminar: Landmarks in Political Science—American Government. (4 cr; \$3890; prereq 80 cr, 3.00 GPA in Pol courses, Δ)

Examination of selected books and essays published in the last 40 years considered to be outstanding contributions to political science in American governmental systems and processes. Examination of the works' arguments and their contribution to political science.

Pol 3940. Honors Seminar: Landmarks in Political Science—International. (4 cr; \$3890; prereq 80 cr, 3.00 GPA in Pol courses, Δ)

Examination of selected books and essays published in the last 40 years considered to be outstanding contributions to political science in international relations. Examination of the works' arguments and their contribution to political science.

Pol 3950. Honors Seminar: Landmarks in Political Science—Comparative Politics. (4 cr; \$3890; prereq 80 cr, 3.00 GPA in Pol courses, Δ)

Examination of selected books and essays published in the last 40 years considered to be outstanding contributions to political science in comparative politics. Examination of the works' arguments and their contribution to political science.

Pol 3960. Honors Seminar: Landmarks in Political Science—Theory. (4 cr; \$3890; prereq 80 cr, 3.00 GPA in Pol courses, Δ)

Examination of selected books and essays published in the last 40 years considered to be outstanding contributions to political science in political theory. Examination of the works' arguments and their contribution to political science.

Pol 5111. Independent Study: American Government. (1-4 cr [5111, 5411, 5511 and/or 5611 may be repeated for 8 cr max]; \$5704; prereq 12 cr Pol, 8 cr other Soc Sci, #)

Opportunity for advanced study and research in American governmental systems and processes supervised by staff member; student must consult with instructor before registration.

Pol 5190. Seminar: Public Policy. (4 cr, \$5199; prereq 8 cr relevant upper div Pol courses, #)
Analysis of public policymaking, with supervised research and writing on selected public policy issues.

Pol 5390. Seminar: Urban Affairs. (4 cr, \$5399; prereq 8 cr relevant upper div urban and regional studies courses, #)
Supervised research and writing in urban and regional processes and problems.

Pol 5411. Independent Study: International Relations. (1-4 cr [5111, 5411, 5511 and/or 5611 may be repeated for 8 cr max]; \$5704; prereq 12 cr Pol, 8 cr other Soc Sci, #)

Opportunity for advanced study and research in international relations supervised by a staff member; student must consult with instructor before registration.

Pol 5490. Seminar: International Relations. (4 cr, \$5499; prereq 8 cr relevant upper div Pol courses, #)
Supervised research and writing in current problem areas of international relations.

Pol 5501. Workshop in Comparative Politics: (Various Titles to Be Assigned). (1-6 cr [5101, 5401, 5501 and/or 5601 may be repeated; no more than 6 cr can be applied to a Graduate School program]; prereq 70 cr incl 12 cr Soc Sci or #)

Intensive study in various aspects of the field of comparative politics.

Pol 5510. Comparative Public Policy. (4 cr, \$3590; prereq 8 cr Lib Ed Cat III or #)

Comparison of selected countries' approaches to selected public policy issues. One or more issues (e.g., foreign policy, federalism, arms control, political/economic development) considered each time course offered. Check with instructor for proposed countries and issues.

Pol 5511. Independent Study: Comparative Politics. (1-4 cr [5111, 5411, 5511 and/or 5611 may be repeated for 8 cr max]; \$5704; prereq 12 cr Pol, 8 cr other Soc Sci, #)

Opportunity for advanced study and research in comparative politics supervised by a staff member; student must consult with instructor before registration.

Pol 5590. Seminar: Comparative Politics. (4 cr, \$5599; prereq 8 cr relevant upper div Pol courses, #)
Supervised analysis, research, and writing in selected areas of comparative politics.

Pol 5610. Contemporary Political Theory. (4 cr; prereq 1600 or 1610, 70 cr incl 8 cr relevant upper div Pol courses or #)

Issues still under vigorous debate in contemporary political theory—Marxism, feminism, critical theory, Rawls.

Pol 5611. Independent Study: Political Theory. (1-4 cr [5111, 5411, 5511 and/or 5611 may be repeated for 8 cr max]; \$5704; prereq 12 cr Pol, 8 cr other Soc Sci, #)

Opportunity for advanced study and research in political theory supervised by a staff member; student must consult with instructor before registration.

Pol 5690. Seminar: Political Theory. (4 cr, \$5290, \$5299; prereq 1600 or 1610, 8 cr relevant upper div courses, #)

Analysis and supervised research and writing in selected topics in political theory.

Psychology (Psy)

College of Education and Human Service Professions

Psy 1003. General Psychology. (5 cr)

Introduction to scientific study of behavior; consideration of the major topics investigated by psychologists with emphasis on basic principles, concepts, and procedures used in psychology.

Psy 1101. Human Service Seminar. (1 cr [may be repeated for 6 cr max]; prereq #)

Introductory examination of one of six topics related to human service work. The six rotating topics are: (a) records, reports, and grants, (b) ethical and legal concerns, (c) family dysfunctions, (d) nomenclature, (e) crisis intervention, (f) introduction to agencies.

Psy 1110. Fields of Psychology. (1 cr; prereq 1003, Psy major)

Provides opportunities for student involvement in department activities and future career possibilities and requirements.

Psy 3020. Basic Statistical Methods. (5 cr, \$3811; prereq 3 cr Psy, Math 1110 or equivalent)

Descriptive statistics, introduction to correlational analysis and regression, sampling techniques and statistical inference; applications of simple analysis of variance and chi square in the behavioral sciences.

Psy 3021-3022. Experimental Design and Methodology. (5 cr each; prereq 3020, 3 hrs lect, 2 hrs lab, 2 hrs ar)

Introduction to problems and methods of experimentation in psychology; the logical and scientific basis of experimental psychology; problems and techniques of designing, conducting, and reporting experiments; selected statistical topics and methods of psychological scaling; experimental procedures and research findings in areas of psychophysics, sensory processes, perception, learning, motivation, thinking, language, and group behavior.

Psy 3061. Physiological Psychology. (4 cr; prereq 3 cr Psy, Biol 1102 or #)

Physiological basis of behavior, including the central and peripheral nervous systems, sensory processes as they relate to perception, cognition, emotion, motivation, intelligence, and learning.

Psy 3081. Systems of Psychology. (4 cr; prereq 3 cr Psy)

Survey of historical development and current status of contemporary systems and theories in psychology.

Psy 3111. Psychology of Personality. (4 cr; prereq 3 cr Psy)

Basic concepts, issues, problems, and methods involved in the study of personality; introduction to selected theories of personality.

Psy 3112. Psychology of Religion. (3 cr; prereq #)

Study of religious beliefs and their functional value in human life. Development of religious beliefs. Varieties of religious experience and dimensions of religiousness. Religion and mental health.

Psy 3121. Abnormal Psychology. (4 cr; prereq 3 cr Psy)

Study of abnormal behavior, including classification of various disorders, description of causal factors, methods of assessment, prevention and treatment.

Psy 3201. Social Psychology. (4 cr; prereq 3 cr Psy)

Study of how thoughts, feelings, and behavior of individuals are affected by others. Social influence and interaction. Topics include attitude measurement and attitude change, conformity, impression formation, attribution theory, aggression, and prosocial behavior.

Psy 3211. Group Dynamics. (3 cr; prereq 3 cr Psy)

Study of principles and processes of interaction in groups, structure, and functioning of groups; leadership, communication, decision making, social influence; aspects of sensitivity training.

Psy 3215. Topics in Human Sexuality. (3 cr, \$3216; prereq 3 cr Psy)

Examination of constitutional and psychosocial factors leading to gender development and establishment of sexual roles; group discussion of family and peer group influences on attitudes, values, and behavior.

Psy 3216. Human Sexuality: A Personal Perspective. (3 cr, \$3215; prereq 3 cr Psy; offered through UC)

Independent study course. Students deal with typical topics covered in human sexuality through viewing videotapes, reading text and journal articles.

Psy 3221. Changing Role of Women. (4 cr; prereq 3 cr Psy)

Analysis of biological and cultural factors present in the formation of masculine and feminine roles and personalities; the relationship between sex identity and self-concept; the effects of sex roles on interpersonal relationships; formation of attitudes, values, and beliefs as related to sex roles; effects of sex roles on vocational choice and achievement.

Psy 3222. Men in Society. (3 cr; prereq 1003 or #)

Study of masculinities and male experiences as specific and varying social-historical cultural formations.

Psy 3231. Psychology of Drug Use. (3 cr; prereq 3 cr Psy)

Examination of predisposers to drug use; acute and chronic psychosocial effects of drug use; prevention, treatment, and crisis intervention strategies.

Psy 3331. Developmental Psychology. (5 cr; prereq 3 cr Psy)

Major processes involved in human development from conception to death. Topics include a survey of theoretical and methodological issues in the study of the individual, a comprehensive view of development during the period of most rapid growth, a perspective on problems arising at different stages of development by tracing their origin.

Psy 3341. Psychology of Aging and Elderly. (3 cr; prereq 3331; offered through UC)

Psychological factors involved in aging; services for the aging as a result of the Older American Act of 1965; educational opportunities for senior citizens based on state law; and the organization, coordination, and administration of various kinds of homes and programs for the aged on the local level.

COURSE DESCRIPTIONS

Psy 3371. Child and Adolescent Psychology. (3 cr, §3361; prereq 3331)
Growth of individual and social forms of human behavior. Interaction of heredity and environment on physical, intellectual, social, and emotional changes from conception to adulthood.

Psy 3400. Marriages and Families. (4 cr, §FamL 3675)
Analysis of personal and cultural factors influencing decisions, functions of families; evaluation of expectations, gender roles, cultural diversity, and societal demands on marital/partner choices and family systems; communication, conflict resolution, violence, and power; guidelines for problem prevention, and strengthening families; factors affecting satisfaction, commitment, stress, and crises over the life span.

Psy 3445. Transpersonal Psychology. (4 cr; prereq 1003, 3531 or #)
Study of this emergent field in psychology introduces the idea of a full-spectrum model of development combining child, adult, and spiritual stages. Examines contemplative practices, alternative views of reality, near-death experiences, lucid dreaming, and parapsychology.

Psy 3450 Dreamwork. (4 cr; prereq 1003)
Historical perspective and theoretical overview of dreamwork. Dream interpretation methods. Dream symbols and themes, archetypal and recurring dreams, nightmares.

Psy 3524. Basic Helping Skills. (5 cr, §3522; prereq 3 cr Psy)
Rationale for and practice of basic skills needed for effective interpersonal helping.

Psy 3531. Psychology of Personal Adjustment. (4 cr; prereq 3 cr Psy)
Examines personal development by exploring ways to change, grow, and achieve one's creative potential. Explores adjustment to social, political, and cultural forces. Includes lab experience that increases self-awareness and self-knowledge.

Psy 3535. Career Awareness and Development. (3 cr; prereq 3 cr Psy; offered through UC)
Theoretical base and practical experiences for students to use in their own career development, from awareness through job search and adjustment.

Psy 3540. Psychology of Food Abuse. (3 cr; prereq 3 cr Psy)
Focus on psychological underpinnings of eating disorders of obesity, anorexia, and bulimia. Etiology, psychodynamics, and treatment.

Psy 3611. Theories of Learning. (4 cr; prereq 3 cr Psy)
Principles of learning and conditioning; learning theories from historical, philosophical, and experimental aspects; various theories of learning as a basis for the professional application of learning principles in human service professions.

Psy 3613. Behavior Modification. (3 cr; prereq 3 cr Psy)
Basic psychological methods, techniques, and findings in the applications of operant and respondent conditioning to the treatment of human behavior problems.

Psy 3621. Cognition. (4 cr; prereq 3 cr Psy)
Introduction to the study of cognitive behavior; discussion of theoretical frameworks, experimental methodology and application.

Psy 3661. Psychology of Language. (4 cr; prereq 3 cr Psy)
Introduction to linguistic analysis, basic theories of language, the relationship between thought and language, acquisition of language, and other topics related to the theory and application of the psychology of language.

Psy 3691. Sensation and Perception. (4 cr; prereq 3 cr Psy)
Theories, methods, and findings in the study of sensory and perceptual processes; psychophysics of the visual, auditory, gustatory, olfactory, cutaneous, kinesthetic, vestibular, and pain senses; demonstration and analysis of the perceptions of constancy, illusion, space, time, motion, and form.

Psy 3701. Psychology in Personnel Work. (3 cr; prereq 3 cr Psy)
Introduction to contributions of the field of psychology to modern personnel work, including testing, selection, merit rating, training, counseling, facilitating environments, and morale.

Psy 3704. Industrial and Business Psychology. (3 cr; prereq 3 cr Psy)
Factors affecting business and industrial work efficiency, including hours of work, safety, training, fatigue, and monotony; introduction to human engineering and an emphasis on contemporary concepts in the area of motivation. Introduction to selected theories related to motivation and organization.

