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# Numbers, Symbols, and Abbreviations

## Course Numbers

Semester courses have four-digit numbers as follows:

**0xxx**—Courses that do not carry credit toward any University degree.

**1xxx**—Courses primarily for undergraduate students in their first year of study.

**2xxx**—Courses primarily for undergraduate students in their second year of study.

**3xxx**—Courses primarily for undergraduate students in their third year of study.

**4xxx**—Courses primarily for undergraduate students in their fourth year of study; graduate students may enroll in such courses. 4xxx courses may be counted for a Graduate School degree if the course is taught by a member of the graduate faculty and has been approved for graduate credit.

**5xxx**—Courses primarily for graduate students; undergraduate students in their third or fourth year may enroll in such courses.

**6xxx**—Courses for postbaccalaureate students in professional degree programs.

**7xxx**—Courses for postbaccalaureate students in professional degree programs.

**6xxx and 7xxx**—Courses to be used primarily for postbaccalaureate professional programs that are not offered through the Graduate School.

**8xxx**—Courses for graduate students.

## Liberal Education

### Abbreviations

**LE**...Liberal education. Prerequisites show courses that can be taken for liberal education along with the category (i.e., LE 4).

**LECD**.....Cultural diversity

**LEIP**.....International perspectives

For more information about liberal education categories and requirements, see page 46.

## Prerequisites

**Prereq**—The prerequisite is intended to show what is required before taking the course.

If no prerequisites are listed, there are none, except for the class standing requirement indicated by the course number. When no department designation precedes the course number listed as a prerequisite, that course is in the same department as the course being offered.

Exemption from prerequisites can be granted only by the instructor, department, or college unit involved and by using course entry approvals.

A permission number will be necessary if you have met the prerequisite at another institution as transfer credits from other institutions cannot be checked at the time of registration.

## Symbols and Abbreviations

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

**&**.....Concurrent registration is required (or allowed) in the course listed after this symbol.

**#**.....Approval of instructor is required before registration.

**%**.....Approval of the department offering the course is required for registration.

**@**.....Approval of the college unit offering the course is required before registration.

**,**.....In prerequisite listings, comma means “and.”

**1-4 cr [max 6]**.....The course can be taken for 1 to 4 credits and may be repeated for up to 6 credits.

**DGS**...Director of graduate studies

## Term Information

Not all courses are offered every term (semester). Refer to the *Class Schedule* or the online catalog at [www.catalogs.umn.edu/umd](http://www.catalogs.umn.edu/umd) to learn during which terms specific courses are offered.

## Medical School Grading

**O**...Outstanding      **P**.....Passing

**E**...Excellent      **N**.....Failing

**S**...Satisfactory

## Accounting (ACCT)

### Labovitz School of Business and Economics

**ACCT 2001. Principles of Financial Accounting.** (3 cr; A-F only. Prereq—Min 15 cr or @)  
Concepts of financial accounting and external reporting. Nature and measurement of assets, liabilities, equities, revenues, expenses. Emphasis on use and understanding of external financial statements.

**ACCT 2002. Principles of Managerial Accounting.** (3 cr; A-F only. Prereq—2001, LSBE student or @)  
Information accumulation, analysis, and use for managerial decisions. Cost-volume-profit relationships; short- and long-term decisions; standards and budgets; segment and managerial performance evaluation.

**ACCT 2005. Survey of Accounting.** (3 cr; A-F only. Prereq—Not open to LSBE students or non-LSBE acct minors LE 8)  
Accounting information presented in published financial statements. Debt financing, stock issuance, alternative methods of accounting. Bookkeeping topics not emphasized.

**ACCT 3001. Technology Tools in Accounting.** (1 cr; A-F only. Prereq—LSBE cand)  
Introduction to basic and advanced applications of spreadsheet, database and other accounting specific to solve accounting problems.

**ACCT 3096. Volunteer Income Tax Assistance.** (1-2 cr [max 3 cr]; S-N only. Prereq—%, 2 cr first registration, 1 cr repeat)  
Provides volunteer experience preparing tax returns for low and moderate income Duluth residents through both classroom and hands-on training.

**ACCT 3101. Intermediate Accounting I.** (3 cr; A-F only. Prereq—LSBE cand or non-LSBE acct minor or @)  
Review of financial accounting standard setting, conceptual framework, and accounting process. Income statement, balance sheet, and statement of cash flows. Present value concepts, cash, receivables, inventories, fixed assets, current liabilities, and contingencies.

**ACCT 3102. Intermediate Accounting II.** (3 cr; A-F only. Prereq—3101, LSBE cand or non-LSBE acct minor or @)  
Long-term liabilities, stockholders' equity, earnings per share, revenue recognition, and tax allocation. Investments, pensions, leases, accounting changes and error analysis, financial statement analysis, and disclosures in financial statements.

**ACCT 3110. Accounting Information Systems.** (3 cr; A-F only. Prereq—LSBE cand or non-LSBE acct minor or @)  
Overview of the characteristics and functions of modern accounting information systems. Focus on system use, internal controls, security issues, and system design and implementation in computerized accounting procedures within the business organization. Develop proficiency in the use of accounting software.

**ACCT 3191. Independent Study.** (1-3 cr [max 3 cr]; A-F only. Prereq—BAC cand with 80 cr, %; or not available as acct elective)  
For students wishing to do special work in an accounting area that extends beyond, or in greater depth than, regular course offerings.

**ACCT 3196. Internship in Accounting.** (2-6 cr [max 6 cr]; S-N only. Prereq—3101, %; repeatable for a max of 6 credits; 3 repeats allowed; max 3 cr may be applied to acct electives)  
Participation in an approved program with professional accounting firms, businesses, government agencies, or non-profit organizations. Requires minimum 200 hours work experience, assigned written reports, and performance

evaluations. Students can take an additional credit for each additional 100 hours of work, up to a maximum of 6 credits. 3 repeats allowed, max 3 credits may be applied to acct electives.

**ACCT 3201. Cost Accounting.** (3 cr; A-F only. Prereq—LSBE cand or non-LSBE 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 3401. Individual Income Taxation.** (3 cr; A-F only. Prereq—[4152 or 3152], LSBE cand or approved non-LSBE acct minor or @)  
Provides an understanding of how taxes impact personal financial decisions. Takes tax planning/minimization perspective and provides a basic information on reporting tax positions to the IRS. In addition to tax planning and compliance, the student will be exposed to basic tax concepts.

**ACCT 3402. Advanced Business Taxation.** (3 cr; A-F only. Prereq—[3151], 3401, LSBE cand or @)  
Understanding how taxes impact basic business and entrepreneurial decisions. It takes a tax planning/minimization perspective and presents advanced tax research and resource materials available on the web.

**ACCT 3701. Small Business Initiative in Accounting.** (1-2 cr [max 2 cr]; S-N or Aud. Prereq—3001, 3101, LSBE cand)  
Provide practical experience in the development of budgets, analysis of financial statements and other types of small business accounting issues.

**ACCT 4160. Auditing.** (3 cr; A-F only. Prereq—3102, 3110, LSBE cand or @; no Grad School cr)  
Theory and procedures in audit process.

**ACCT 4501. Advanced Accounting.** (3 cr; A-F only. Prereq—3102, LSBE cand or @)  
Topics including consolidated financial statements, partnership, and fiduciary accounting.

**ACCT 4505. International Accounting.** (3 cr; A-F only. Prereq—3102, LSBE cand 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 4510. Fund and Not-For-Profit Accounting.** (3 cr; A-F only. Prereq—LSBE cand or @)  
Accounting concepts and processes applied to government, hospital, education, charity, and other not-for-profit entities.

**ACCT 4795. Special Topics (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; A-F only. Prereq—3101, LSBE cand or @)  
Enables students, working closely with the instructional faculty, to explore one or more contemporary accounting issues in substantial depth.

## Aerospace Studies (AIR)

### Swenson College of Science and Engineering

**AIR 100. AFROTC GMC Leadership Laboratory.** (0 cr; S-N or Aud)  
Practical environment giving leadership training while being instructed on military customs and courtesies, physical fitness, military drill and the general Air Force environment. This class is taken concurrently with AFROTC 1xxx and 2xxx level academic classes.

**AIR 1000. AFROTC GMC Lead Lab.** (1 cr [max 4 cr]; S-N or Aud)

Practical environment giving leadership training while being instructed on military customs and courtesies, physical fitness, military drill and the general Air Force environment. This class MUST be taken concurrently with AFROTC 1xxx and 2xxx level academic classes

**AIR 1101. Foundations of the U.S. Air Force.** (1 cr; A-F or Aud)

Two-part survey of U.S. Air Force as public-service organization. Role of military in U.S. society; military history; officership; professionalism; core values; career opportunities; customs/courtesies; communication skills. Leadership Laboratory (Air 0100) is mandatory for AFROTC cadets and complements this course by providing followership experiences.

**AIR 1102. Foundations of the U.S. Air Force.** (1 cr; A-F or Aud)

Two-part survey of U.S. Air Force as public-service organization. Role of military in U.S. society; military history; officership; professionalism; core values; career opportunities; customs/courtesies; communication skills. Leadership Laboratory (Air 0100) is mandatory for AFROTC cadets and complements this course by providing followership experiences.