Psy 3707. Organization Psychology. (4 cr; prereq 3 cr Psy)
Fitting organizations to people: behavioral science-based criteria of organization effectiveness, organization theories, approaches to person/organization goal achievement; structures, communication networks, leadership theories/styles; climate; reward systems; external community relations and influences.

Psy 3821. Psychological Measurement. (3 cr; prereq 3020 or #)
Study of selection, preparation, administration, and interpretation of psychological tests and diagnostic devices, with emphasis on sources of tests of intelligence, aptitude, achievement, personality, and interest; criteria for their evaluation, methods of scoring, and interpretation; preliminary consideration of theories of reliability and validity of measurements.

Psy 3940. Directed Research in Psychology. (Cr ar [may be repeated for 6 cr max]; limited to Psy majors and minors; prereq #)
Supervised experience in conducting psychological research; problem chosen by instructor; written report required.

Psy 3960. Special Topics in Psychology: (Various Titles to Be Assigned). (1-4 cr; prereq 3 cr Psy)

Psy 3970. Research in Psychology. (Cr ar [may be repeated for 6 cr max]; limited to Psy majors and minors; prereq #)
Intensive independent research on problem chosen by student; term paper required.

Psy 3977. Honors Research in Psychology. (Cr ar [may be repeated for 3 cr max]; prereq sr Psy major, approval by Psy faculty, 3.00 GPA overall, 3.25 GPA in Psy)

Individual research (advanced) in selected areas; oral examination upon completion.

Psy 3985. Field Placement for Special Counseling. (3-15 cr; prereq admittance to BAS program with Psy major, #)

Experience counseling in agencies, supervised by employees and University personnel. Nine credits required in junior year.

Psy 3986. Preprofessional Field Placement. (Cr ar [may be repeated for 15 cr max]; \$3980; prereq BA or BAS sr major in Psy, Δ)

Supervised experience in a human service organization. Curriculum requirements dependent on placement. Twelve credits required in senior year for BAS major.

Psy 3990. Projects in Psychology. (Cr ar [may be repeated for 6 cr max]; limited to Psy majors and minors; prereq #)

Supervised practical experience in University or community activities to gain experience in psychology applications; report required.

Psy 3995. Honors Seminar in Psychology. (3 cr; prereq 3021, Psy major with 90 cr, 3.00 GPA overall, 3.25 GPA in Psy, #)

Concentrated study using original writings on major issue or by person with historical or theoretical importance within psychology. Bibliography, individual paper, and group project required.

Psy 3997. Honors Projects in Psychology. (Cr ar [may be repeated for 3 cr max]; prereq sr Psy major, approval by Psy faculty, 3.00 GPA overall, 3.25 GPA in Psy)

Individual projects (advanced) demonstrating applications of psychology based on sound theoretical and research foundations; written report and oral examination.

Psy 5060. Biological Bases of Behavior. (3 cr; prereq 3 cr Biol)

Survey of biological concepts and approaches to the explanation and treatment of normal and abnormal behavior.

Psy 5121. Psychopathology. (4 cr; prereq 5 cr Psy or #)

Survey of historical and contemporary issues in psychopathology; concepts of normality and abnormality; patterns of abnormal behavior and their dynamics and treatment, including use of the DSM III-R.

Psy 5122. Developmental Psychopathology. (4 cr; prereq 5 cr Psy or #)

Abnormal behaviors in preschool and school-age populations in developmental context; deviance from developmental norms.

Psy 5123. Psychology of Addictive Behaviors. (3 cr; offered through UC only)

Nature of addictions. Models of addictive behaviors. Consequences of addictive behaviors and treatment choices.

Psy 5211. Group Counseling. (3 cr; prereq grad or #) Group dynamics; current theory and research; develop leadership skills relative to school and community counseling; lab experience.

Psy 5311. Child Development: Current Theory and Research. (3 cr; prereq 3 cr Psy or #)

Psychoanalytic, cognitive-developmental, and social learning viewpoints on child development. Review of significant research derived from these theoretical viewpoints.

Psy 5321. Late Childhood and Adolescent Development. (3 cr; prereq 3 cr Psy or #)

Physical, social, emotional, cognitive, personality, and contextual changes in children 10 years and older and early, middle, and late adolescence.

Psy 5500. Parenting. (4 cr, \$FamL 5610; prereq Psy 3331 or #)

Parent-child interaction, roles and responsibilities throughout the life cycle; examination and analysis of parenting strategies; contemporary variations of family cultures, structures, and lifestyles; sources of education and support.

Psy 5512. Developmental Guidance. (3 cr; prereq 5 cr Psy or Educ or #)

Foundations and applications of developmental theories, including developmental tasks for use in classroom, large- and small-group, and individual counseling settings.

Psy 5516. Sex: A Human Function. (4 cr; prereq 5 cr Psy or #; offered through UC only)

Examines the current status of human sexuality emphasizing topics related to sexual health, sexual functioning, and the politics of sex role and sexuality.

Psy 5521. Counseling Procedures. (3 cr; prereq grad or #)

Introductory course in advanced counseling for school and community counselors; theoretical orientations in counseling; application of counseling process to selected case studies; orientation/exploration of issues in counseling.

Psy 5523. Family Counseling: Theoretical Foundations. (3 cr; prereq grad, Ed Psy or SW candidates or #)

Theoretical foundations for family counseling. History and origins of family counseling, major family theories, and some related intervention approaches.

Psy 5525. Counseling Skills. (4 cr, \$PsyA 5525; prereq 5521 or #)

Application of humanistic, cognitive, and behavioral counseling theories through intensive practice of skills.

Psy 5526. Cross-Cultural Psychology. (3 cr; prereq 3 cr Psy or Educ or #)

Enhances understanding and promotes skills in working with racial minorities, women, and low socioeconomic status persons.

Psy 5527. Development in Worldwide Cultures. (3 cr; prereq 3 cr Psy or #; offered through UC)

Independent study course. Multicultural and cross-cultural analysis of issues shaping development in selected countries worldwide. Topical examination of growth processes from conception through puberty, with ecological evaluation of the interaction in families of different cultures. Analysis of forces contributing to risk and resilience in a culturally pluralistic society.

COURSE DESCRIPTIONS

Psy 5611. Psychology of Human Learning. (3 cr; prereq 3 cr Psy or #)
Principles and research in human learning. Implications and applications for instruction and modifying behavior.

Psy 5712. Career Development: Theory and Practice. (3 cr; prereq 5 cr Psy or #)
Major theories of career development and their research base. Role of guidance and education in career development. Evaluation of current practices in occupational guidance and career education.

Psy 5722. Psychological Consultation. (3 cr; prereq grad or #)
Theories, principles, practices, and procedures in the consultation process and the development, organization, and management of human service and education systems.

Psy 5755. Counseling Individuals with Disabilities and Their Families. (4 cr; prereq 3524 or #)
Contemporary practice of rehabilitation counseling with specific disabled populations and their families in a noncultural context.

Psy 5812. Advanced Statistical Methods. (3 cr; prereq Psy 3020 or equiv or #)
Application of variance, covariance, and linear regression analyses to a variety of multilevel and factorial designs commonly used in experimental and quasi-experimental educational research.

Psy 5813. Research Methods in Psychology. (3 cr, \$PsyF 8041; prereq Psy 5812 or equiv or #)
Research methods and design for the behavioral sciences including quasi-experimental design, writing a research proposal, completing appropriate analysis, and interpretation of results.

Psy 5851. Tests and Measurements. (3 cr; prereq grad, statistics course or #)
Familiarizes counseling students with major types of available tests and their special contributions and limitations.

Psy 5900. Internship: School Licensure. (2 cr [may be repeated for 6 cr max; cr cannot be applied to a Graduate School program], \$8551; prereq #, completion of counselor training program)
Supervised work experience in elementary, middle, or secondary school to fulfill one year experience required for students without a teaching license who wish to be licensed as a school counselor by the Minnesota Board of Teaching.

Psy 5990. Projects in Psychology. (1-6 cr [may be repeated for 6 cr max]; prereq #)
Guided individual in-depth explorations of psychological principles. Can be used for Plan B Star Paper option.

Psy 5991. Directed Instruction. (1-4 cr [may be repeated for 6 cr max]; prereq #)
Experience in teaching psychology under supervision. Students work with department faculty in planning and helping teach an undergraduate course.

Psy 8050. Research Problems. (1-9 cr; prereq candidate for MA in Ed Psy degree)
Application of research knowledge through guided individual study of a psychology topic. Used to complete Plan B paper requirement.

Psy 8500. Seminar Guidance. (1 cr; prereq grad or #)
Orientation to the master's degree, including requirements and results of past program evaluations. Counseling as a profession; ethical standards of several counseling specialties.

Psy 8501. Seminar: Interpersonal Processes in Groups. (2 cr; prereq grad or #)
Lab experience to improve counselor effectiveness in interpersonal relations and group counseling.

Psy 8503. Ethical, Social, and Cultural Contexts of Counseling. (2 cr; prereq grad or #)
Professional ethics seminar for counselors. Critical study of professional codes of ethics and the social and cultural contexts of counseling. Bases for ethical decision making in dealing with situations not covered by the professional code.

Psy 8510. Seminar: Professional Issues in School Counseling. (1 cr; prereq grad or #)
History and philosophy of school counseling, current trends and professional issues. Role and functions of the school counselor contrasted with other professionals such as school psychologist and school social worker. Program planning, management, and evaluation.

Psy 8511. Professional Issues in Community Counseling. (1 cr; prereq grad or #)
History and philosophy of community-based counseling. Current issues and trends in programming. Basic principles of program development, management, and evaluation. Patterns of staffing. Staff roles and responsibilities.

Psy 8531. Pre-Practicum and Outreach Counseling. (3 cr; prereq Ed Psy grad or #)
Supervised practice in outreach group counseling and individual counseling on UMD campus and beginning practice off campus at a school or community setting. Videotaping required.

Psy 8532. Practicum: Individual Counseling. (3 cr [may be repeated for 9 cr max; no more than 3 cr can be applied to a Graduate School program]; prereq Ed Psy grad or #)
Community or school site supervised practice of counseling skills with focus on counseling individuals. Videotaping required.

Psy 8541. Practicum: Small Group Focus. (3 cr [may be repeated for 9 cr max; no more than 3 cr can be applied to Graduate School program]; prereq grad Ed Psy or #)
Community or school site supervised practice of counseling skills with focus on small group counseling. Videotaping required.

Recreation (Rec)

College of Education and Human Service Professions

Courses numbered 1206 to 1799, unless designated by a double asterisk, fulfill liberal education requirements.

Rec 1000. Recreation and Leisure Today. (5 cr)
Overview of recreation and leisure in modern society and its impact on people.

Rec 1206. Fall Outdoor Recreation. (2 cr)
Instruction and practice in the skills of fall camping and outdoor activities. Includes navigation, rockclimbing, and hiking skills.

Rec 1207. Winter Outdoor Recreation. (2 cr)
Instruction and practice in the skills of winter outdoor recreational activities, including snowshoeing, cross-country skiing, ice fishing, and camping.

Rec 1208. Spring Outdoor Recreation. (2 cr)
Instruction and experience in the skills of spring outdoor recreational activities: canoeing, fishing, camping, hiking.

Rec 3300. Recreation Programming. (3 cr; prereq 3320 or 3330, Soc 1500 or #)
Designing and evaluating recreation programs.

Rec 3310. Recreation Leadership. (3 cr; prereq 3335 or #)
Practical and theoretical view of practices, methods, and processes involved in leadership development, including a detailed analysis of the qualities and roles of leaders and supervisors of recreation activities.

Rec 3315. Recreation Management. (3 cr; prereq 3310 or #)
Analysis of the administrative process and legal basis of personnel management, fiscal management, and facility management.

Rec 3320. Recreational Sports. (3 cr; prereq 1000 or #)
Organization and administration of intramural, extramural, and club sports in a recreational sport agency.

Rec 3325. Life Fitness Program Development. (3 cr; prereq 3320 or #)
Organization and administration of life fitness activities and nonformal instruction in recreational sport programs.

Rec 3327. Recreation Event Management. (3 cr; prereq 3300 or #)
Planning, directing, and evaluating major recreational sport events (e.g., marathons, triathlons, Special Olympics, major tournaments).

Rec 3330. Outdoor Recreation. (3 cr)
Overall view of outdoor recreation with special emphasis on northern Minnesota.

Rec 3331. Camp Administration. (3 cr; offered through UC)
Theoretical and practical knowledge regarding the organization and management of camps.

Rec 3332. Camp Counseling. (3 cr; offered through UC)
Examination of skills, roles, and responsibilities of counselors in organized camps in relation to objectives, organization, guidance, leadership skills, and program resources. Practical experience in campcraft and leadership skills.

Rec 3335. Recreation Planning. (3 cr; prereq 3320 or 3330, Soc 1500 or #)
Planning process and factors in designing, constructing, and maintaining recreation facilities and grounds.

Rec 3340. Field Interpretive Techniques I. (3 cr; prereq 1000 or #; offered through UC)
Techniques and methods for interpreting the natural history of the autumn environment. Geomorphology, tree identification, and basic raptor ecology emphasized. Primarily field based; uses outdoor sites throughout northeast Minnesota.

Rec 3341. Field Interpretive Techniques II. (3 cr; prereq 3340, Rec major or #; offered through UC)
Techniques and methods for interpreting the natural history of the winter and spring environments. Ecology of winter, ponds, spring wildflowers, biomes, and migratory birds emphasized. Primarily field based; uses outdoor sites throughout northeast Minnesota.

Rec 3350. Recreation Practicum. (3 cr; prereq 3300 or #)
Practical involvement in a professional recreation experience.

Rec 3900. Recreation Internship. (5-15 cr; prereq recreation major or Δ)
Supervised professional experience in recreation agencies.

Rec 3910. Recreation Seminar. (1-4 cr [may be repeated for 4 cr max]; prereq 3320 or 3330 or #)
Facilitated discussions of contemporary recreation and leisure issues.

Rec 3950. Independent Study. (1-6 cr each offering [may be repeated for 6 cr max]; prereq #)
Opportunity for students to undertake an independent project that would serve to further their knowledge base and/or professional competencies.

Rec 3952. Readings in Recreation/Leisure. (1-6 cr [may be repeated for 6 cr max]; prereq #)
Complementary readings and discussion in a student's area of interest in the field of recreation and leisure with faculty supervision.

Russian (Russ)

College of Liberal Arts

Also see courses listed under Language (Lang) earlier in this section.

Russ 1111. Beginning Russian I. (4 cr)
Grammar, reading, and conversation for students with no previous knowledge of Russian.

Russ 1112. Beginning Russian II. (4 cr; prereq successful completion of 1111 or equiv or #)
Grammar, reading, and conversation for students with little previous knowledge of Russian.

Russ 1113. Beginning Russian III. (4 cr; prereq successful completion of 1112 or equiv or #)
Grammar, reading, writing, and conversation.

Safety (Safe)

College of Science and Engineering

Safe 3900. Industrial Safety and Hygiene. (3 cr; prereq Ind Tech major, 90 cr or #; 3 hrs lect; offered through UC)

Principles of occupational safety and health as they apply to technical professions. Recognition, evaluation, control, and avoidance of workplace hazards. Health hazards from harmful physical and chemical agents, including electrical and mechanical hazards, chemicals, noise, and radiation.

Safe 5000. Loss Control. (2 cr [cr to be used only for MIS program]; prereq Δ; 2 hrs lect; offered through UC)
Analytical aspects of occupational safety and health problems including problem solving and decision making as related to cause and effect of accidental death and injury. Workers' compensation and research in occupational safety studied as a means of preventing corporate financial losses.

Safe 5001. OSHA Voluntary Compliance. (3 cr [cr to be used only for MIS program]; prereq Δ; 3 hrs lect; offered through UC)

Overview of voluntary compliance with provisions of the federal Occupational Safety and Health Act. Recognize the more critical health and safety violations and provide guidelines for correcting hazards in the workplace.

Safe 5002. Safety and Health Standards, Codes, and Regulations. (3 cr [cr to be used only for MIS program]; prereq 5001 or #, Δ; 3 hrs lect; offered through UC)

Study of occupational safety and health standards and codes and regulations with particular emphasis on application to typical work situations.

Safe 5003. Legal Implications in Safety. (2 cr [cr to be used only for MIS program]; prereq 5000 or #, Δ; 2 hrs lect; offered through UC)

Federal, state, and local laws and judicial interpretations that have applications to safety programs including tort liability and insurance, and corporate responsibility in product safety.

Safe 5004. Organization, Administration of Safety Programs. (3 cr [cr to be used only for MIS program]; prereq 5001, 5002, #, Δ; 3 hrs lect; offered through UC)

Study of current administrative practices that specifically relate to organizing and managing a modern safety program. Actual involvement in the design and development of safety programs suitable for an industrial facility.

Safe 5005. System Safety. (3 cr [cr to be used only for MIS program]; prereq Δ; 3 hrs lect; offered through UC)

Comprehensive analytical approach examining hazard mechanisms through the use of statistical techniques, accident probabilities, epidemiological studies, and cost/benefit analyses.

Safe 5006. Behavioral Aspects of Safety. (3 cr [cr to be used only for MIS program]; prereq 5000, 5001, 5002, Δ; offered through UC)

Study of behavior-based approach to safety. Characterizes employees as mature human beings motivated to work safely through employment of behavior-based programs.

Safe 5100. Industrial First Aid. (2 cr [cr to be used only for MIS program]; prereq Standard First Aid Certificate or #, Δ; offered through UC)
Principles of first aid as related to industrial accident prevention with emphasis on knowledge, skills, and judgments. Leads to the American Red Cross Standard First Aid Instructor's Rating.

Safe 5105. Environmental Health and Safety. (2 cr [cr to be used only for MIS program]; prereq Δ; 2 hrs lect; offered through UC)

Emergency management techniques for natural and human-caused large scale accidents, emphasizing compliance with current federal and state environmental regulations for planning and implementation of emergency response and hazard communication.

Safe 5106. Physical Hazard Control. (2 cr [cr to be used only for MIS program]; prereq Δ; 4 hrs lect-lab; offered through UC)

Examination of physical hazards in the work environment and methods of control. Emphasis on recognition of common hazards found in industry and design of corrective measures.

Safe 5107. Physical Hazard Control Design. (2 cr [cr to be used only for MIS program]; prereq 5106, Δ; 4 hrs lect-lab; offered through UC)

Advanced course in study and design of controls for physical hazards in work environment. Emphasis on recognition of high-hazard work environments and application of appropriate corrective design measures.

Safe 5108. Industrial Toxicology. (3 cr [cr to be used only for MIS program], \$5102; prereq Δ; offered through UC)

Introduction to the principles and practice of toxicology as it relates to chemical hazards of the workplace. Interpretation and assessment of data and potential risk. Derivation and application of guidelines and regulations concerning toxic chemicals.

Safe 5111. Traffic and Fleet Safety. (2 cr [cr to be used only for MIS program]; prereq Δ; 2 hrs lect; offered through UC)

Overview of traffic and highway safety problems including highway design, traffic control, and regulation. In- and out-of-building vehicle and pedestrian traffic control with special emphasis on fleet safety programs.

Safe 5112. Elements of Industrial Hygiene. (2 cr [cr to be used only for MIS program]; prereq Δ; 2 hrs lect; offered through UC)

Introduction to industrial hygiene. Survey of the effects of chemical, physical, and biological agents on the body, and typical methods of control.

Safe 5114. Advanced Industrial Hygiene. (2 cr [cr to be used only for MIS program]; prereq 5112, Δ; offered through UC)

Advanced study in recognition, evaluation, and control techniques necessary for prevention of occupationally related diseases.

Safe 5115. Seminar in Industrial Hygiene. (1 cr [cr to be used only for MIS program]; prereq #; offered through UC)

Candidate-facilitated discussions of contemporary industrial hygiene and safety issues.

Safe 5119. Air Sampling and Analysis. (2 cr [cr to be used only for MIS program]; prereq 5112 or #, Δ; offered through UC)

Practical study and use of air sampling equipment, analytical methods, and ventilation measurement.

Safe 5120. Air Measurement Laboratory. (1 cr [cr to be used only for MIS program]; prereq 5112 or #, Δ; offered through UC)

Field application of air sampling and measurement equipment and techniques.

Safe 5121. Industrial Noise Control. (2 cr [cr to be used only for MIS program], \$5101; prereq Δ; offered through UC)

Study of the physics of sound, industrial noise sources, effects of noise on humans, and noise control methods. Techniques of noise measurement and audiology discussed in relation to regulatory requirements.

Safe 5122. Ergonomics. (3 cr [cr to be used only for MIS program], \$5113; prereq Δ; 2 hrs lect, 1 hr lab; offered through UC)

Human factors of safety engineering that provide the theory, principles, and methods of work site development as applied to the anthropometric, physiological, and psychological need considerations of employees.

Safe 5123. Fire Prevention and Control. (2 cr [cr to be used only for MIS program], \$5124; prereq Δ; 2 hrs lect; offered through UC)

Hazard analysis and risk assessment as related to the prevention and control of undesired fires; analytical study of flammable materials and extinguishing systems found in industrial settings.

Safe 5127. Elements Of Industrial Ventilation. (3 cr [cr to be used only for MIS program], \$5125; prereq Δ; 2 hrs lect, 2 hrs lab; offered through UC)

Basic principles of ventilation as applied to control of air contaminants produced by industrial operations. Elementary design of exhaust ventilation systems, air flow principles of exhaust hoods, and fan operation and specification.

Safe 5128. Advanced Industrial Ventilation. (3 cr [cr to be used only for MIS program], \$5126; prereq 5127, Δ; 2 hrs lect, 2 hrs lab; offered through UC)

Advanced principles of ventilation for control of airborne chemical contaminants. Complex system design, principles and function of air cleaning devices, troubleshooting, and solutions to industrial ventilation problems.

Safe 5900. Internship in Industrial Safety. (1-5 cr [cr to be used only for MIS program]; prereq 5004, admission to candidacy for degree, Δ; offered through UC)

Cooperative internship in an industrial, governmental, or other agency that has an established safety program or is in the process of safety program implementation.

Safe 5901. Problems in Industrial Safety and Hygiene. (1-5 cr [cr to be used only for MIS program]; prereq 15 cr industrial safety, admission to candidacy for degree; offered through UC)

Special investigation of an approved problem in industrial safety.

Safe 5902. Elements of Health Physics. (2 cr [cr to be used only for MIS program]; prereq 5112, 5114 or #, Δ; offered through UC)

Discussion of the health and safety hazards of radiated energy. Ionizing nuclear radiation and X-rays, nonionizing radiation hazards from microwaves, lasers, and infrared and ultraviolet light.

Safe 5903. Independent Study in Industrial Hygiene/Safety. (1-3 cr [may be repeated for 6 cr max; cr to be used only for MIS program]; prereq #, Δ; offered through UC)

Special projects, field studies, or research in industrial hygiene or safety topics.

Safe 5904. Special Topics: (Various Titles to Be Assigned). (1-3 cr [may be repeated for 6 cr max; cr to be used only for MIS program]; prereq Δ; offered through UC)

Study of selected topics in hygiene, safety, or toxicology. Similar topics may not be repeated for credit.

Safe 5905. Seminar in Industrial Safety. (1 cr [cr to be used only for MIS program]; prereq #; offered through UC)

Candidate-facilitated discussions of contemporary industrial safety issues.

Safe 5906. Semiconductor Industry Loss Control. (2 cr [cr to be used only for MIS program]; prereq Δ; offered through UC)

Safety, health, and loss-control aspects of semiconductor industry. Hazard identification, reduction, and control.

Safe 5907. Safety Program Analysis and Management. (2 cr [cr to be used only for MIS program]; prereq Δ; 1 hr lect, 2 hrs lab; offered summer, UC)

Upgrading of participant's safety program analysis skills and encouraging proactive approach to programming. Lecture and discussion session on relevant topics necessary to function as safety professional. Participation in group simulation projects.

School of Business and Economics (SBE)

SBE 0001. Freshman Orientation. (No cr; regis required for one qtr for SBE students who have not previously enrolled in college; offered fall qtr only) Orientation program for SBE students.

SBE 1100. The Business Environment. (4 cr) Context and operation of business and organizations. Foundation and function areas of business and entrepreneurship. Analysis of technological, ethical, diversity, and global issues from business and organizational perspectives.

Social Work (SW)

College of Education and Human Service Professions

SW 1210. Global Issues. (4 cr)

Global problems of war, peace, and national security; population, food, and hunger; environmental concerns and global resources; economic and social development; human rights. Examination of issues from a global problem-solving perspective. Consideration of value, race, class, and gender differences.

SW 1601. Social Welfare in the United States. (4 cr)

Historical development and contemporary status of social welfare in the United States. Exploration of effect of race, class, and gender on social welfare issues.

SW 1619. Race, Class, and Gender in the United States. (4 cr)

Examination of race, class, and gender as pivotal dimensions in American society. Focus on similarities and differences between groups, dynamics of discrimination, and efforts to meet needs and achieve potential for all groups in the United States.

SW 5000. The American Social Welfare Institution. (3 cr; prereq jr or sr or grad)

Historical development of social welfare and the profession of social work in the United States.