**AIR 1591. Leadership Practicum.** (1-4 cr [max 4 cr]; A-F or Aud)

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

**AIR 2101. The Evolution of the U.S. Air Force Air and Space Power.** (1 cr; A-F or Aud)

Air Force heritage; development/deployment of air power, a primary element of U.S. national security; leadership and quality principles; ethics and values. Leadership development based on student participation in group problem solving. Oral/written communication development. Leadership Laboratory (Air 0100) is mandatory for AFROTC cadets and complements this course by providing followership experiences.

**AIR 2102. The Evolution of the U.S. Air Force Air and Space Power.** (1 cr; A-F or Aud)

Air Force heritage; development/deployment of air power, a primary element of U.S. national security; leadership and quality principles; ethics and values. Leadership development based on student participation in group problem solving. Oral/written communication development. Leadership Laboratory (Air 0100) is mandatory for AFROTC cadets and complements this course by providing fellowshp experiences.

**AIR 3000. AFROTC POC Leadership Laboratory.** (1 cr [max 4 cr]; S-N or Aud)

Practical environment giving leadership training through teaching freshmen and sophomores military customs and courtesies, physical fitness, military drill and the general Air Force environment. This class is taken concurrently with AFROTC 3xxx and 4xxx level academic classes.

**AIR 3001. AFROTC POC Lead Lab.** (2 cr [max 8 cr]; S-N or Aud)

Practical environment giving leadership training through teaching freshmen and sophomores military customs and courtesies, physical fitness, military drill and the general Air Force environment. MUST be taken concurrently with AFROTC 3xxx and 4xxx level academic classes

**AIR 3101. Air Force Leadership Studies.** (3 cr; A-F or Aud)

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

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studies. A mandatory Leadership Laboratory (Air 3000) provides advanced leadership experiences and the opportunity to apply the leadership and management principles of this course.

**AIR 3102. Air Force Leadership Studies.** (3 cr; A-F or Aud)

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. A mandatory Leadership Laboratory (Air 3000) provides advanced leadership experiences and the opportunity to apply the leadership and management principles of this course.

**AIR 3591. Leadership Practicum.** (1-4 cr [max 4 cr]; A-F or Aud)

Practical application of leadership and management in structured realistic situations.

**AIR 4101. National Security Affairs, Preparation for Active Duty.** (3 cr; A-F or Aud. Prereq—No Grad School cr) 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. A mandatory Leadership Laboratory (Air 3000) provides advanced leadership experiences and the opportunity to apply the leadership and management principles of this course.

**AIR 4102. National Security Affairs, Preparation for Active Duty.** (3 cr; A-F or Aud. Prereq—No Grad School cr) 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. A mandatory Leadership Laboratory (Air 3000) provides advanced leadership experiences and the opportunity to apply the leadership and management principles of this course.

## American Indian Studies (AMIN)

College of Liberal Arts

**AMIN 1103. Beginning Ojibwe I.** (3 cr; A-F only. LECD 03) Speaking and comprehension of basic Ojibwe speech patterns. Development of rudimentary reading knowledge.

**AMIN 1104. Beginning Ojibwe II.** (3 cr; A-F only. Prereq—1103 or # LECD 03) Speaking and comprehension of basic Ojibwe speech patterns. Development of rudimentary reading knowledge.

**AMIN 1106. American Indian Prose, Poetry, and Oratory.** (3 cr; A-F only. LE 9) 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 1120. American Indian Experiences: 1900–present.** (3 cr; A-F only. LECD 07) Through a chronological and biographical approach, the social, economic, political, and cultural changes and continuities of American Indian life from 1900 to the present will be introduced. Significant changes experienced by American Indians as well as their ability to adapt, resist, and thrive will be analyzed.

**AMIN 2105. Survey of American Indian Arts.** (3 cr; A-F only. LE 9)

Traditional arts of American Indians and the cultures that produced them; techniques, motifs, and aesthetics of Indian textiles and utilitarian and ceremonial arts.

**AMIN 2110. American Indian Politics: Law, Sovereignty, and Treaty Rights.** (3 cr; Stdnt Opt. LE 6)

Introduces critical terms and issues facing American Indian nations in their relationships with federal and state governments as well as their own conceptions of nationhood and law by critically analyzing the principal actors and discussing the roles national mythologies, media, identity, and activism play in law and policy formation.

**AMIN 2115. Ojibwe History and Culture.** (3 cr; A-F only) Anishinabe, Ojibwe, and Chippewa. Origins and lifestyle; relationship between traditional and contemporary times. Emphasis on Minnesota.

**AMIN 2203. Intermediate Ojibwe I.** (3 cr; A-F only. Prereq—1104 or # LECD 03)

Speaking basic Ojibwe sentences and paragraphs at fluent level so listener can understand speaking pattern context. Ability to write and read Ojibwe language proficiently.

**AMIN 2204. Intermediate Ojibwe II.** (3 cr; A-F only. Prereq—2203 or # LECD 03)

Speaking basic Ojibwe sentences and paragraphs at fluent level so listener can understand speaking pattern context. Ability to write and read Ojibwe language proficiently.

**AMIN 2520. Tribal Law and Government.** (3 cr; A-F only. Prereq—Intro soc sci course, 1120, 3106 or #) Review of American Indian law and analysis of modern tribal government.

**AMIN 2707. Boarding Schools and Beyond: A History of American Indian Education.** (3 cr; Stdnt Opt. LECD 08) Explores the diverse experiences American Indians have had in the U.S. educational system from federal boarding schools to contemporary public schools and tribal colleges. Students will be exposed to rhetorical and political aspects of education.

**AMIN 3106. Indian-White Relations.** (3 cr; A-F only. Prereq—1120 or # LECD 08)

Ten to twelve significant events and their ramifications for contemporary Indian affairs. Variety of options for fulfilling course requirements.

**AMIN 3260. American Indian Novel.** (3 cr; A-F only. Prereq—1120 or #)

Approximately four novels by American Indian authors are read with an explanation of the novels and the milieu that produced them.

**AMIN 3300. Projects in American Indian Studies.** (1-5 cr [max 10 cr]; A-F only. Prereq—1120, #)

Directed reading, research, or involvement in social action culminating in the preparation of a paper.

**AMIN 3301. Advanced Ojibwe.** (3 cr; A-F only. Prereq—2204 or #)

Taught entirely in Ojibwe language. Fluent Ojibwe speaking, writing, reading, and conversations to increase oral and comprehension abilities.

**AMIN 3333. Introduction to Federal Indian Law.** (3 cr; A-F only. Prereq—1120 or #) Legal concepts, cases, and issues surrounding American Indian federal law (e.g., treaties).

**AMIN 3410. Fur Trade in Canada and the United States.** (3 cr; A-F only. Prereq—1120 or #)

Historical review and analysis of Canadian and U.S. Indians in the fur trades.

**AMIN 3750. American Indian Psychology.** (3 cr; A-F only. Prereq—Intro soc sci course, 1120, 3106 or #)

Reviews major theories of personality development and motivational psychology applicable to American Indian issues. Attributes of culturally appropriate developmental models are advanced through cross-cultural examination of general traits, perspectives, norms, and values. Relevant techniques of counseling.

**AMIN 3905. Special Topics: (Various Title to be Assigned).** (3 cr [max 12 cr]; A-F only. Prereq—Intro soc sci course or 1120 or #)

Study of topics not included in regular curriculum.

**AMIN 3997. Internship in American Indian Studies.** (4-8 cr [max 12 cr]; A-F only. Prereq—Amin major, #; may not be taken final semester of sr yr; may be taken in one or two semesters)

Supervised lab experience in American Indian agency or project or with significant Indian clientele. Advance, concurrent, and follow-up written and oral presentations.

**AMIN 4302. Independent Study of the Ojibwe Language.** (1-6 cr [max 12 cr]; A-F only. Prereq—1103, #; no Grad School cr)

Individual opportunity to devise and/or be involved in programs to increase fluency.

**AMIN 4630. American Indians and the Media.** (3 cr; A-F only. Prereq—1120 or #; no Grad School cr)

Examination of images of American Indians in media such as literature, movies, TV, toys, music, and sports as they have contributed to and continue to perpetuate stereotypic and distorted images.

**AMIN 4990. Directed Research.** (1-6 cr [max 12 cr]; A-F only. Prereq—max 8 cr to Grad School program, #)

Qualified seniors and graduate students may register for work on tutorial basis in research of an advanced nature in American Indian Studies

**AMIN 5905. Legal Aspects of Federal Indian Policy For Human Services.** (3 cr; A-F only. Prereq—Amin 1120 and one upper division soc sci course or #)

Examines federal Indian policy as a by-product of treaty rights, sovereignty and self-determination. Emphasis on federal policy impact on American Indian family life, education, child welfare, and religious freedom. Selected case studies used.

**AMIN 5910. Special Topics: (Various Titles to be Assigned).** (3 cr [max 12 cr]; A-F only. Prereq—Intro soc sci course or 1120 or #; no more than 6 cr may be applied to Grad School program)

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 semester.