SW 5010. Social Welfare Policies and Issues. (3 cr; prereq 5000, jr or sr or grad)

Formulation, analysis, and application of conceptual frameworks in examination of social policies and social welfare programs.

SW 5102. Human Behavior in the Social Environment I. (3 cr, \$5106; prereq grad or #)

Overview of social psychological and social systems concepts. Applications of concepts to social work and human service issues. Focus on smaller social systems—individuals, families, and groups.

SW 5103. Human Behavior in the Social Environment II. (3 cr, \$5106; prereq 5102, grad or #)

Application of social psychological and social systems concepts to understand social work and human service issues. Focus on larger social systems—communities, organizations, society, and culture.

SW 5104. Dynamics of Discrimination. (3 cr; prereq grad or #)

Analysis of historic, socioeconomic, and psychological processes fostering discrimination on bases of race, sex, age, socioeconomic class, ethnicity, religion, and sexual preference. Examination of social problems generated by systemic discrimination and methods that can be used to reduce discrimination. Implications for the social service professions.

SW 5111. Grant Writing in the Human Services. (2-3 cr; prereq jr or sr or grad)

Introduction to art of successful grant writing, with focus on step-by-step development of grant planning/writing.

SW 5112. Fundraising in the Human Services. (2 to 3 cr)

Art of fundraising for community human service agencies. Historical context, philanthropic concepts, development of the case statement, fundraising principles, and techniques.

SW 5131. Special Topics in Social Work: (Various Titles to Be Assigned). (1-5 cr)

Proseminar on contemporary topics of concern to students and faculty. Specific course content announced in *Class Schedule*.

SW 5230. Family Policy. (3 cr; prereq 5010, jr or sr or grad or #)

Examination of social policies and social welfare programs in terms of their impact on family life. Study and formulation of policy alternatives and models for family policy analysis.

SW 5235. American Indians and Social Policy. (3 cr; prereq 5010, jr or sr or grad or #)

Study of federal and state social policies as they affect delivery of services to American Indians. Policy and program alternatives for Indian communities.

SW 5239. Independent Study. (Cr ar [max of 5 cr per qtr, may be repeated once for 10 cr max]; prereq Δ)

Directed reading, research, or other experiences leading to presentation of report.

SW 5267. Issues in American Indian Mental Health. (3 cr)

Current American Indian mental health issues. Current cultural, psychological, and sociological theories related to American Indian mental health. Overview of various approaches to mental health service delivery with an emphasis on developing appropriate techniques and methods for services to American Indian people.

SW 5270. Women and Social Policy. (3 cr; prereq 5010, jr or sr or grad or #)

Examination of policy issues related to women in areas such as day care, rape, employment, education, and abortion. Emphasis on how existing social policies affect women. Analysis of organizational and planning strategies as a means to pass legislation and to develop policies/programs to meet women's needs. Cross-cultural comparisons will be made where relevant.

SW 5275. Dynamics of American Indian Families. (3 cr)

Introduction to traditional and contemporary concepts relating to American Indian families. Public policy and social problems affecting American Indian families. Cultural strengths inherent in and conflicts experienced by Indian families. Practice of skills for working with Indian families, including interviewing, problem solving, networking, and referral skills.

SW 5280. Alcoholism and the American Indian Community. (3 cr)

History of social policy and American Indian alcoholism; biological, social, cultural, and psychological systems in relation to alcoholism among American Indians; approaches to human service delivery.

SW 5700. Special Projects in Social Development. (1-10 cr [may be repeated for 10 cr max]; prereq Δ)

Approval of adviser and field coordinator required to do project in community organization, research, social services, administration, social policy and/or social planning. Project may closely coordinate with another course or may be an independent area of interest.

SW 5911. Workshop: (Various Titles to Be Assigned). (1-5 cr each offering)
Workshop on a topic of special concern to persons in the human services.

SW 8001. Social Work Practice I. (3 cr; prereq admission to MSW program or #)
Introduction to generalist approach to social work practice, including development of specific counseling skills.

SW 8002. Social Work Practice II. (3 cr; prereq admission to MSW program, 8001 or #)
Data collection, problem assessment, and contracting phases of general method of social work practice. Emphasis on skill development in engaging clients to assess problems, set goals, and develop intervention plans. Content illustrated at all levels of practice.

SW 8003. Social Work Practice III. (3 cr; prereq admission to MSW program, 8002 or #)
Final phases of general method of social work practice focusing on methods of intervention, evaluation of practice outcomes, and termination process. Content illustrated at all levels of practice.

SW 8005. Contemporary Practice Issues in Social Work. (3 cr; prereq admission to MSW program or #)
Overview of advanced generalist model of social work practice. Current issues in field.

SW 8010. Family-Centered Practice. (3 cr; prereq admission to MSW program, 8003 or #8005 or #)
Application of family-centered model to intervention with different size client systems and fields of practice. Incorporates contemporary theories of family functioning and methods of assessment and intervention.

SW 8020. Methods of Clinical Social Work Practice. (3 cr; prereq 8003, 8005, admission to MSW program or #)
Overview of clinical social work assessment and intervention. Emphasis on clinical interviewing and other helping skills within the generalist practice framework.

SW 8221. Rural Development. (3 cr, \$5227; prereq admission to MSW program, 8003 or 8005 or #)
Examination of rural-urban differences in the United States and internationally. Emphasis on rural development problems and needs, and strategies to facilitate development objectives.

SW 8233. Practice with Elderly. (3 cr; prereq 8003 or 8005 or #)
Assessment, intervention, and evaluation. Knowledge and skills needed to provide quality services for elderly.

SW 8236. Family and Child Practice. (3 cr; prereq 8003 or 8005 or #)
Methods and models of practice in agencies serving families and children; child welfare and mental health settings.

SW 8238. Small Group Intervention. (3 cr, \$5601; prereq 8003 or 8005 or #)
Worker roles and skills using small groups, both pre-existing and formed, as a means of intervention. Includes work with support groups and helping networks.

SW 8310. Community Organizing. (3 cr, \$5310; prereq admission to MSW program, 8003 or 8005 or #)
Organizing strategies at neighborhood and community level evaluated in terms of their history, effectiveness among different social classes, and groups; tactics used by mass-based, multi-issue organizations compared with those of single-issue, staff-led groups; introduction to techniques used to gain citizen participation, train staff and members, and negotiate with opposing forces in conflict situations.

SW 8400. Human Services Administration. (3 cr, \$5400; prereq 8003 or 8005 or #)
Theory and practice of social administration; functions in administration; roles of workers, supervisors, managers, executives, and board members; financial and personnel management.

SW 8500. Research I. (3 cr)
Introduction to social science research and its applications to social work and social welfare.

SW 8501. Research II. (3 cr; prereq 8500 or equiv or #)
Student develops abilities to conduct beginning-level research projects and evaluate other research.

SW 8750. Research Problems. (3 cr; prereq admission to MSW program, 8501 or #)
Application of research skills in seminar format with emphasis on research project completion.

SW 8801. Field Placement I. (1-12 cr [4 cr per qtr or cr ar]; prereq admission to MSW program, 8001, 8002, 8003 or 8005; enrollment required for entire academic yr or block placement with #)
Required first-year field practicum for MSW students. Students placed in community agency for experience in working with variety of problems, methods, and community resources. Concurrent seminar integrates theory and practice.

SW 8802. Field Placement II. (1-12 cr [4 cr per qtr or cr ar]; prereq admission to MSW program, #8010, 8400, 8221, 8310 or #; enrollment required for entire academic yr or block placement with #)
Required second-year advanced field practicum for MSW students. Students placed in community agency that allows them to focus on a particular problem area or field of practice. Concurrent seminar integrates theory and practice.

Sociology (Soc)

College of Liberal Arts

Soc 1100. Sociology and Social Problems. (5 cr)
Introduction to sociological concepts and their application in understanding social problems.

Soc 1200. Introduction to the Family. (4 cr)
Study of the changing roles of the sexes in paired personal relationships more traditionally referred to as mate selection, courtship, marriage, and the process of family formation, maintenance, or dissolution, as well as alternative family forms.

Soc 1250. Topics in Sociology: (Various Titles to Be Assigned). (1-5 cr; prereq 1100 or #)
Minicourse experience dealing with topics of current general interest.

COURSE DESCRIPTIONS

Soc 1300. Introduction to Criminology. (4 cr, \$3300)

Analysis of social justice with emphasis on criminal justice system in United States. Special attention to nature, extent of crime, and social factors related to criminal behavior.

Soc 1400. Development of Sociological Theory. (4 cr, \$3420; prereq 1100 or Anth 1604 or #)

Analysis of classical sociological theory, including Emile Durkheim, Max Weber, Karl Marx, and George H. Mead.

Soc 1500. Introduction to Social Science Research Methods. (4 cr; prereq 1100 or 1300 or Anth 1602 or Anth 1604 or Δ)

Logic of social scientific explanation. Overview of research designs and types of measurement. Introduction to data analysis.

Soc 3121. Field Experience. (Cr ar [may be repeated for 12 cr max; only 6 cr may be applied to a Soc or Crim major; only 3 cr may be applied to a Soc minor]; prereq Δ)

Supervised lab experience in a human service agency or project.

Soc 3302. Special Topics in Criminology: (Various Titles to Be Assigned). (1-5 cr [may be repeated for 10 cr max]; prereq 1100, 1500, 40 cr or #) Specific course topic and content to be submitted by instructor for department approval.

Soc 3305. Sociological Theories of Deviance. (4 cr; prereq 1100, 1500, Crim major or Soc major/minor or Crim/Soc major 40 cr or #)

Theories explaining deviance. Implications of these theories for reducing deviance at various stages in the deviant's life.

Soc 3310. Sociology of Criminal Law. (4 cr; prereq 1100, 1500, Crim major or Soc major/minor or Crim/Soc major, 55 cr or #; offered through UC)

Nature, goals, and problems of the administration of the American criminal judicial process.

Soc 3315. Delinquency. (4 cr; prereq 1100, 40 cr or #)

Analysis of juvenile delinquency in contemporary American society. Explores major issues concerning causes, prevention, and treatment of juvenile offenders.

Soc 3316. Juvenile Justice. (4 cr; prereq 1100, Crim major or Soc major/minor or Crim/Soc major, 40 cr or #; offered through UC)

Examines contemporary U.S. juvenile justice system.

Soc 3318. Community Relations in Criminal Justice. (4 cr; prereq 1100, Crim major or Soc major/minor or Crim/Soc major, 40 cr or #)

Explores the relationship of law enforcement and corrections to the community, focusing on crime prevention and rehabilitation.

Soc 3320. Law Enforcement Agency Administration. (4 cr; prereq 1100, Crim major or Soc major/minor or Crim/Soc major, 40 cr or #; offered through UC)

Explores the nature, goals, and problems of law enforcement agencies. Defines administration management as it relates to law enforcement processes.

Soc 3323. Women and Justice. (4 cr, \$3322; prereq 1100 or 1300 or WS 1100, 40 cr or #)

Examination of women's involvement in the criminal and civil justice systems in the United States. Attention given to women as criminal and civil defendants and users of these systems, as well as practitioners within the justice systems.

Soc 3330. Legal Research. (4 cr; prereq 3310, Crim major or Soc major/minor or Crim/Soc major, 55 cr or #; offered through UC)

Overview of the American legal system, including the courts and the legislature; primary and secondary sources of law; judicial reports; citations and digest; annotated law reports; legal periodicals and research procedure. Different areas of law and research associated with them.

Soc 3340. Minorities, Crime, and Justice in the United States. (4 cr; prereq 1100, 1500, Crim major or Soc major/minor, 40 cr or #)

Examines the U.S. criminal justice system in relation to minorities. Attitudes and perceptions of crime and justice from minority perspectives. Differential crime rates among majority-minority groups, police-minority contacts, processing of minorities by the courts, and disproportionate representation of minorities in the prison system.

Soc 3350. Sociology of Violence. (4 cr; prereq 1300, 1500, 40 cr or #)

Extent and diversity of violence in U.S. culture and criminal justice responses to this violence.

Soc 3360. Penology. (4 cr; prereq 1100, Crim major or Soc major/minor or Crim/Soc major, 40 cr or #)

Analysis and evaluation of role of prisons in societies. Cross-cultural look at historical development of prisons and social forces involved in creation of penal sanctions.

Soc 3362. Correctional Agency Management. (4 cr; prereq 1300, Crim major or Soc major/minor or Crim/Soc major, 90 cr or #)

Assumptions, theories, and research related to change, control, and management in correctional systems. Evolution of management theory and effects of law, media, corrections organizations, and the community on the management of corrections organizations.

Soc 3364. Issues in Corrections. (4 cr; prereq 1300, Crim major or Soc major/minor or Crim/Soc major, 90 cr or #)

Punishment issues, including overcrowding, shock incarceration, electronic monitoring, home confinement, treatment alternatives, aids, privatization of prisons, capital punishment, and violence. Current research and theory concerning treatment, policy, and rights of prisoners used to focus on issues related to current practices and proposed changes.

Soc 3370. Comparative Systems of Punishment and Corrections. (4 cr; prereq 1100, 40 cr or #; 3305, 3400 or Anth 5626 recommended)

Idea of corrections as emerged in contemporary U.S. justice. Comparative analysis with various societies from Australian aborigines to Soviet Union demonstrating different approaches and philosophies of justice, crime, and punishment.

Soc 3380. Law and Society. (4 cr; prereq 1100, 40 cr or #)

Complexities and organization of a legal system. Antecedents to sociology of law, including various components of historical jurisprudence, major sociological theorists, and their influences on study and analysis of law, and specific elements of legal system such as courts and policing.

Soc 3390. Victimology. (4 cr; prereq 1300, 90 cr or #)

Criminal victimizations; socio-demographic profiles of crime victims; how victims cope with victimization; victims' rights; consequences of crime for victims and nonvictims; victims' attitudes toward criminal justice system; effectiveness of services for assisting victims.

Soc 3400. Contemporary Sociological Theory. (4 cr, \$3420; prereq 1400, 1500, Crim major or Soc major/minor or Crim/Soc major, 40 cr or Δ)

Theoretical perspectives in sociology during 20th century; examination of several major theorists and major paradigms and their importance to sociological thinking.

Soc 3500. Research Methods and Analysis. (4 cr, \$3501; prereq 1500, 3305 or 3400 or Anth 5626 or Δ, Crim major or Soc major/minor or Crim/Soc major or Anth major/minor)

Survey of quantitative and qualitative techniques of data analysis as they relate to theory, philosophy, and methodology of research. Emphasis on basic descriptive and inferential techniques and critical evaluation of published research.

Soc 3520. Quantitative Research Methods. (4 cr, \$3502; prereq 3500 or Δ, Crim major or Soc major/minor or Crim/Soc major or Anth major/minor)

Advanced quantitative techniques of data analysis as they relate to theory, philosophy, and methodology of research. Emphasis on multivariate inferential statistics and critical evaluation of published statistical reports.

Soc 3530. Qualitative Research Methods. (4 cr; prereq 3500, Comp 3160 or Δ, Crim major or Soc major/minor or Crim/Soc major or Anth major/minor)

Application of qualitative research methods to the study of social structures with emphasis on field research techniques and secondary data analysis and interpretation.

Soc 3700. Social Psychology. (4 cr; prereq 1100, 40 cr or #)

Theory and research issues regarding relation of individual to society. Emphasis on socialization, the effects of social organization and disorganization, and interpersonal interaction.

Soc 3720. Survey of Crisis Intervention. (4 cr; prereq 40 cr, intro course in Soc or Psy or #; offered through UC)

Analysis of crisis intervention theory and the development of crisis intervention and its application in the community. Maturational crisis, situational crisis, interpersonal communication skills, and the learning of coping mechanisms.

Soc 3732. Social Psychology Topics: (Various Titles to Be Assigned). (1-5 cr [may be repeated for 10 cr max]; prereq 3700, 40 cr or #)

Examination of social psychology topics identified through student-faculty consultation.

Soc 3735. Managing Social Conflict. (2 cr; prereq 1100, 40 cr or #)

Review of problem-solving and mediation approaches to managing interpersonal and organizational conflicts outside formally established structures such as collective bargaining or litigation.

Soc 3740. Social Movements. (4 cr; \$5710; prereq 1100, 40 cr or #)

Comparison of major theories of social movements as a source of social change, including resource mobilization theory and new social psychological theories. Emphasis on empirical studies of major 20th century social movements.

Soc 3800. Social Organization. (4 cr; prereq 1100 or Anth 1604, 40 cr or #)

Social organization as process and structure. Levels of organization including groups, organizations, and community.

Soc 3820. Sociology of Community. (4 cr; prereq 3800, 70 cr or #, Crim major or Soc major/minor or Crim/Soc major or Anth major/minor)

Organization and structure of social systems as affected by socio-demographic and economic factors involved in community formation, maintenance, and change. Emphasis on description of community as social structures.

Soc 3842. Social Organization Topics. (1-5 cr [may be repeated for 10 cr max]; prereq 3800, 40 cr or #)

Examination of specific community and social forms and processes identified through student-faculty consultation.

Soc 3845. Bureaucracy and Society. (4 cr; prereq 1100, Crim major or Soc major/minor or Crim/Soc major, 40 cr or #)

Sociological examination of the structure and processes of public and private bureaucracies and the patterns of adaptation by bureaucracies to their external social environments.

Soc 3860. Social Effects of Technological Change. (4 cr; prereq 1100, 1500, 120 cr or #)

Applying sociological principles and methods to assessing effects of technological change on communities, institutions, organizations, and individuals. Emphasis on topics involving cross-discipline effects.

Soc 3900. Social Issues and Social Change. (4 cr; prereq 1100, 40 cr or #)

Analysis of the forces of social change and social issues as they affect social life. Emphasis on the use of social theory and research in comprehending the dynamics of issues and change.

Soc 3912. Issues and Change: Special Topics. (1-5 cr [may be repeated for 10 cr max]; prereq 1100, 40 cr or #)

Examination of social issues and changes identified through student-faculty consultation. Students and faculty jointly select specific topics.

Soc 3922. Sociology of Family Violence. (2 cr; prereq 1100 or 1300 or WS 1100, 40 cr or #)

Explores the nature of family violence in various social settings. Emphasizes analysis of wife/husband battering and child abuse.

COURSE DESCRIPTIONS

Soc 3925. Sociology of Rape. (4 cr, \$3921; prereq 1100 or 1300 or WS 1000, 40 cr or #)
Examination of social, moral, and legal definitions and implications of rape.

Soc 3942. Social Stratification and Minorities. (4 cr; prereq 1100, 40 cr or #)
Class, status, and power as dimensions of stratification; social mobility in the United States and other societies. Minority groups—their nature, origins, disadvantages, and patterns of adjustment. Relationship between classes and minorities.

Soc 3960. Sociology of Sport. (4 cr; prereq 1100 or #; offered through UC)
Examination of sociological phenomena using informal and organized sports as focus. Topics relating to culture, socialization, history, and social organization in the world of sports.

Soc 3970. Women, Men, and Society. (4 cr; prereq 1100, 40 cr or #)
Explores the impact of society and culture on the relative positions, behavior patterns, and social realities of women and men, using interactionist and structural approaches. Role of specific institutions with special attention to ethnic and socioeconomic variations.

Soc 5000. Workshop: (Various Titles to Be Assigned). (1-3 cr each offering [may be repeated for 5 cr max; cr cannot be applied to a Graduate School program]; prereq 90 cr or grad or #)
Workshops on topics of current general interest.

Soc 5120. Independent Study in Sociology. (Cr or [may be repeated for 5 cr max]; prereq Δ)
Directed reading, research, or involvement in social action leading to the preparation of a paper or other project.

Soc 5122. Honors Research. (2 cr [may be repeated for 6 cr max]; prereq 3520 or 3530, 120 cr, approval by the dept honors program director)
Advanced individual project in any area of sociology, demonstrating sound theoretical and research foundations and resulting in a written report.

Soc 5130. Alcoholism. (4 cr; prereq 1100, 90 cr or grad or #)
Alcoholism considered by way of etiologies, social and behavioral involvement, treatment approaches, helping resources, outcome research, and public policy.

Soc 5140. Legal Gambling. (4 cr; prereq 1500, 90 cr or grad or #)
Examination of worldwide expansion of legal gambling with specific attention to North America. Social policy implications explored as well as social cost and benefits. Attention given to pathological gambling theory, prevalence, assessment, treatment, and recovery.

Soc 5145. Approaches to Gambling Behavior. (4 cr [credit cannot be applied to a Graduate School program]; prereq 90 cr or grad or #; offered through UC)
Theories about normative, problem, and pathological gambling examined in relation to empirical findings. Problem gambling contrasted with chemical addictions. Future of gambling studies. Internet course.

Soc 5181, 5182. Special Topics: (Various Titles to Be Assigned). (1-5 cr [any combination of these courses may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq 90 cr or grad or #)
Proseminar on contemporary topics in sociology. Specific course content announced in *Class Schedule*.

Soc 5300. Social Control. (4 cr; prereq 90 cr or grad or #)
Alternative ways in which society defines and responds to behavior and individuals targeted as problematic or undesirable.

Soc 5740. The Social Psychology of Deviance. (4 cr; prereq 3700, 90 cr or grad or #)
Social psychological approach to theories of deviant behavior, process and consequences of labeling deviants, deviant subcultures, and treatment programs for those defined as deviant.

Soc 5850. Rural Social Systems. (4 cr; prereq 3800, 90 cr or grad or #)
Study of the structure and dynamics of rural social system with an intensive examination of horizontal and vertical systemic linkages.

Soc 5860. Environmental Sociology. (4 cr; prereq 120 cr or grad or #)
Introduction to environmental sociology—the relationship between social structure, human social behavior, and the physical environment. Focuses on the “natural” environment and not the “built” environment.

Spanish (Span)

College of Liberal Arts

Also see courses listed under Language (Lang) earlier in this section.

Span 1301-1302. Beginning Spanish I-II. (4 cr each, \$1111-\$1112; prereq for 1302: one yr high school Span or successful completion of 1301 or #)
Conversation and communicative course for students with little or no previous study of Spanish. Emphasis on aural and oral skills; some emphasis on reading; grammar only as needed.

Span 1501-1502-1503. College Spanish I-III. (4 cr each; prereq for 1501: successful completion of 1302 or equiv or two or more yrs high school Span or #; prereq for 1502: successful completion of 1501 or #; prereq for 1503: successful completion of 1502 or #)
Consolidation and enrichment of previously acquired abilities in speaking and understanding Spanish set within an introduction to written Spanish and a survey of contemporary culture of Spanish-speaking societies.

Span 1580. Hispanic Cultures. (4 cr; may not count toward Span major or minor)
Consideration of important aspects of Hispanic people and culture. Taught in English and presumes no knowledge of Spanish.

Span 3001-3002. Advanced Spanish I-II. (4 cr each, \$1233, \$3122; prereq for 3001: successful completion of 1503 or equiv or #; prereq for 3002: successful completion of 3001 or #)
Development of Spanish literacy within a culturally authentic contemporary context. Emphasis on writing and speaking plus complete review of grammar. Taught in Spanish.

Span 3004. Conversational Spanish. (2 cr [may be repeated for 4 cr max]; prereq successful completion of 3002 or #)
Practice in oral conversation skills for students who have completed the basic language sequences and are in the advanced literature-culture-linguistics sequence.

Span 3006. Language Study Abroad. (1-5 cr [may be repeated for 15 cr max]; prereq Δ)
For students pursuing formal study of the Spanish language in a Spanish-speaking country, under the auspices of another college or university or by individual arrangement.

Span 3190. Special Topics in Spanish: (Various Titles to Be Assigned). (4 cr [may be repeated for 12 cr max])
Literature and/or culture of Spanish-speaking populations, using short stories, novels, and essays, in English (some readings in Spanish for Spanish majors and minors). Topics will vary. For undergraduates or students pursuing post-BA teaching certificate contracts.

Span 3400. Culture and Civilization Study Abroad. (1-10 cr [may be repeated for 30 cr max]; prereq Δ)
For students pursuing formal study of Spanish culture and civilization in a Spanish-speaking country, under the auspices of another college or university or by individual arrangement.

Span 3580. Hispanic American Civilization and Culture. (4 cr; prereq 3002 or equiv, grade of C or better in last adv Span language class taken or #; offered alt yrs)
Overview of important aspects of Hispanic American civilization and culture.

Span 3581. Spanish Civilization and Culture. (4 cr; prereq 3002 or equiv, grade of C or better in last adv Span language class taken or #; offered alt yrs)
Overview of important aspects of Spanish civilization and culture.

Span 5212. Spanish Prose Fiction. (4 cr; prereq 3002 or equiv, grade of C or better in last adv Span language class taken or #; offered every third yr)
Prose fiction from Spain, Realism to present.

Span 5213. Spanish Poetry. (4 cr; prereq 3002 or equiv, grade of C or better in last adv Span language class taken or #; offered every third yr)
Study of poetry from Spain, Middle Ages to present.

Span 5214. Hispanic Drama. (4 cr; prereq 3002 or equiv, grade of C or better in last adv Span language class taken or #; offered every third yr)
Study of drama from Spain and Hispanic America, Renaissance to present.

Span 5215. Cervantes. (4 cr; prereq 3002 or equiv, grade of C or better in last adv Span language class taken or #; offered every third yr)
Study of Cervantes' *Novelas ejemplares* and *Don Quixote*.