## American Sign Language (ASL)

College of Education and Human Service Professions

**ASL 2001. Beginning American Sign Language I.** (3 cr; A-F or Aud. Prereq—[CSD 2001] LECD 03)

Introduction to basic vocabulary in American Sign Language and the fingerspelling alphabet.

**ASL 2002. Beginning American Sign Language II.** (3 cr; A-F or Aud. Prereq—[CSD 2002], 2001 or # LECD 03)

Expansion of vocabulary base in American Sign Language. In-depth study of principles of American Sign Language as used receptively and expressively in communication with deaf individuals.

**ASL 3003. Intermediate American Sign Language I.** (3 cr; A-F or Aud. Prereq.—[CSD 5003], 2002 or #) Intermediate-level study of grammatical and linguistic features of ASL; focus on understanding deaf culture and fluency in expressive and receptive skills.

**ASL 3004. Intermediate American Sign Language II.** (3 cr; A-F or Aud. Prereq.—[CSD 5004], 3003 or #) Continued intermediate-level study of grammatical and linguistic features of ASL; focus on understanding deaf culture and fluency in expressive and receptive skills.

**ASL 4005. Advanced American Sign Language.** (3 cr; A-F or Aud. Prereq.—[CSD 4005], 3004 or #; no Grad School cr) Advanced level study of American Sign Language vocabulary and structure. Expressive and receptive skill development. Additional focus on use of ASL by the deaf community.

**ASL 4100. Linguistics of American Sign Language.** (3 cr; A-F only. Prereq—3004 or #, no Grad School cr) Introductory study of the linguistics of ASL. Comparative study of the linguistic structure of ASL and English. Overview of language as a system within a cultural context.

**ASL 4110. Deaf Culture.** (3 cr; A-F only. Prereq—3004 or #, no Grad School cr) Exploration of the history of the deaf community in the United States. Topics will include the deaf community as a cultural and linguistic group with cultural norms, values and traditions. Minority dynamics and cross-cultural interactions also will be covered. ASL will be the language of instruction.

**ASL 4298. American Sign Language Skill Building Workshop.** (1 cr; A-F or Aud. Prereq—2002 or #, no Grad School cr) Instruction and intensive practice in various subjects related to American Sign Language.

## Anthropology (ANTH)

College of Liberal Arts

**ANTH 1080. Freshman Seminar: Understanding Global Cultures.** (3 cr; A-F only. Prereq—Freshman, fewer than 30 credits LEIP 08) Explores nations around the globe towards the goal of developing a cross-cultural understanding of how cultures function. Explores America as a foreign culture, looking at the United States from the viewpoints of foreign anthropologists and other scholars, using comparative ethnographic perspectives to interpret aspects of American culture.

**ANTH 1095. Freshman Seminar: Topics: (Various Titles to be Assigned).** (3-4 cr [max 4 cr]; A-F or Aud. Prereq—Freshman, fewer than 30 cr LEIP 08) Seminar designed specifically for freshmen.

**ANTH 1601. Freshman Seminar: Prehistoric Cultures.** (4 cr; A-F or Aud. =ANTH 1602. Prereq—Freshman, fewer than 30 cr LEIP 07) Origin and development of extinct and living human beings, including growth and differentiation of cultures from their beginnings to earliest stages of ancient civilizations.

**ANTH 1602. Prehistoric Cultures.** (4 cr; A-F or Aud. =ANTH 1601. LEIP 07) Origin and development of extinct and living human beings, including growth and differentiation of cultures from their beginnings to earliest stages of ancient civilizations.

**ANTH 1604. Cultural Anthropology.** (4 cr; A-F or Aud. LEIP 06) Introduction to representative cultures of the world and to concepts and methods of cultural anthropology, focusing on range of variation and degree of uniformity in human behavior and in cultural adaptations.

**ANTH 1612. Introduction to Archaeology.** (4 cr; A-F or Aud. LE 6) Basic principles of archaeology with examples of their application to world prehistory.

**ANTH 2001. Career Development in Anthropology.** (2 cr; A-F only. Prereq—1602 or 1604 or equivalent, or #) Overview of career opportunities for anthropological skill sets. The mechanics of career development: locating jobs; matching skills to job requirements; networking; writing resumes, cover letters, CV's, and graduate school application essays. A focus on the lifelong process of building a career.

**ANTH 3618. Ancient Middle America.** (3 cr; A-F or Aud. Prereq—1604, min 30 cr) Survey of the Aztecs, Maya, and their predecessors.

**ANTH 3622. Prehistoric Archaeology: Old World.** (3 cr; A-F or Aud. Prereq—1604, min 30 cr) Archaeological survey of Europe, Africa, and Asia.

**ANTH 3624. Archaeology of North America.** (3 cr; A-F or Aud. Prereq—1604, min 30 cr) Archaeological survey of major cultural areas of North America north of Mexico.

**ANTH 3628. Women in Cross-Cultural Perspective.** (3 cr; A-F or Aud. Prereq—1604, min 30 cr) Worldwide survey of the structure of gender systems, focusing on women's lives in selected, primarily non-Western, cultures, how gender relations are impacted by colonialism, industrialism, and economic development

**ANTH 3632. Latin American Cultures.** (3 cr; A-F or Aud. Prereq—1604, min 30 cr) Survey of social, political, economic, and religious organization of contemporary national and native cultures of Mexico, Central America, and South America.

**ANTH 3635. Peoples and Cultures of Europe.** (3 cr; A-F or Aud. Prereq—1604, min 30 cr, or #) Exploration of European peoples to develop a cross-cultural understanding of how cultures function. Survey of social, political, economic, religious, family and kinship, gender, urban, globalism/globalization and the European Union (EU) on all of the above.

**ANTH 3638. Peoples and Cultures of the Middle East.** (3 cr; A-F or Aud. Prereq—1604, min 30 cr or #) Examines how anthropologists study the cultures and social institutions of the modern Islamic Middle East. Focus on religion, family life, gender, politics, economy, urban ways of life, kinship and marriage, and the impacts of globalism on the Middle East.

**ANTH 3640. What is a City?: Archaeological Perspectives on Urbanism.** (3 cr; A-F or Aud. Prereq—Min 30 cr or #) Focus on a variety of historically and archaeologically documented urban case studies and important concepts, e.g., the use of space, the physical manifestation of cities, urban abandonment, and the impact of cities on the environment.

**ANTH 3642. Exploring Human Origins.** (3 cr; A-F or Aud. Prereq—Min 30 cr or #) Designed to familiarize students with the discipline of paleanthropology or human evolution. Addresses primate and hominid anatomy, dating techniques, stratigraphy, fossil formation and paleoecology as well as human evolution through the fossil evidence and associated archaeological

material of various hominid groups including the australopithecines, Homo erectus, Neanderthals, and early modern humans. Explores human evolution and current debates surrounding the evolutionary relationships of various hominid taxa.

**ANTH 3691. Independent Study in Anthropology.** (1-5 cr [max 10 cr]; A-F or Aud. Prereq—Min 60 credits or #) Directed reading and research in ethnography leading to preparation of paper.

**ANTH 3695. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 4 cr]; A-F or Aud. Prereq—1604, min 30 cr or #) Seminar on contemporary topics in selected branches of anthropology.

**ANTH 3888. Anthropology of Food.** (3 cr; A-F or Aud. Prereq—1604 or #) Advanced survey and comparative study of the relationship between food and culture in the past and present. Topics include the domestication and evolution of plants and animals, biological and cultural aspects of the production, distribution, preparation, and consumption of food, and an analysis of the social and cultural significance of food—including food preferences and taboos, food and religion, food and identity, food and power, gendered division of labor in foodways, beliefs and values about foods, food symbols and metaphors, new food technologies, and the globalization of contemporary food systems.

**ANTH 4616. Culture and Personality.** (3 cr; A-F or Aud. Prereq—1604, min 60 cr) Role of culture in forming of personality; problems of individual adjustment to demands of culture. Psychological and sociopsychological approach to culture.

**ANTH 4621. Myth and Sacred Symbols.** (3 cr; A-F or Aud. Prereq—1604, min 60 cr) Interpretation of myths and sacred symbols found in beliefs and rituals of selected traditional cultures.

**ANTH 4623. Anthropology and Contemporary Human Problems.** (3 cr; A-F or Aud. Prereq—1604, min 60 cr) Cultural roots of such interrelated contemporary human problems as over-population, food production and distribution, health and nutrition, social and ecological disorders. Review of alternative solutions to such problems as suggested by anthropological study and analyses.

**ANTH 4628. Language and Culture.** (3 cr; A-F or Aud. Prereq—1604, min 60 cr) Relationship between language and culture studied through comparative cases from diverse areas of the world.

**ANTH 4631. Anthropology and Environment.** (3 cr; A-F or Aud. Prereq—1604, min 60 cr) In-depth study of some of the methods and concepts concerning the interrelations of certain human populations with their environments in diverse natural, cultural, historical, and evolutionary settings.