Span 5312. Hispanic American Prose. (4 cr; prereq 3002 or equiv, grade of C or better in last adv Span language class taken or #; offered every third yr)
Prose of Hispanic America with emphasis on 20th-century prose fiction.

Span 5313. Hispanic American Poetry. (4 cr; prereq 3002 or equiv, grade of C or better in last adv Span language class taken or #; offered every third yr)
Poetry of Hispanic America with an emphasis on 20th-century.

Span 5590. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq 3002, grade of C or better in last adv Span language class taken or #, Δ)
Seybolt, Zeitz
Students devise programs of reading and research in consultation with the instructor.

Span 5597. Seminar. (4 cr per qtr [may be repeated for 8 cr max], \$3997; prereq 3002 or equiv, grade of C or better in last adv Span language class taken or #)
Study of cultural topics (e.g., Chicanos) through literature and essays or of selected literary periods, genres, authors, or themes.

Span 5889. Literature in the Western Tradition. (4 cr, \$3889, \$Engl 3889, \$Engl 5889, \$Fr 3889, \$Fr 5889, \$Ger 3889, \$Ger 5889; prereq grad or # or Δ; offered through UC)
Comparison and contrast of major literary movements in the West and derivative cultures, including non-Western works. Taught in English, although language students may be asked to do some papers and readings in the foreign language.

Special Education (SpEd)

College of Education and Human Service Professions

SpEd 1357. Individuals with Disabilities in Society. (4 cr, \$1234)
Study of major types of disabilities and giftedness, including definitions, causes, characteristics, and educational implications. Examination of disability perspectives. Social, legal, and educational considerations of disability issues.

SpEd 5201. Psychology of Exceptionality. (3 cr; prereq 90 cr or #)
Study of psychological factors pertaining to the major types of exceptionality, including selected aspects of sensory, motor, cognitive, and social functioning.

SpEd 5202. Behavior Analysis/Special Education. (4 cr, \$5308; prereq 90 cr or #)
Principles of applied behavior analysis and direct measurement techniques relevant to modifying academic and social behaviors within special education services. Pre-practicum.

SpEd 5203. Assessment in Special Education. (4 cr, \$5314; prereq 90 cr or #)
Measurement theory, assessment practices, familiarization with selected instruments, legal and ethical precautions. Pre-practicum.

SpEd 5300. Special Education Seminar. (1 cr [may be repeated for 6 cr max]; prereq 90 cr or #)
In-depth discussion of practices, trends, issues, and problems related to the student's selected area in special education.

COURSE DESCRIPTIONS

SpEd 5305. Exceptionality in the Classroom. (3 cr; prereq 9 cr Ed or Psy or #)

Practical methods, materials, and managerial skills to assist the classroom teacher in differentiating instruction for exceptional children in the regular classroom.

SpEd 5307. Language Basis for Academic Skills. (3 cr)

Examination of the relationship of language behavior to the acquisition of academic skills of reading, mathematics, writing, and spelling.

SpEd 5327. Transitional Needs of Students with Disabilities. (3 cr, §5536; prereq 90 cr or #)

Assessment procedures, curriculum, planning approaches, instructional methods, resources, and legal requirements to meet the needs of students with disabilities making the transition from school to postsecondary training, education, and employment.

SpEd 5351. Interventions in Learning Disabilities. (4 cr, §5310; prereq 90 cr, admission to SpEd program or #)

Program design, curriculum modification, mainstream relationships, instructional and behavioral consultation, and contemporary issues. Pre-practicum.

SpEd 5352. Interactional Reading Instruction. (4 cr, §5318; prereq admission to SpEd program, 90 cr, EEd 3375 or #)

Application of direct instruction principles to teaching students with reading/learning disabilities. Includes supervised lab experiences with students.

SpEd 5353. Mathematics in Special Education. (4 cr, §5309; prereq admission to SpEd program, 90 cr, EEd 3355 or #)

Specialized instructional interventions and classroom modifications for students with learning disabilities. Includes a teaching lab experience with students.

SpEd 5361. Infants and Toddlers with Special Needs. (4 cr, §5341; prereq admission to SpEd program, 5202 or #)

Causation and assessment of handicapping conditions in infants and toddlers. Examination of effective intervention techniques in a variety of settings involving interagency collaboration and family involvement. Pre-practicum.

SpEd 5362. Preschoolers with Special Needs. (4 cr, §5342; prereq 5361 or #)

Identification, assessment, and classification of preschoolers with special needs. Examination of effective intervention techniques for use in a variety of settings, including emphasis on integration and teaming strategies. Pre-practicum.

SpEd 5363. Early Special Education Curricula. (4 cr, §5343; prereq 5362 or #)

Integration and adaptation of basic components of early childhood special education programs including assessment, IEP Development, standard and modified curricula, team and parent involvement, mainstreaming, and transitioning into a functional curricular plan. Pre-practicum.

SpEd 5381. Behavior and Emotional Disorders of Children and Youth. (3 cr; prereq 90 cr or #; offered through UC)

Behavior and emotional disorders of school-aged children and youth; conceptual foundations, causes, intervention approaches, special topics.

SpEd 5382. Managing Disruptive Behavior. (3 cr; prereq 90 cr or #; offered summer or through UC)

Models of behavior change for preschool, elementary, and secondary students; identification and assessment of problem behaviors in preschool, elementary, and secondary settings; proactive and reactive strategies for managing disruptive behaviors; principles of strategy selection; monitoring progress in behavior change; legal and ethical issues in behavior change.

SpEd 5383. Advanced Intervention for Emotional/Behavioral Disorders. (4 cr; prereq 5202, 5382 or #)

Advanced application of skills to change behavior in students with emotional and behavioral disorders; crisis intervention skills; knowledge of available resources and services for these students; skills in working with service providers. Pre-practicum.

SpEd 5384. E/BD Assessment, Instruction, and Curriculum. (4 cr; prereq SpEd 5203, SpEd 5381 or #)

Formal and informal assessment instruments for identification and programming for students with emotional and behavioral disorders and developing social, emotional, and behavioral curricula; models of instruction. Pre-practicum.

SpEd 5400. Workshop: (Various Titles to Be Assigned). (1-6 cr each offering [no more than 6 cr can be applied to a Graduate School program]; prereq tchg exper, 90 cr or #; offered through UC)

SpEd 5600. Special Area Practicum. (1-12 cr [may be repeated for 12 cr max]; prereq #)

Direct or indirect observational, evaluative, and/or instructional experience with or on behalf of exceptional children.

SpEd 5610. Mainstreaming Practicum. (1-6 cr; prereq elementary or secondary student tchg or #)

Supervised classroom teaching experience with students, some of whom have handicaps, plus periodic seminars.

SpEd 5710. Practice, Research, and Leadership I. (4 cr; prereq #; offered through UC only)

Analysis of research approaches, preparation standards, leadership skills, and current issues and trends in special education leading to a professional development plan. Examines information technology, professional ethics, and reflective change processes.

SpEd 5720. Practice, Research, and Leadership II. (4 cr; prereq 5710 or #; offered through UC only)

Synthesis of research methods, special education research in selected areas, and change processes for groups to increase one's leadership capacity. Examines technology-based sources of educational research, leadership models, and strategic planning processes.

SpEd 5730. Practice, Research, and Leadership III. (4 cr; prereq 5720 or #; offered through UC only)

Applying research and leadership skills to improve one's practices in special education. Examines educational organizations and approaches to organizational change. Socialization into leadership roles in special education through presentations, publications, and participation in national discussions.

SpEd 5800. Topics in Special Education: (Various Titles to Be Assigned). (1-6 cr [may be repeated for 12 cr max; no more than 6 cr may be applied to a Graduate School program])
Current issues in special education to meet needs and interests of various groups, particularly practicing professionals. Topics vary; specific title and content announced in *Class Schedule*.

SpEd 5900. Special Area Project. (1-4 cr; prereq #)
Opportunity for an advanced student to undertake an independent project that would serve to substantially further either his or her theoretical knowledge base or professional competencies.

Statistics (Stat)

College of Science and Engineering

See also Mathematics (Math).

Stat 1565. Elementary Statistics. (4 cr, \$3062, \$3562; prereq Math 1003 or math placement into Math 1210 or Math 1250 or Δ)
Introduction to statistical ideas involved in gathering, describing, and analyzing observational and experimental data. Experimental design, descriptive statistics, correlation and regression, probabilistic models, sampling, and statistical inference.

Stat 3062. Statistical Methods. (4 cr, \$3562; prereq Math 1250)
Graphical and numerical descriptions of data, elementary probability, sampling distributions, estimations, confidence intervals, one-sample and two-sample t-test.

Stat 3562. Introduction to Probability and Statistics I. (4 cr; prereq Math 1297 or Math 1597H)
Basic probability, including combinatorial methods, random variables, mathematical expectation. Binomial, normal, and other standard distributions. Sampling distributions. Introduction to estimation and statistical hypothesis testing.

Stat 3563. Introduction to Probability and Statistics II. (3 cr; prereq 3562)
An introduction to statistics. Estimation and hypotheses testing for means and proportions including t-tests, chi-square tests, simple linear regression, analysis of variance, nonparametric statistics.

Stat 5561. Applied Statistical Analysis. (4 cr; prereq 3062 or 3563, Math 3320; 3 hrs lect, 1 hr lab)
Analysis of variance techniques as applied to scientific experiments and studies. Randomized block designs, factorial designs, nesting. Checking model assumptions. Using statistical computer software.

Stat 5562. Regression Analysis. (4 cr; prereq 3563, Math 3320; 3 hrs lect, 1 hr lab)
Simple, polynomial, and multiple regression. Matrix formulation of estimation, testing, and prediction in the linear regression model. Analysis of residuals, model selection, transformations, and use of computer software.

Stat 5563. Multivariate Statistics. (3 cr; prereq 5561, 5562 or #; offered alt yrs)
Hotelling T^2 , multivariate analysis of variance, canonical correlation, discriminant analysis, principal components. Use of computer software.

Stat 5569. Experimental Design. (3 cr; prereq 5561, 5562 or #; offered alt yrs)
Statistical design of experiments. Completely randomized, randomized block, and Latin Square designs. Factorial experiments. Confounding. Split plots. Incomplete blocks. Applications to areas such as biological and industrial experiments.

Stat 5585. Introduction to Probability Modeling. (3 cr, \$5595; prereq 3562, Math 3298 or Math 3598H)
Development of probability models and their applications to science and engineering. Classical models such as binomial, Poisson, and exponential distributions. Random variables, joint distributions, expectation, covariance, independence, conditional probability. Markov processes and their applications.

Stat 5595. Probability. (4 cr; prereq 3562, Math 3350)
Axioms of probability. Discrete and continuous random variables and their probability distributions. Joint and conditional distributions. Mathematical expectation, moments, correlation, and conditional expectation. The normal and related distributions. Limit theorems.

Stat 5596. Statistical Inference. (4 cr; prereq 3563, 5595)
Mathematical statistics: Bayes and maximum likelihood estimators, unbiased estimators; confidence intervals; hypothesis testing, including likelihood ratio tests and most powerful tests.

Stat 5598. Stochastic Processes. (3 cr; prereq 5585 or 5595 or #)
Markov chains and the Poisson processes. Related topics, such as continuous time Markov chains, renewal theory, random walks, branching processes, and queuing theory.

Stat 5961. Actuarial Probability and Statistics. (2 cr [cr cannot be applied toward Math major or Math minor or MS in applied and computational math]; prereq 5596)
Problem-solving techniques in probability and statistics needed in actuarial work.

Stat 8568. Linear Models. (3 cr; prereq 5596, Math 5326)
Developing the statistical theory of the general linear model. Distribution theory, testing, and estimation. Analysis of variance and regression.

Stat 8666. Doctoral Pre-thesis Credits. (1-18 cr [max 11 cr per summer term]; prereq doctoral student who has not passed preliminary oral examination)

Stat 8888. Thesis Credits: Doctoral. (1-36 cr [max 18 cr per qtr, 11 cr per summer term]; prereq doctoral candidate)
Doctoral dissertation research and preparation for the Ph.D. in statistics.

Stat 8985. Seminar: Stochastic and Statistical Modeling. (4 cr, \$5985, \$Math 5985; prereq #)
Applications of probabilistic and statistical modeling methods, such as linear and nonlinear regression, generalized linear models, Markov chains, and Poisson processes. Case-study analyses of models from areas such as the natural sciences, medicine, engineering, and industry.

Supportive Services Program (SSP)

Achievement Center

SSP 1000. Introduction to College Learning. (1 to 3 cr)

Helps students make a successful transition into college learning and UMD student life.

SSP 1002. Special Topics in College Learning: (Various Titles to Be Assigned). (1-3 cr [may be repeated for 6 cr max; cr cannot be applied toward a degree])

Various topics on learning strategies. Topic announced before course offered.

SSP 1003. Basic Mathematics. (3 cr [cr cannot be applied toward a degree], §1053, §Math 1001, §Math 1003, §Math 1110, §Math 1115, §Math 1160, §Math 1185)

Computational math skills and applications; preparation for algebra.

SSP 1052. Writing Strategies. (3 cr, §Comp 1110, §Comp 1120, §Engl 1106, §Engl 1110)

Individualized approach to learning skills necessary for argumentative writing process, including development of individual writing process, organization of argumentative paragraph and essay, and beginning research/library skills.

SSP 1054. College Study Strategies. (2 cr)

Time management, test taking strategies, note taking, concentration, and library orientation.

SSP 1101. Personal Development. (3 cr, §Psy 1501)

Introduction to some of the components of the human personality and the relationship of the individual to the environment. Primary focus on such topics as human relations, values, interpersonal skills and competencies, decision making, and conflict resolution.

SSP 1802. English as a Second Language: Writing. (3 cr, §Engl 1802)

Preparation for Comp 1120.

SSP 1803. English as a Second Language: Reading. (3 cr, §Engl 1803)

Emphasis on comprehension, speed, and vocabulary; uses university course reading material.

SSP 1804. English as a Second Language: Practice in Speaking and Understanding. (1-3 cr [may be repeated for 4 cr max], §Engl 1804)

Practice in pronunciation, intonation, and listening comprehension.

SSP 3001. Preparation for SSP Teaching Assistantship. (1 to 4 cr [may be repeated for 4 cr max]; prereq #)

Skills needed to develop and conduct effective small group learning experiences. Communication processes, leadership styles and responsibilities, goal setting, social influences, developmental stages of groups, learning theories, and content as related to the appropriate SSP skills course.

SSP 3002. SSP Teaching Assistantship Practicum. (1 to 4 cr [may be repeated for 9 cr max]; prereq #)

Leading structured small groups in designated SSP courses. TA responsibilities outlined in contract with faculty supervisor.

SSP 3003. Tutor Training: Individualization of Instruction. (2 cr; prereq #)

Introduction to contemporary learning theory and its application to one-on-one (tutorial) and small group learning situations. Emphasis on philosophy, procedures, and practices known to be effective in improving learning.

SSP 3004. Tutor Practicum. (1-2 cr [may be repeated for 4 cr max]; prereq 3003 or #)

Supervised practicum for students leading one-to-one and small-group tutorials. Tutor responsibilities outlined in contract with instructor.

SSP 3007. Student Advisers for Freshman Experience Training. (2 cr, §3001; prereq #)

Introduction to contemporary student development and learning theory; its application to small-group and one-on-one learning situations. Emphasis on philosophy, procedures, and practices that are known to assist a student's multidimensional growth and learning. Enhances student leadership skills and knowledge.

SSP 3008. Student Advisers for Freshman Experience Practicum. (1-2 cr; prereq 3007 or #; may be repeated for 4 cr max but not to exceed 12 cr in 3002, 3004, 3008)

Supervised practicum in small-group settings. Responsibilities of SAFE leaders outlined in contract with faculty supervisor.

Swedish (Swed)

College of Liberal Arts

Also see courses listed under Language (Lang) earlier in this section.

Swed 3005. Special Topics in Swedish and Scandinavian Studies. (1-5 cr [may be repeated for 8 cr max]; offered in Study-in-Sweden program)

Selected topics not currently offered dealing with genres, periods, specific authors, and cultural movements of Swedish and Scandinavian worlds.

Theatre (Th)

School of Fine Arts

Th 1110. Acting Fundamentals I. (4 cr; not open to Th majors)

Developing the ability to respond to imaginative situations with sincerity, individuality, and effectiveness; projects in elementary acting techniques.

Th 1112. Acting I. (4 cr; prereq 1500, Th major; 3 hrs lect, 3 hrs lab)

Introduction to fundamental skills of acting, using techniques such as theatre games, improvisation, and introductory scene study. For all theatre majors.

Th 1113. Acting II. (4 cr; prereq #: 3 hrs lect, 3 hrs lab)
Continuation of 1112, with emphasis on approaches to characterization and contemporary scene study.

Th 1115. Acting Fundamentals II. (4 cr; prereq 1110; not open to BFA Th majors)
Continuation of 1110. Development of acting skills beyond the fundamental level for non-BFA theatre majors. Project work emphasis on characterization and contemporary scene study.

Th 1116. Audition Techniques. (4 cr; prereq #: 3 hrs lect, 3 hrs lab)
Theory, techniques, and practical experience of auditioning as an actor.

Th 1119, 3119. Acting: Scene Study. (1 cr each [may be repeated for 6 cr max in both courses combined]; prereq Th major only, 1112 or #)
Rehearsal and presentation of selected monologue and scene work.

Th 1120. Performance Practicum I. (1 cr [may be repeated for 12 cr max]; prereq #: by audition only)
Rehearsal and performance of a minor role in a play or dance before a public audience. Role determined by instructor.

Th 1200. Voice and Movement for the Actor. (4 cr; prereq #: 3 hrs lect, 3 hrs lab)
Introduction to vocal and movement techniques designed to liberate, develop, and strengthen actor's body and voice.

Th 1201. Musical Theatre: Theory/Sight Singing. (4 cr; prereq #: 3 hrs lect, 3 hrs lab)
Introduction to sight singing, music reading, written music transposition, and melody-line piano keyboard. For musical theatre student performers.

Th 1330. Stagecraft. (4 cr; prereq 1500 or #: 3 hrs lect, 3 hrs lab)
Introduction to the methods of planning, constructing, painting, rigging, and shifting stage scenery. Lab work required.

Th 1336. Sound Design. (4 cr; prereq 1500 or #)
Principles and practice of choosing, editing, and running sound cues for theatrical productions.

Th 1337. Stage Lighting I. (4 cr; prereq 1500 or #)
Principles and practice of stage lighting.

Th 1440. Costume Construction I. (4 cr; prereq 1500 or #: 3 hrs lect, 3 hrs lab)
Introduction to study and practice of methods and materials used in building costumes for theatrical productions. Lab work required.

Th 1451. Stage Makeup I. (4 cr)
Introduction to the principles and materials of stage makeup, and their application in developing a character makeup for theatrical productions.

Th 1500. Introduction to Theatre Arts. (4 cr)
Appreciation of theatre arts. Developing sensitivity and critical sophistication as articulate, discriminating theatregoers. Play viewing, play reading, critiques, and term projects.

Th 1501. Introduction to Film. (4 cr)
History and genres of film; how movies are made. Watching and analyzing films and developing an articulate and discerning viewpoint.

Th 1506. Musical Theatre History. (4 cr)
Musical theatre genre, focusing on the integration of theatre, music, and dance. Major librettists, composers, directors, choreographers, and performers.

Th 1660, 3660. Production Practicum. (1 cr each [may be repeated for 6 cr max in both courses combined]; min 30 hrs work per qtr)
Practical experience in general backstage areas and front-of-house operations of theatrical productions, including planning and execution of scenery and properties, costumes and makeup, lighting, sound, stage operation, publicity, box office, and theatre management before and/or during performance runs.

Th 1663. Lighting/Sound Practicum. (1 cr [may be repeated for 3 cr max]; prereq Th major or minor; min 30 hrs work)
Practical experience working on lighting and sound for theatrical productions.

Th 1690. Theatre Production I. (4 cr [may be repeated for 8 cr max]; prereq Δ; offered summer only)
Intensive study of all aspects of theatre arts through participation in the Minnesota Repertory Theatre.

Th 1695. Summer Theatre Company I. (6 cr [may be repeated for 12 cr max]; prereq 1500, Δ; offered summer only)
Concentrated workshop experience in all aspects of theatre production through participation in rehearsal and performance.

Th 1761. Theatre Marketing/Management Practicum. (2 cr [may be repeated for 6 cr max]; prereq Th major or minor; 60 hrs work)
Practical experience working in theatre box office, management, marketing, and advertising promotion for UMD theatre productions.

Th 1762. Costume Practicum. (2 cr [may be repeated for 6 cr max]; prereq Th major or minor; 60 hrs work)
Practical experience working on costume construction and costume crafts for theatrical productions.

Th 1764. Scenery/Properties Practicum. (2 cr [may be repeated for 6 cr max]; prereq Th major or minor; 60 hrs work)
Practical experience constructing and painting scenery and properties for theatrical productions.

Th 1765. Running Crew Practicum. (2 cr [may be repeated for 6 cr max]; prereq #: 60 hrs work)
Practical experience working backstage during the run of theatrical productions.

Th 1950. B.F.A. Qualifying Presentation. (1 cr; prereq Δ)
Presentation of performance audition or technical portfolio for admission to full B.F.A. candidacy.

Th 3100. Acting in Commercials. (2 cr; offered summer only; 1 hr lect, 2 hrs lab)
Hands-on exposure to the principles necessary for acting in commercials, analyzing various types of commercials, and learning the appropriate techniques for each.

COURSE DESCRIPTIONS

Th 3112. Acting for Camera. (4 cr; prereq #; 3 hrs lect, 3 hrs lab)
Contemporary acting techniques modified to meet demands of television and film.

Th 3113. Acting: Classical Styles. (4 cr; prereq #; 3 hrs lect, 3 hrs lab)
Exploration of acting in performance of dramatic works from selected classical periods.

Th 3116. Acting: Musical Theatre I. (4 cr [may be repeated for 8 cr max with #]; prereq #; 3 hrs lect, 3 hrs lab)
Applying musical theatre performance theories and techniques.

Th 3120. Performance Practicum II. (2 cr [may be repeated for 12 cr max]; prereq #; by audition only)
Rehearsal and performance of a major role in a play or dance before a public audience. Role determined by instructor.

Th 3171. Independent Study. (1-3 cr [may be repeated for 6 cr max; undergrads may not take more than 6 cr in both 3171 and 5171 combined]; prereq #)
Directed readings and projects of interest to the student.

Th 3175. Topics in the Theatre: (Various Titles to Be Assigned). 1-6 cr each [may be repeated for 12 cr max]; prereq #)
Intensive study of special topics not covered by regular theatre courses. Topic announced before course offered.

Th 3177. Playwriting. (4 cr; prereq 1500 or #; 4 hrs lect)
Instruction and practice in fundamentals of playwriting including dialogue, character, and scenario development; traditional and experimental formal structures; emphasis on theatre format with peripheral screenplay information.

Th 3187. New Play Development Workshop. (4 cr [may be repeated for 8 cr max]; prereq #; 3 hrs lect, 3 hrs lab)
Intensive work in the development of new scripts from initial reading to minimally staged performance.

Th 3200. Speech for the Actor. (4 cr; prereq #; 3 hrs lect, 3 hrs lab)
Ear training and articulation (in anticipation of dialects), and the acquisition of non-regional dialect for the stage through the use of phonetics and classical texts.

Th 3210. Stage Dialects. (2 cr; prereq #; offered summer only; 1 hr lect, 2 hrs lab)
Develops skills in three of the most commonly used stage dialects: British (High, Middle, Low), Irish, and Spanish.

Th 3216. Acting: Musical Theatre II. (4 cr; prereq #; 3 hrs lect, 3 hrs lab)
Acting and audition styles for the musical theatre emphasis.

Th 3221. Stage Direction I. (4 cr; prereq 1112, 80 cr, Th major or minor or #; 3 hrs lect, 3 hrs lab)
Intensive study of stage direction. Emphasis on exploration of role and responsibilities of stage director in relation to play, production team, and actors; creative process of director with regard to interpretation of and relation to play. Aesthetic, fundamental staging elements explored through lecture and practical application.

Th 3330. Scene Painting. (4 cr; prereq 1330; 2 hrs lect, 4 hrs lab)
Advanced work in the use of both traditional and modern methods of painting stage scenery with an emphasis on practical lab work.

Th 3331. Scenic Design I. (4 cr; prereq 1330 or #)
Study of the elements of design used in the creation of scenery for the theatre.

Th 3332. Scenic Design II. (4 cr; prereq 3331)
Advanced study in creating scenic designs for a variety of theatrical forms, including musical comedy, opera, dance, and legitimate theatre.

Th 3334. Stage Rendering Techniques. (4 cr; prereq 1500 or #)
Practical course in study of different rendering mediums, styles, and techniques for the theatrical designer.

Th 3338. Stage Lighting II. (4 cr; prereq 1337 or #)
Advanced theories and techniques used in designing lights for traditional and nontraditional theatre works.

Th 3350. Theatrical Drafting. (4 cr; prereq 1330)
Principles and practice in the techniques of drafting traditional and nontraditional types of stage scenery.