**ANTH 4632. Anthropology of Landscapes.** (3 cr; A-F or Aud. Prereq—1604, min 60 credits or Grad School student or #) Concepts of landscape and space in anthropology. Topics include culturally constructed landscapes, memory, pilgrimage, commemoration, and ways of making a living from the landscape. Theoretical background and analytical examples drawn from the four subfields of anthropology: cultural, physical, linguistics, and archaeology.

**ANTH 4633. Ethnobotany.** (4 cr; A-F only. Prereq—1604, min 60 cr) Advanced survey and study of interrelations between humans and plants, including material, symbolic, ritualistic and other aspects of human-plant interactions. Combines cultural anthropology

## Course Descriptions

and botany to investigate the roles of plants as food, medicine, natural resources and/or gateways to culturally sanctioned religious experiences.

**ANTH 4640. Medical Anthropology.** (4 cr; A-F or Aud. Prereq—1604, min 60 credits or Grad School student, or #) Comparative, cross-cultural examination of sickness and healing. Drawing from ethnographic work on indigenous, alternative, and Euro-American medical systems as well as shamanism, the course works with symbolic, social, political, and historical perspectives.

**ANTH 4651. Development of Anthropological Theory.** (4 cr; A-F or Aud. Prereq—1604, min 90 cr, no Grad School cr) Theoretical perspectives from mid-19th century to the present; examines the interrelationship of method and theory, and implications for practice of anthropology.

**ANTH 4653. Senior Seminar.** (3 cr; A-F or Aud. Prereq—1604, min 90 cr or #; no Grad School cr) Contemporary topics in selected branches of anthropology. Active participation in group research project to develop and enhance anthropological research skills.

**ANTH 4654. Biological Anthropology.** (3 cr; A-F or Aud. Prereq—1604, min 60 cr) 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.

**ANTH 4691. Independent Study in Anthropology.** (1-5 cr [max 5 cr]; A-F or Aud. Prereq—Min 60 cr or #, no Grad School cr) Directed reading and research in ethnology leading to preparation of paper.

**ANTH 4695. Special Topics: (Various Titles to be Assigned).** (1-5 cr [max 10 cr]; A-F or Aud. Prereq—1604, min 90 cr or #) Seminar on contemporary topics in selected branches of anthropology.

**ANTH 4696. Field Research in Archaeology.** (1-10 cr [max 10 cr]; A-F or Aud. Prereq—1602 or 1612, #) Archaeological field excavation, survey, and research in historic and prehistoric sites.

**ANTH 4697. Anthropology Internship.** (2-6 cr [max 6 cr]; S-N or Aud. Prereq—#, no Grad School cr) Supervised experience in an anthropological work related setting: social service agency, museum, immigration services, school or other, approved by instructor. Setting learning objectives, techniques for measuring progress and report writing will be taught.

**ANTH 4699. Honors Project.** (2-4 cr [max 4 cr]; A-F or Aud. Prereq—1604, #; no Grad School cr) Advanced individual project in any area of anthropology demonstrating sound theoretical and research foundations and resulting in a written report, oral presentation. A web page or poster presentation may be done in consultation with the honors advisor.

**ANTH 4997. Teaching Assistantship in Anthropology.** (1-3 cr [max 3 cr]; A-F only. Prereq—Min 60 cr, #, no Grad School cr) Practical experience in teaching-related activities in anthropology courses.

## Art (ART)

### School of Fine Arts

**ART 901. Graphic Design Portfolio Review.** (0 cr; S-N or Aud. Prereq—[repeatable one time], 9 cr in art courses, pre-graphic design major or %) Presentation of portfolio and other required evaluative materials for admission to graphic design major candidacy.

**ART 902. Studio Art Portfolio Review.** (0 cr; S-N only. Prereq—15 cr in art courses, pre-studio art major or %) Presentation of portfolio and other required evaluative materials for admission to studio art major candidacy.

**ART 903. Art Education Portfolio Review.** (0 cr; S-N or Aud. Prereq—[repeatable one time], 9 cr in art courses, pre-art ed major or %) Presentation of portfolio and other required evaluative materials for admission to art education major candidacy.

**ART 1001. Art Today.** (3 cr; A-F or Aud. LEIP 09) Introductory survey of influence of art and roles of artists in varied sociocultural contexts, emphasizing recent art and its historical sources.

**ART 1002. Introduction to Art.** (3 cr; A-F or Aud. =ART 1005. Prereq—Pre-elementary/middle sch educ or [BA theatre or music], or BFA theatre or BMus music education LE 10) Studio course with strong lecture component for those with little or no creative experience in art, introducing various materials, techniques, and concepts. Studio work, lectures, class discussions, viewing artworks, and outside reading.

**ART 1005. Freshman Seminar: Introduction to Art.** (3 cr; A-F or Aud. =ART 1002. Prereq—Freshman, fewer than 30 cr LE 10) Studio course with a strong analytical component for those with little or no creative experience in art; introducing various materials, techniques and concepts in the context of lectures, discussions, critical writing and analysis.

**ART 1006. Freshman Seminar: Fundamentals of Drawing.** (3 cr; A-F or Aud. =ART 1009. Prereq—Freshman, fewer than 30 cr LE 10) Development of visual and conceptual skills through drawing as well as lectures, presentations, group discussions, critiques.

**ART 1009. Fundamentals of Drawing.** (3 cr; A-F or Aud. =ART 1006. Prereq—Not for art majors or minors LE 10) Stimulation of visual and conceptual skills through dynamics of drawing as well as lectures/presentations and group discussions.

**ART 1010. Drawing I.** (3 cr; A-F or Aud. Prereq—Art or art ed major or art minor or architecture and design minor or #) Introduction to the drawing experience and problems concerned with translation of three-dimensional visual experience into two-dimensional form.

**ART 1011. 2-D Design.** (3 cr; A-F or Aud. Prereq—Art or art ed major or art minor or #) Introduction to two-dimensional design through study of design elements and principles, including visual organization and color theory and their application in various media.

**ART 1012. 3-D Design.** (3 cr; A-F or Aud. =ART 1015. Prereq—Art or art ed major or architecture and design studies minor or #) Introduction to basic concepts and materials of three-dimensional form and space.

**ART 1013. 2-D Digital Design.** (3 cr; A-F or Aud. Prereq—Art or art ed major or art minor or photography minor or architecture and design studies minor or communication arts or arts in media minor or #) Two-dimensional studio and graphic design concepts using the computer as a creative tool. Laptop required; digital instruction presented only on the Mac platform.

**ART 1015. Freshman Seminar: 3-D Design.** (3 cr; A-F or Aud. =ART 1012. Prereq—Freshman, fewer than 30 cr LE 10) Introduction to the design, fabrication and analysis of three dimensional form and space based on principles and elements of design, hands on design assignments and study of 3-D design as a source of cultural artifacts in contemporary society.

**ART 1125. Watercolor I.** (3 cr; A-F or Aud. Prereq—1002 or 1010 or #) Basic concepts and techniques.

**ART 1126. Watercolor II.** (3 cr [max 6 cr]; A-F or Aud. Prereq—[3125], 1125 or #) Advanced concepts and techniques.

**ART 1405. Fundamentals of Ceramics I.** (3 cr; A-F or Aud. Prereq—Not for art majors or minors LE 10) Basic handbuilding and glazing of earthenware ceramics.

**ART 1605. Fundamentals of Photography.** (3 cr; A-F or Aud. =ART 1607, ART 2600. Prereq—Not for art majors or minors LE 10)

Introduction to photography and its roles in the communications culture. Basic photographic principles and introduction to digital darkroom. Assignments emphasize creative thinking. Requires digital camera with adjustable shutter speeds and apertures. Laptop and software required; instruction presented only on the Mac platform. Plus 3 hours arranged studio work per week.

**ART 1607. Freshman Seminar: Fundamentals of Photography.** (3 cr; A-F or Aud. =ART 1605, ART 2600. Prereq—Freshman, fewer than 30 cr LE 10)

Introduction to photography as a communicative tool and medium for creative expression. Investigation of photography's role in the communications culture and to historical influences in the medium. Students produce a final portfolio of photographic prints. Requires digital camera with adjustable shutter speeds and apertures. Laptop and software required; instruction presented only on the Mac platform.

**ART 1800. Creating Visual Narratives.** (3 cr; A-F or Aud. Prereq—Film studies minor, #) Introductory level video course offering the basic concept of video narrative and the fundamental aspects of working with digital production processes and techniques.

**ART 1814. Creating Across Cultures.** (3 cr; A-F or Aud. Prereq—[2814] LECD 09) Underrepresented visual arts of cultural groups within U.S. society.

**ART 1900. Visual Literacy.** (3 cr; A-F or Aud. Prereq—[2900] LE 9) Various forms of visual expression—art, commercial imagery, typography, architecture, graffiti, etc.—as rhetoric. Introduction to variety of theories and/or modes of criticism, and consideration of their value for explanation of visual expression.

**ART 2014. 3-D Digital Studio I.** (3 cr; A-F or Aud. =ART 1014 or 3014. Prereq=1013 and art or art ed major, pre-art educ major or pre-graphic design major, or art minor or architecture and design studies minor or #.) Introduction to design using 3-D digital applications, particularly for the creation of images for the purpose of artistic expression or for use as graphic elements. The class will cover use of the software as well as artistic and design issues raised by this particular medium.

**ART 2016. 2-D Digital Studio I.** (3 cr [max 6 cr]; A-F or Aud. Prereq=[3016], 1013, art or art ed major, pre-art educ major or pre-graphic design major, or art or photography minor or #) Introduction to digital printmaking and other 2-Dimensional outputs in relationship to contemporary fine art practice. Focus on digital input and output, with cross-media explorations. The class is conceptually driven, teaching skills, techniques, and introducing theory, history and criticism. Development of a serial approach to visual imagery. Laptop required; digital instruction presented only on the Mac platform.

**ART 2030. Digital Arts I.** (3 cr [max 6 cr]; A-F or Aud. Prereq=[3030], 1013, 2016, art or art ed major, pre-art educ major or pre-graphic design major, or art minor or #) Introduction to digital media practice and theory through lectures, studio time, readings and hands-on assignments. Introduction to the most vital forms of contemporary 4-D art making, including video art, sound/sonic, and web art/net.art. Other introductions may include narrative driven structures, interactivity and basic animation.

**ART 2100. Painting I.** (3 cr; A-F or Aud. Prereq=[1100], 1006 or 1009 or 1010, 1011, art or art ed major or art minor or #) Color and pigment theory, basic concepts and explorations in technology and imagery. Painting traditions and contemporary directions.

**ART 2200. Sculpture I.** (3 cr; A-F or Aud. Prereq=[1200], 1015 or 1012, art or art ed major or art minor or #) Sculptural materials, methods, and concepts, with problems relating to form, time, and space; experience with various sculptural forms and media, emphasizing creative expression.

**ART 2300. Printmaking I: Intaglio, Relief.** (3 cr; A-F or Aud. =ART 2302. Prereq=1006 or 1009 or 1010, 1011, art or art ed major or art minor or #) Introduction to methods and materials used in zinc plate etching and relief printing from wood and linoleum. Technical, aesthetic, and contextual considerations encountered in production of meaningful artwork. Theoretical, legal, critical, and historical aspects of printmaking.

**ART 2301. Printmaking I: Litho, Screen.** (3 cr [max 6 cr]; A-F or Aud. Prereq=[1301], 1006 or 1009 or 1010, 1011, art or art ed major or art minor or #) Introduction to methods and materials used in lithographic printmaking from stones and plates and water-based screenprinting. Content includes technical, aesthetic and contextual considerations encountered in the production of meaningful artwork. Additional information on theoretical, legal, critical and historical aspects of printmaking.

**ART 2302. Printmaking I: Hybrid and Non-Toxic Print Processes.** (3 cr; A-F or Aud. =ART 2300. Prereq=1006 or 1009 or 1010, 1011, art or art ed major or art minor or #) A studio-based investigation of contemporary non-toxic printmaking processes including Solarplate intaglio and relief applications; "ImageOn" photopolymer laminations; Collagraph; "Prono Plate" lithography and bookmaking.

**ART 2400. Ceramics I.** (3 cr; A-F or Aud. Prereq=1006 or 1009 or 1010, 1012, art or art ed major or art minor or #, =1400) Handbuilding methods, surface enhancement, and conceptual support for pottery and/or ceramic sculpture.

**ART 2500. Jewelry and Metals I.** (3 cr; A-F or Aud. Prereq=1011 or 1013, art or art ed major or art minor or #, =1500) Basic jewelry design, fabrication, and surface enhancement techniques.

**ART 2600. Photography I.** (3 cr; A-F or Aud. =ART 1605, ART 1607. Prereq=Art or art ed major or art or photography minor, 1013 or #) Introduction to photographic concepts, materials, and the digital darkroom. Varied thematic assignments within the visual arts context. Requires digital camera with adjustable shutter speeds and apertures. Laptop and software required; instruction presented only on the Mac platform.

**ART 2905. Design Technology I.** (3 cr; A-F or Aud. Prereq=1013 and graphic design major or pregrad art and tech major or arts in media minor or #) Fundamentals of graphic reproduction and Web site design; application of digital programs used in preparing print and web work. Laptop required; digital instruction presented only on the Mac platform.

**ART 2907. Typography I.** (3 cr; A-F or Aud. Prereq=Graphic design major or digital arts and photography emphasis or #) Introduction to fundamentals of typography in print and screen media. Presents terminology, history, and theories of letterforms. Students will perform directed assignments to develop typographic skills on computer and by hand.

**ART 2911. Graphic Design I.** (3 cr; A-F or Aud. Prereq=1010, 1011, 1013, 2905, 2907, arts in media minor, graphic design major, or digital art and photography emphasis or #) Introduction to theory and practice of graphic design. Meaning and aesthetics of image juxtaposition; resonance of type and image.

**ART 3015. 3-D Digital Studio II.** (3 cr [max 9 cr]; A-F or Aud. Prereq=[4014], 2014, art or art ed major or architecture and design studies minor or art minor or #) Advanced study in 3-D digital applications, particularly for the creation of images and animation for the purpose of artistic expression or for use as graphic elements. The class covers use of the software as well as artistic and design issues raised by this particular medium.

**ART 3017. 2-D Digital Studio II.** (3 cr [max 6 cr]; A-F or Aud. Prereq=[5016], 2016, art or art ed major or art minor or #) Advanced art making as part of the tradition of digital printmaking and other 2-Dimensional outputs in relationship to contemporary fine art practice.

**ART 3031. Digital Arts II.** (3 cr [max 6 cr]; A-F or Aud. Prereq=[5030], 2030, art or art ed major, pre-art educ major or pre-graphic design major, or art minor or #.) Advanced art making for students interested in exploring interdisciplinary or advanced study and research in current or emerging technologies.

**ART 3095. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 12 cr]; A-F or Aud. Prereq=#) Intensive study of special topics in visual arts. Topic announced before course offered.

**ART 3100. Painting II.** (3 cr [max 9 cr]; A-F or Aud. Prereq=2100, art or art ed major, pre-art educ major or pre-graphic design major, or art minor or #; max 9 cr) Painting in specialized interest area, using student/instructor-generated semester goals outline.

**ART 3200. Sculpture II.** (3 cr [max 6 cr]; A-F or Aud. Prereq=2200, art or art ed major or art minor or #) Sculptural materials, methods, and concepts, with problems relating to form, time, and space; experience with various sculptural forms and media, emphasizing creative expression.

**ART 3214. Sculpture II: Robotics and Physical Computing.** (3 cr [max 6 cr]; A-F or Aud. Prereq=2200, art or art ed major or art minor or #) Intermediate and advanced sculpture robotics and physical computing: Approaches to sculpture, digital control of objects, kinetic sculpture and sound in installation events, performances, and exhibitions.

**ART 3300. Printmaking II.** (3 cr [max 6 cr]; A-F or Aud. Prereq=2300 or 2301, art or art ed major or art minor or #) Continued exploration of processes explored in either or both of the introductory courses. Increased technical challenges combined with refinement of image and concept. Some photographic and mixed-media processes; increased experience in editing and critical review.

**ART 3400. Ceramics II.** (3 cr [max 6 cr]; A-F or Aud. Prereq=2400 or #) Advanced handbuilding and surface enhancement techniques; development of a stylistically consistent body of work.

**ART 3405. Fundamentals of Ceramics II.** (3 cr [max 6 cr]; Stdnt Opt. Prereq=1405 or #; not for art majors or minors) Handbuilding, glazing, and firing of earthenware ceramics.

**ART 3425. Ceramics II Wheel Throwing.** (3 cr; A-F or Aud. Prereq=2400, art or art ed major or art minor or #) Introduction to the potters wheel and clay throwing techniques. Glazing and firing; surface work and enhancement, with conceptual support for pottery and sculptural clay forms.

**ART 3500. Jewelry and Metals II.** (3 cr [max 6 cr]; A-F or Aud. Prereq=2500, art or art ed major or art minor or #) Advanced application of jewelry techniques and design.

**ART 3600. Photography II: Alternative Processes and Film.** (3 cr [max 6 cr]; A-F or Aud. Prereq=1013, 2600 or 1607 and art or art ed major or art or photography minor or #) Continued development of photographic concepts using film and the wet darkroom, and selected other alternative processes techniques within the creative context. Portfolio requirements are project-based. Requires both digital and film cameras, at least one of them with adjustable shutter speeds and apertures. Laptop and software required; instruction presented only on the Mac platform.

**ART 3700. Drawing II.** (3 cr [max 6 cr]; A-F or Aud. Prereq=1010, art or art ed major, pre-art educ major or pre-graphic design major, or art minor or #) Individually supervised projects supporting involvement in other studio areas.

**ART 3715. Figure Drawing.** (3 cr; A-F only. Prereq=3700, art or art ed or graphic design major or art minor or #) The study of the human form, its structures and movements related to aesthetic considerations. Intermediate and advanced issues include perspective, space, foreshortening, proportioning and appropriation for the purposes of approaching the figure as an expressive and conceptual tool of art making.