Th 3444. Costume Design I. (4 cr; prereq 1440, 1500 or #)
Principles and practice of costume design with emphasis on designing and rendering costumes from various historical periods.

Th 3445. Costume Design II. (4 cr; prereq 3444 or #)
Advanced principles and practice of costume design with emphasis on designing and rendering costumes from various historical periods.

Th 3446. Costume Construction II. (4 cr; prereq 1440 or #)
Advanced principles and practice of costume construction techniques with an emphasis on pattern drafting and draping and a study of costume crafts.

Th 3451. Craft Technologies for Theatre. (4 cr; prereq 1330, 1440 or #; 3 hrs lect, 3 hrs lab)
Advanced study in design, construction, and painting techniques for the craft areas in theatrical costuming and stage properties.

Th 3456. Computer-Aided Theatrical Design. (4 cr; prereq #)
Study in design with technical applications to scene, lighting, and costume design.

Th 3465. Stage Management. (4 cr)
Exploration of the theory and practice of stage management techniques applicable to a variety of theatre forms and situations.

Th 3661. Production Management. (2 cr [may be repeated for 12 cr max], \$1670, \$3670; prereq #; min 60 hrs work)
Participation in management and leadership in all areas of theatre production.

Th 3695. Summer Theatre Company II. (6 cr [may be repeated for 12 cr max]; prereq 1695, Δ; offered summer only)

Concentrated workshop experience in supervision and leadership in specialized aspects of theatre production through participation in rehearsal and performance.

Th 3696. Creative Drama Workshop. (3 cr [may be repeated for 12 cr max]; prereq #)

Concentrated experience in script and performance development in a small theatrical touring ensemble.

Th 3700. Actor's Studio. (4 cr [may be repeated for 24 cr max]; prereq #; 3 hrs lect, 3 hrs lab)

Develops advanced skills in acting, including scene study, voice and movement for stage, and audition techniques.

Th 3900. Intern Teaching in Theatre. (3 cr [may be repeated for 9 cr max]; prereq #)

Practical experience teaching beginning courses in the department. Students serve as intern teachers, assisting instructor in the administration of the course.

Th 3950. Senior Audition. (1 cr; prereq Δ)

Senior theatre majors, under guidance of faculty adviser, prepare and present performance pieces or technical portfolios representing the best of their cumulative undergraduate work for invited audience.

Th 5171. Independent Study. (1-3 cr [may be repeated for 6 cr max, undergrad may not take more than 6 cr in both 3171 and 5171 combined]; prereq sr, Δ)

Directed readings and projects of interest to the student.

Th 5175. Topics in the Theatre: (Various Titles to Be Assigned). (1 to 6 cr each offering [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program]; prereq #)

Intensive study of special topics falling outside the usual theatre courses. Topic announced before course offered.

Th 5222. Stage Direction II. (4 cr; prereq 3221 or #; 3 hrs lect, 3 hrs lab)

Intensive study of stage direction with emphasis on individual directorial interpretation and imagination and the creative process the director uses in relation to script and staging. Staging ideas and elements explored through lecture and practical application.

Th 5330. Theatre: Special Projects. (2-4 cr [may be repeated for 12 cr max; no more than 6 cr can be applied to a Graduate School program], \$5220, \$5336, \$DN 5405; prereq #)

Projects in directing, choreography of individuals or groups, designing costumes, lighting, scenery, or sound.

Th 5352. Portfolio Preparation and Presentation. (4 cr [cr cannot be applied to a Graduate School program]; prereq #)

Methods of selection and presentation of student's work in technical theatre/design; analysis of portfolio; job applications, opportunities; unions, résumés.

Th 5451. Theatre Design: Period Styles. (4 cr; prereq 3331, 3444 or #)

Introduction to historical styles: architecture, painting, and dress as they influence theatrical design through the ages.

Th 5551. History of the Theatre I. (4 cr; prereq 1500 or #)

Survey of style, theory, and production techniques of world theatre from its theoretical origins through the 17th century.

Th 5552. History of the Theatre II. (4 cr; prereq 1500 or #)

Survey of style, theory, and production techniques of 18th- and 19th-century world theatre.

Th 5553. History of the Theatre III. (4 cr; prereq 1500 or #)

Survey of style, theory, and production techniques of 20th-century world theatre.

Th 5555. Dramatic Theory and Literature. (4 cr; prereq jr or #)

Survey and analysis of dramatic literature through the study of selected plays and writings on theory and criticism.

Th 5600. Theatre Production III. (1-9 cr [may be repeated for 18 cr max; no more than 6 cr can be applied to a Graduate School program], 1 cr for each 30 hrs work; prereq Δ)

Intensive work/discussion experience in all aspects of theatrical production. Advanced student or in-service teacher focuses on development of professional skills in conjunction with summer theatre productions.

Th 5900. Internship in Professional Theatre.

(1-12 cr [no more than 6 cr can be applied to a Graduate School program], 1 cr for each 30 hrs work; prereq completion of core program in BFA theatre major or D)

Field study in a cooperating professional, commercial, or regional repertory theatre.

Th 5991. Independent International Study. (1-12 cr [cr cannot be applied to a Graduate School program]; prereq Δ, jr standing in theatre recommended)

Travel and research in international theatres, schools, and/or performing arts centers. Advanced planning necessary. Credit depends on nature and scope of project.

Toxicology (Txc1)

Graduate School

Txc1 5214. Principles of Toxicology. (4 cr; prereq Chem 5336, Chem 5337, Phsl 5440, Phsl 5441, Phsl 5927, Phsl 5928 or MdBc 5751, MdBc 5752, #)

Principles of toxicology including factors that determine disposition of foreign chemicals in living systems.

Txc1 5215. Organ System Toxicology. (4 cr; prereq 5214, #)

Discussion of various kinetic and dynamic determinants of target organ toxicity and description of pathological alterations in structure/function relationship for major organ systems.

Txc1 5216. Chemical and Environmental Toxicology. (4 cr; prereq 5214, #)

Description of mechanisms of toxicity of specific classes of chemical agents including discussions of application of toxicology in various professional careers.

COURSE DESCRIPTIONS

Txcl 8101-8102-8103. Toxicology Seminar. (1 cr per qtr; prereq #)
Presentation and discussion of current issues regarding investigative toxicology research.

Txcl 8572. Investigative Toxicology. (2 cr; prereq 5214-5216, grad)
Current investigations in the toxicological sciences.

Txcl 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 11 cr per summer term]; prereq doctoral student who has not passed preliminary oral examination)

Txcl 8777. Thesis Credits: Master's. (1-16 cr; 16 cr required; Plan A only)

Txcl 8800. Directed Research. (Cr ar; prereq grad)
Experimental investigation of toxicological problems.

Txcl 8888. Thesis Credits: Doctoral. (1-36 cr [max 18 cr per qtr, 11 cr per summer term])
Doctoral dissertation research and preparation.

Urban and Regional Studies (URS)

College of Liberal Arts

URS 1001. Introduction and Orientation to Urban and Regional Studies. (2 cr; offered through UC)

Interdisciplinary perspective that introduces the student to the variety of political, historical, socioeconomic, and spatial elements that are central to an understanding of urban and regional issues in America today. Intended for urban and regional studies sophomores and others considering an urban and regional studies major.

URS 3001. Internship in Urban and Regional Studies. (1-8 cr [may be repeated for 12 cr max]; prereq URS major, jr or sr, #)
Scheduled assignments with direct supervision in public agencies or relevant private firms.

Water Resources Science (WRS)

Graduate School

WRS 5010. Introduction to Field Research in Water Resources. (3 cr; prereq admission to WRS Graduate Program or #)
Introduction to field research techniques and opportunities during two-week summer excursion to regional sites. Data acquisition in large/small lakes, streams, and wetlands for biota and chemical/physical water quality; surface and groundwater hydrologic measurements and sampling.

WRS 8050. Special Topics in Water Resources Science. (2-4 cr; prereq #)

WRS 8060. Directed Studies in Water Resources Science. (1-4 cr; prereq #)
Topic(s) arranged by student and instructor. Number of credits depends on amount of work expected by instructor.

WRS 8090. Plan B Project. (4 cr; prereq #; may appear on master's program but does not count toward 20-cr min in major field)
Project topic to be arranged by student and adviser. Written report required.

WRS 8666. Doctoral Pre-Thesis Credits. (1-18 cr [11 cr per summer term]; prereq doctoral student who has not passed preliminary oral examination)

WRS 8777. Thesis Credits: Master's. (1-16 cr [11 cr max per summer term]; prereq grad)

WRS 8888. Thesis Credits: Doctoral. (1-36 cr [18 cr max per qtr; 11 cr per summer term]; prereq doctoral candidate)

Women's Studies (WS)

College of Liberal Arts

Women's studies courses, in addition to those listed below, can be found in other departments. Check descriptions for Anth 3628, Comm 3220, Comm 5900, Comp 3160, Engl 3580, Engl 5580, Engl 5585, Hlth 3118, Hist 3005, Hist 3357, HmCl 3028, HmCl 3240, Mgts 3981, Phil 3250, Pol 3040, Pol 3620, Psy 3215, Psy 3216, Psy 3221, Psy 3540, Soc 3323, Soc 3430, Soc 3922, Soc 3924, Soc 3925, Soc 3930, Soc 3970, SW 5270. The most current list of new and special topics courses is available in the women's studies office.

WS 1000. Introduction to Women's Studies. (4 cr)
Women's studies as an interdisciplinary field of study; overview of the many issues related to the current and changing role and status of women.

WS 1100. Feminist Inquiry. (4 cr; prereq 1000 or #)
Major issues, concepts, and questions addressed by feminist scholarship; consideration of the context of feminist inquiry.

WS 3000. International Perspectives on Feminism. (4 cr; prereq 1000 or #)
Movements and perspectives of feminism worldwide; comparison and contrast with feminism in the United States.

WS 3101. Women, Race, and Class in the United States. (4 cr, \$3100; prereq 1000 or #)
Complex influences of gender, race, and class on women's lives in the United States. Focuses on experiences, views, and cultural expression of contemporary women who are not white or middle class.

WS 3150. Women-Identified Culture. (4 cr; prereq 1000, #)
Chronological survey introducing a relatively new body of knowledge in women's studies about lesbian cultures. Lesbian studies in literature, history, law, sociology, aesthetics, and philosophy; international perspectives.

WS 3200. Women's Autobiographies. (4 cr; prereq 1000 or #)
Examination of women's self-concepts as expressed in autobiographical writings. Consideration of meanings women give their lives as women, impact of race and class, choices for artistic, political, intellectual, and/or private lives. Analysis of autobiographical techniques and style.

WS 3300. Women, Religion, and Spirituality. (4 cr; prereq 1000 or #; offered through UC)
Religions and spirituality in relation to women. Historical and contemporary practices and beliefs.

WS 3350. Women and the Law. (4 cr; prereq 1000 or #; offered through UC)
Explores ways women's lives and gender relationships are influenced by laws and judicial system and how the system can become more responsive to women's experience.

WS 3400. Women and Film. (4 cr; prereq 1000 or #)
American and foreign films screened, analyzed, and reviewed from a feminist perspective. Role of women in history, economics, and politics of filmmaking.

WS 3500. Special Topics in Women's Studies: (Various Titles to Be Assigned). (1-4 cr [may be repeated for 12 cr max]; prereq 1000 or #)
Study of selected topics not covered by regular women's studies courses. Topic announced before course offered.

WS 3600. Ecofeminist Theories and Practices. (4 cr; prereq 1000 or #)
Examines environmental ethics from a socialist feminist perspective, and applies an ecofeminist analysis to contemporary ethical, social, and environmental issues.

WS 3800. Independent Study. (1-4 cr each offering [may be repeated for 8 cr max]; prereq 1000, 4 other cr women's studies or #)
Directed readings, research, and/or projects on women's studies topics of particular interest to the student.

WS 3850. Internship. (1-15 cr [may be repeated for 15 cr max; no more than 6 cr can be applied to a WS major]; prereq WS major, 32 cr WS-approved courses, Δ)

Work in public agency, private organization, or service agency offering practical application of women's studies theories and/or experience not available in classroom. Students must set goals, fulfill requirements for credit earned, and submit written and oral evaluations of experience.

WS 5000. Seminar. (4 cr; prereq 1100, 3000, 3100, Comp 3160, Hist 3357, approved methods course, 8 cr approved WS, sr or #)

Students pursue individual research topics. Class meetings devoted to studying feminist theories of scholarship.

WS 5500. Special Topics: (Various Titles to Be Assigned). (1-4 cr [may be repeated for 12 cr max]; prereq sr or grad or #)

Advanced study. Topic announced before course offered.

WS 5900. Independent Study. (1-4 cr [may be repeated for 8 cr max]; prereq sr, grad or #)

Readings, research, and/or projects on topics of particular interest to grad students concerning women and women's issues.