**ART 3809. Art in Elementary Education Methods.** (3 cr; A-F or Aud. Prereq=0903, art education cand) Instructional problems based on the growth of artistic expression in children, philosophy of art education, and contemporary problems. Museum and multicultural based experiences are combined with outreach opportunities to develop inclusive elementary art curriculum and assessment.

**ART 3810. Art in Elementary Education.** (2 cr; A-F or Aud. Prereq=1002 or 1005, pre-elem/middle school ed major only) Instructional problems; growth and development of artistic expression in children. Studio experience relating to elementary art curriculum.

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**ART 3811. Teacher as Artist: Postmodern Theory and Practice.** (3 cr; A-F or Aud. Prereq=0903, [3809 or 3810], Art ed major or #)

Experience the complex role of the teacher as artist in the postmodern classroom and studio. Focuses on building professional expertise in the field of art education, museum education and contemporary artistic practice. Students will plan for an exhibition of their work in Tweed Museum of Art.

**ART 3814. Digital Methods in Art Education.** (3 cr; A-F or Aud. Prereq=Art education major or #)

Theoretical and practical experiences with emerging visual technologies. Assignments will integrate contemporary pedagogical theories of visual culture and digital media in art education. Art projects will use the computer as a creative tool.

**ART 3815. Art in Secondary Education.** (3 cr; A-F or Aud. Prereq=3811, art ed majors only or #)

Nature and objectives of art programs in secondary school; content and methods. Development of secondary art curriculum and classroom site visits.

**ART 3907. Typography II.** (3 cr; A-F or Aud. Prereq=2907, graphic design major or #)

Advanced exploration of typography concepts and issues in screen and print media.

**ART 3922. Graphic Design II.** (3 cr; A-F or Aud. Prereq=2911, graphic design major or #)

Continuation of theory and practice of graphic design. Introduction to professional practices. Materials meaning, aesthetics, and practical use.

**ART 3933. Graphic Design III.** (3 cr; A-F or Aud. Prereq=3922, graphic design major or #)

Continuation of theory and practice of graphic design. Graphic design as an organizational and informative medium and as a purely aesthetic pursuit.

**ART 3950. Architecture Studio.** (3 cr; A-F or Aud. Prereq=1009, 1012, 1013, 2016, Hist 3361, architecture and design studies minor or #)

Architectural concepts, methods, and materials, with experience in architectural planning and problem-solving.

**ART 4040. Introduction to Digital Filmmaking.** (3 cr; A-F only. Prereq=2030, art or art ed major, pre-art educ major or pre-graphic design major, or art minor or #)

Introduction to the narrative, documentary and experimental possibilities of digital filmmaking production, development of critical appreciation of film, with an exposure to history and theory of the medium and factors influencing intercultural communication in these genres. Students develop, produce and complete a digital film.

**ART 4100. Painting III.** (3 cr [max 9 cr]; A-F or Aud. Prereq=3100, art or art ed major or art minor or #; no Grad School cr)

Advanced individually supervised projects using both traditional and contemporary painting media and techniques.

**ART 4191. Individual Study in Painting.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq=Two sem painting, #; no Grad School cr)

Instruction tailored to individual's needs outside of traditional class structure.

**ART 4200. Sculpture III.** (3 cr [max 6 cr]; A-F or Aud. Prereq=3200, art or art ed major or art minor or #; no Grad School cr)

Sculpture in area of specialized interest.

**ART 4291. Individual Study in Sculpture.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq=2 sem sculpture, #; no Grad School cr)

Individual study in sculpture.

**ART 4300. Printmaking III.** (3 cr [max 6 cr]; A-F or Aud. Prereq=3300, art or art ed major or art minor or #)

Further exploration of print processes. Emphasis on refinement of technical skills as well as development of concepts and imagery. Experimentation encouraged in nontraditional, collaborative, and cross-disciplinary approaches. Increased experience in editing and alternative formats combined with a more comprehensive critical review.

**ART 4391. Individual Study in Printmaking.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq=3300, %)

Graduate students complete a project by contract with instructor, supported by a research paper.

**ART 4400. Ceramics III.** (3 cr [max 6 cr]; A-F or Aud.

Prereq=3400, art or art ed major or art minor or #; no Grad School cr)

Technical and conceptual refinement of advanced body of ceramic work.

**ART 4491. Individual Study in Ceramics.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq=2 sem ceramics, %)

Directed study in specific areas.

**ART 4600. Photography III: Digital Portfolio.** (3 cr [max 9 cr]; A-F or Aud. Prereq=(1900 or 2900), (3600 or 3625), art or art ed major or art or photography minor or #)

Intensive digitally-based portfolio development in area of special interest. Selected readings in photographic theory and criticism. Graduate student portfolios are complemented by a related research project. Requires digital camera with adjustable shutter speeds and apertures. Laptop and software required; instruction presented only on the Mac platform.

**ART 4650. Photography IV: Alternative Processes Portfolio.** (3 cr [max 6 cr]; A-F only. Prereq=1900, 3600 or 3625, 4600, art or art ed major or art or photography minor or #)

Intensive portfolio development using alternative contemporary and historic photographic processes in area of special interest. Graduate student portfolios are complemented by a related research project. Requires both digital and film cameras, at least one of them with adjustable shutter speeds and apertures. Laptop required. Instruction presented only on the Mac platform.

**ART 4675. Photography V: The Photographic Book.** (3 cr [max 9 cr]; A-F only. Prereq=1900, [3600 or 3625], [4600 or 4650], art or art ed major or art or photography minor or #)

Creation of one or more individual photographic book projects, with emphasis on effective sequencing of images and appropriate book form for the specific body of work. Selected readings in book arts relating to photography. Graduate student book projects are complemented by a related research project. Requires digital camera with adjustable shutter speeds and apertures. Laptop required; instruction presented only on the Mac platform.

**ART 4691. Individual Study in Photography.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq=2 semesters of photography, %)

Graduate students complete a project by contract with instructor, supported by a research paper.

**ART 4700. Drawing III.** (3 cr [max 6 cr]; A-F or Aud.

Prereq=3700, art or art ed major or art minor or #) Individually supervised projects supporting involvement in other studio areas. Graduate students produce a technically and conceptually sophisticated portfolio of drawing, supported by a research paper.

**ART 4791. Individual Study in Drawing.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq=2 semesters of drawing, #)

Graduate students complete a project in drawing by contract with instructor, supported by a research paper.

**ART 4812. Senior Seminar.** (3 cr; A-F or Aud. Prereq=Sr or #; no Grad School credit)

Current visual arts and design issues investigated through research, lectures, assigned readings, discussion, writing assignments, and presentations.

**ART 4813. Senior Seminar II: Studio Practice.** (3 cr; A-F or Aud. Prereq=4812, Sr or #, studio art-general major; no Grad School cr)

Preparation for the emerging studio professional in such areas as documenting work, building an exhibition history, and arts-related employment opportunities, through lectures, presentations, discussion, assigned readings, writing assignments, and field experience.

**ART 4893. International Collaborations/Design in Education and Cultural Preservation.** (3-6 cr [max 6 cr]; A-F or Aud. =ART 4922. Prereq=4908, graphic design major or digital art and photography emphasis or Grad School student)

Intensive three week summer interdisciplinary workshop course at an international cultural heritage site. Students will work collaboratively with archeologists, writers, photographers, and others to gather data and develop an educational Web site or digital catalog to publicize the results of the project. Students will use and study design research theories and methods as they work with historical structures, or ruins at the site of an archeological research location. Selected readings, presentations, and visits to related cultural heritage areas. Requires experience with digital technology.

**ART 4899. Senior Presentation/Exhibition.** (1 cr; A-F or Aud. Prereq=Sr art major or #; no Grad School cr)

Students, singly or in pairs, plan/prepare/present under guidance of faculty/museum staff an exhibition of their work in Tweed Museum of Art or an approved alternative public venue.

**ART 4903. Art Education Student Teaching Seminar.** (1 cr; A-F or Aud. Prereq=Art ed major and &Educ 4500, EdSe 4600, ElEd 4650; no Grad School cr)

For students currently student teaching in art (K-12). Students will share concerns and situations, suggestions, and gain group support. The seminar supplements the field experience and builds on issues of supervision, evaluation, professional development, and the culminating Standards of Effective Practice art education portfolio.

**ART 4905. Design Technology II.** (3 cr; A-F or Aud. Prereq=2905, graphic design major or #)

Advanced concepts and digital program applications for print and web graphic contexts.

**ART 4907. Motion Graphics.** (3 cr; A-F or Aud. Prereq=[5907], 2911 and graphic design major, or digital art and photography emphasis or Grad Student, or #) Introduces aesthetics, mechanics, and meaning of motion graphics.

**ART 4908. Interactive Design I.** (3 cr [max 6 cr]; A-F or Aud. Prereq=[5909], 4907, graphic design major, or digital art and photography emphasis or Grad Student or #)

Interactivity in graphic design, concentrating on computer-based interactive presentations.

**ART 4909. Interactive Design II.** (3 cr [max 6 cr]; A-F or Aud. Prereq=4908, graphic design major, or digital art and photography emphasis or Grad Student, or #, =5910)

Interactivity in graphic design, concentrating on computer-based interactive presentations.

**ART 4922. Senior Design Studio I.** (3 cr [max 6 cr]; A-F or Aud. =ART 4893. Prereq=3933 or #, no Grad School cr)

Exploration of advanced graphic design topics through an extensive project for print and/or screen: research, creative production and development of a presentation system. Done individually or in groups.

**ART 4933. Senior Design Studio II.** (3 cr [max 6 cr]; A-F or Aud. Prereq=4922 or #, no Grad School cr)

Professional presentation, portfolio development and professional practice.

**ART 4950. Architecture Capstone/Portfolio.** (3 cr; A-F or Aud. Prereq–3950 and architecture and design studies minor, ARH 3331 or ARH 3361 or Hist 3365 or #; no Grad School cr)

Continued work in architectural concepts, methods, and materials, culminating in a capstone portfolio.

**ART 5091. Individual Study in Electronic Arts.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq–1014 or 3016, art or art ed major or art minor and #; no Grad School cr)  
Individually supervised projects in electronic arts media.

**ART 5795. Intermedia Studio Problems.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq–2 sem work in each subject area with #)  
Directed study emphasizing intermedia concerns.

**ART 5991. Independent Study in Graphic Design.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq–2 sem work in graphic design and graphic design major and #)  
Independent work in graphic design

**ART 5997. Art Museum Internship.** (1-3 cr [max 12 cr]; A-F or Aud. Prereq–1001, 6 cr ARH; 1 cr for each 45 hrs of work; no Grad School cr, #)  
Supervised practicum in art museum operation

**ART 5999. Special Projects in Design.** (3 cr [max 6 cr]; A-F or Aud. Prereq–Graphic design major or Grad Student; #)  
Specific projects in graphic design practice.

**ART 8333. FTE: Master's.** (1 cr; No grade. Prereq–Master's student, adviser and DGS consent)

**ART 8901. Graduate Seminar.** (4 cr [max 16 cr]; A-F or Aud. Prereq–88980)  
Critique of student work and discussion of readings. Faculty presentations on design history, criticism, theory, and analysis.

**ART 8903. Art Teaching Practicum.** (1 cr [max 4 cr]; A-F or Aud. Prereq–Grad tchg asst or #)  
Theory of and experience in teaching college-level art.

**ART 8980. Graduate Studio.** (4 cr [max 16 cr]; A-F or Aud. Prereq–88901; Grad student)  
Production of graphic designs based on problems and topics that are discussed in Art 8901 (Graduate Seminar), in which students enroll concurrently.

**ART 8990. M.F.A. Creative Thesis.** (3-6 cr [max 6 cr]; A-F or Aud. Prereq–Grad Student and #)  
In consultation with advisor, completion of major project as culmination of M.F.A. studies.

## Art History (ARTH)

School of Fine Arts

**ARTH 1303. History of World Art I.** (3 cr; A-F or Aud. LE 9)  
Development of world art and architecture from prehistory through Middle Ages.

**ARTH 1304. History of World Art II.** (3 cr; A-F or Aud. LEIP 09)  
Development of world art and architecture from Renaissance to present.

**ARTH 1400. Freshman Seminar: Honors: Paris in the Age of Impressionism.** (3 cr; A-F or Aud. Prereq–Freshman, fewer than 30 cr, honors student LE 9)  
Paris in art and literature, 1860-1900.

**ARTH 2300. The City as a Work of Art.** (3 cr; A-F only. LEIP 09)  
The city as a work of art and center of culture. A study of artistic representations combined with references to primary texts. Use of case studies of particular urban centers to explore the rise of the city and the history of urban planning around the globe.

**ARTH 2390. American Art of the 20th Century.** (3 cr; A-F or Aud. LECD 09)  
American art from Armory Show of 1913 to present examined in social and historical contexts.

**ARTH 2815. Women Artists in History.** (3 cr; A-F or Aud. LECD 09)  
Survey of contributions women have made in the visual arts throughout history.

**ARTH 3091. Honors Research in Art History.** (1-3 cr [max 3 cr]; A-F or Aud. Prereq–#)  
Directed research in an art history area for students of exceptional ability. Students must be invited by art history faculty to register for this course.

**ARTH 3320. Ancient Art.** (3 cr; A-F or Aud)  
Art and architecture of Minoans, Mycenaeans, Greeks, and Romans.

**ARTH 3330. Renaissance Painting and Sculpture.** (3 cr; A-F or Aud)  
Developments in Europe, 1300-1600.

**ARTH 3331. European Architecture, 1400-1800.** (3 cr; A-F or Aud)  
Developments during Renaissance and Baroque periods.

**ARTH 3340. Baroque and Rococo Art.** (3 cr; A-F or Aud)  
Developments in European painting and sculpture during 17th and 18th centuries.

**ARTH 3360. European Art in an Age of Revolution.** (3 cr; A-F or Aud)  
European art from French Revolution through pan-European revolutions of 1848, examined in social and historical contexts.

**ARTH 3361. European Art: Impressionism and Post-Impressionism.** (3 cr; A-F or Aud)  
European art from 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, 1900-1945.** (3 cr; A-F or Aud)  
Includes 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: Colonial to Impressionist.** (3 cr; A-F or Aud)  
U.S. art from colonial period through 1900, examined in social and historical contexts.

**ARTH 3395. Special Topics: (Various Titles to Be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud)  
Title announced before course is offered.

**ARTH 4491. Directed Study in 19th- and 20th-Century European Art.** (1-4 cr [max 9 cr]; A-F or Aud. Prereq–Grad Student or #; max 6 cr for undergrads, max 9 cr for grad)  
Independent research in an area of the student's interest; fundamental knowledge of period or subject required.

**ARTH 4620. History of Photography.** (3 cr; A-F or Aud. Prereq–2390 or 3370 or art or art ed major or art, photography or communication arts minor or #)  
Conceptual and technical evolution of the photographic medium from its inception to the present, with special emphasis upon its development within art, design and new media contexts.

**ARTH 4691. Directed Study in the History of Photography.** (3-4 cr [max 4 cr]; A-F only. Prereq–#,&4620 is not allowed)

Independent research in an area of the student's interest, culminating in a paper or project. Fundamental knowledge of subject required. Graduate student must complete a substantial research paper or project on a topic chosen in consultation with instructor

**ARTH 4901. History of Graphic Design.** (3 cr; A-F or Aud. Prereq–Art or art ed major or graphic design major or art or communication arts or arts in media minor or Grad student or #)

Introduction to the history of graphic design, from the origins of written communication to present. Graduate students complete a substantial research paper or project on a topic in consultation with the instructor.

**ARTH 4991. Directed Study in the History of Graphic Design.** (1-4 cr [max 8 cr]; A-F or Aud. Prereq–Grad student or #)  
Independent research in an area of the student's interest, culminating in a paper or project. Fundamental knowledge of subject required.

**ARTH 4999. Senior Paper Art History.** (1 cr; A-F or Aud. Prereq–Major in ARH with 90 cr, #; no Grad School credit)  
Students write and/or revise a final paper demonstrating their competency in art historical research and writing.

**ARTH 5191. Directed Study in Ancient and Medieval Art.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq–#; max 6 cr for undergrads)  
Independent research in an area of art history pertinent to the interests of the student. Fundamental knowledge of period or subject required.

**ARTH 5391. Directed Study in Renaissance and Baroque Art.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq–#; max 6 cr for undergrads)  
Independent research in an area of art history pertinent to the interests of the student. Fundamental knowledge of period or subject required.

**ARTH 5591. Directed Study in American Art.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq–#; max 6 cr for undergrads)  
Independent research in an area of art history pertinent to the interests of the student. Fundamental knowledge of period or subject required.

## Astronomy (AST)

Swenson College of Science and Engineering

**AST 1040. Introductory Astronomy.** (3 cr; A-F or Aud. LE 5)

Survey of present knowledge of solar system, interstellar space, stars, galaxies, and universe. Historical development of astronomy as a science. Taught in day school and in Individualized Learning Program format.

**AST 1061. Freshman Seminar: Observing the Universe.** (4 cr; A-F or Aud. Prereq–Freshman, fewer than 30 cr LE 4)  
Introduction to principles of astronomical observation, telescopes and mounts, naked-eye astronomy, constellation identification, lunar phases, motion of the planets, astrophotography, image processing, and image analysis. Highlights the work of Galileo Galilei and the 18th century astronomer Charles Messier.

**AST 2040. The Solar System.** (3 cr; A-F or Aud. Prereq–1040, Math 1250 or #)  
Survey of terrestrial and jovian planets and their satellites; asteroids, comets, interplanetary debris; examination of lunar rocks and meteorite samples when available; origin and evolution of solar system.

**AST 4110. Observational Astronomy.** (3 cr; A-F or Aud. Prereq–Phys 2012 or #)  
Applied principles of astronomical observation; review of optical telescopes and mounts; locating and tracking objects; remote telescope operation, CCD, CMOS, and film astrophotography, astrometry, photometry, spectroscopy, astronomical image processing and analysis.

## Behavioral Sciences (BHSC)

### School of Medicine

**BHSC 5432. Clinical Psychopharmacology.** (3 cr; Stdnt Opt)  
Clinical application of pharmacological principles; overview of major psychological disorders, such as depression, anxiety, psychosis, ADHD, substance abuse, and sleep disorders; appropriate treatments of psychological disorders with psychotropic medications. Clinical guidelines for psychotropic drugs.

**BHSC 5491. Problems in Medical Behavioral Sciences.** (1-6 cr [max 6 cr]; A-F or Aud. Prereq—Med or upper div or Grad Student, #; max 6 cr to Grad School program)  
Independent study on a tutorial, seminar, or lecture basis. Investigative work, lecture material, and/or appropriate reading and discussions designed according to interest and capabilities of individual student.

**BHSC 5591. Studies in Medical Behavioral Sciences.** (2 cr; P-N only. Prereq—Regis med student, #)  
Selectives on topics in general medical behavioral science, typically including women's mental health issues, chronic pain, socialization into medicine, aging, hypnosis and others.

**BHSC 6200. Behavioral Medicine.** (1 cr; P-N only. Prereq—Regis med student)  
Introduction to contemporary behavioral medicine. Interface of biological, psychological, and social factors in a range of health issues, including stress, substance abuse, chronic pain and illness, cardiovascular disease, obesity, and infectious diseases.

**BHSC 6211. Medical Sociology.** (1 cr; P-N only. Prereq—Regis med student)  
Advanced aspects of sociology and its application to areas of medical science. Emphasis on doctor-patient relationship, role of medicine in society, and institutionalization of medical care through hospitals, medical schools, and medical profession.

**BHSC 6230. Medical Psychology: Interviewing.** (1 cr; P-N or Aud. Prereq—Regis med student)  
Psychological aspects of interviewing in health care settings; interpersonal communicative skills and problems; techniques of rapport building and history taking.

**BHSC 6260. Psycho-Social-Spiritual Aspects of Life-Threatening Illness.** (2 cr; P-N only. Prereq—Regis med student)  
Psychological, social, and spiritual coping of patients, families, and health care professionals as they experience life-threatening illnesses. Effective intervention strategies for health care professionals are emphasized. Post-death responses of families and care providers.

**BHSC 6652. Human Behavioral Development and Problems.** (4 cr; 0-N only. Prereq—Regis med student)  
Human psychological development throughout life; normal cognitive, learning, social, and personality development; problems expressed during various stages of life in the family and other settings. Assessment/treatment described as relevant to practice of family medicine.

**BHSC 6701. Medical Ethics.** (2 cr; 0-N only. Prereq—Regis med student)  
Basic concepts and skills of medical ethics, including core values, clinical issues, and case analysis.

## Biochemistry and Molecular Biology (MDBC)

### School of Medicine

**MDBC 3194. Biochemistry Undergraduate Research.** (1-3 cr [max 3 cr]; S-N or Aud. Prereq—#)  
Laboratory experience in biochemistry and molecular biology research.

**MDBC 5201. Topics in Biochemistry.** (3 cr; A-F or Aud. Prereq—Chem 3322 or Chem 4341 or #)  
In-depth coverage and expansion of selected biochemical principles introduced in introductory undergraduate courses

**MDBC 5202. Cellular and Molecular Biology.** (3 cr; A-F or Aud. Prereq—Biol 2102 or Biol 5231 or Chem 4342 or #)  
In-depth coverage of selected topics in cellular and molecular biology. Most topics will have been introduced in undergraduate courses.

**MDBC 5501. Neurobiochemistry.** (2 cr; A-F or Aud. Prereq—Chem 3322 or Chem 4342 or #)  
Current concepts 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 central nervous system.

**MDBC 8151. Biochemistry Seminar.** (1 cr [max 4 cr]; S-N or Aud. Prereq—Biochem or Chem Graduate Student or #)  
Current topics in biochemistry.

**MDBC 8294. Current Research Techniques.** (1-3 cr [max 4 cr]; S-N or Aud. Prereq—Biochem or Chem Graduate Student or #)  
Research projects in biochemistry, each carried out in research lab of a faculty member.

**MDBC 8333. FTE: Master's.** (1 cr; No grade. Prereq—Master s student, adviser and DGS consent)

**MDBC 8444. FTE: Doctoral.** (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

**MDBC 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. Prereq—Max 6 cr per semester or summer; doctoral student who has not passed prelim oral; no required consent for the first two registrations up to 12 cr; departmental consent for the third and fourth registrations up to an additional 12 cr, or 24 cr total (for doctoral students admitted summer 2007 and beyond; doctoral students admitted prior to summer 2007 may register up to 4 times totaling 60 cr)

**MDBC 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**MDBC 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

## Biology (BIOL)

### Swenson College of Science and Engineering

**BIOL 1001. Biology and Society.** (4 cr; A-F or Aud. Prereq—For nonmajors LE 4)  
Contemporary issues in biology. (3 hrs lect, 2 hrs lab)

**BIOL 1010. Home Horticulture.** (3 cr; A-F or Aud. LE 5)  
Concepts of plant identification, growth and culture with practical application to home landscape, house plants and fruit, flower and vegetable gardening. Labs include plant propagation, grafting, computer landscape design and one field trip.

**BIOL 1011. General Biology I.** (5 cr; A-F or Aud. Prereq—1 yr high school Chem or 1 sem college Chem, SCSE student, or student in exercise science or athletic training or teaching life science or teaching earth and space science or teaching physical science or environmental studies or recreation-outdoor education or B.A. majors in biology or chemistry or geology LE 4)

Fundamental concepts of biology, including chemical basis of life, cell structure and function, energy transformations, photosynthesis, cellular respiration, genetics, molecular biology, DNA technology, development, origin of life, and evolution. (4 hrs lect, 2.5 hrs lab)

**BIOL 1012. General Biology II.** (5 cr; A-F or Aud. Prereq—1011)

Fundamental concepts of biology, including classification and diversity of life, anatomy, physiology, and development of prokaryotes, protists, fungi, animals, and plants; behavior; population, community, and ecosystem ecology. (4 hrs lect, 2.5 hrs lab)

**BIOL 1086. Freshman Seminar: Food Preservation, Sanitation and Handling.** (3 cr; Stdnt Opt. Prereq—Freshman, fewer than 30 credits LE 5)

Association of microorganisms with food, contamination in nature, during handling and processing, food spoilage and prevention, role of microorganisms in food production, vehicle for bioterrorism will be emphasized. Lectures, discussions, demonstrations, student participation by hands-on experience, field trips.

**BIOL 1087. Freshman Seminar: Darwinian Medicine.** (3 cr; A-F or Aud. Prereq—Freshman, fewer than 30 credits LE 5)

Darwinian medicine integrates evolutionary explanations into understanding human vulnerabilities to disease. This course introduces principles of evolution including natural selection, adaptation and phylogeny within Darwinian medicine's major subject categories: defenses, infection, novel environments, genes, design compromises, and evolutionary legacies.

**BIOL 1093. Biological Illustration.** (3 cr; A-F or Aud. =BIOL 1083. LE 5)

Introduces the diversity and beauty of the biological world through sketching and drawing. Develops the student's observational abilities by drawing animals and plants in various settings. Retention of biological concepts is enhanced when a drawing class is included at the introductory level.

**BIOL 1094. Freshman Seminar: Northern Stream Ecosystems and the Angler.** (3 cr; A-F or Aud. Prereq—Freshman, fewer than 30 credits LE 5)

Fundamental concepts of nature and history of stream ecosystems, their inhabitants, and ecological concepts of stream organization in addition to appreciation of stream conservation and angling. Acquisition of skills and techniques for participation in the sport of flyfishing.

**BIOL 2101. Cell Biology.** (3 cr; A-F or Aud. Prereq—1011, 1012, (Chem 1152 or Chem 1162), (Chem 2521 or Chem 2541), (2102 can be taken concurrently or in a later semester))

Structure and function of procaryotic and eucaryotic cells, including cell surface, membranes, organelles, cytoskeleton, cell growth, cell physiology, and experimental methods used in cell studies. (3 hrs lect)

**BIOL 2102. Cell Biology Laboratory.** (2 cr; A-F or Aud. Prereq—1011, 1012, (2101 or &2101), (Chem 2521 or Chem 2541) or #)

Contemporary cell biology research techniques, hypothesis testing and communication of results.

**BIOL 2201. Genetics.** (3 cr; A-F or Aud. Prereq—1012)  
Basic principles of Mendelian inheritance, molecular genetics, chromosomal aberrations, and population genetics. (3 hrs lect)

**BIOL 2202. Genetics Laboratory.** (2 cr; A-F only. Prereq–1011, 2201 (concurrent registration is allowed for 2201))  
Mendelian and molecular research techniques used to illustrate fundamental principles of genetics.

**BIOL 2763. Biology of Women.** (2 cr; A-F or Aud. Prereq–1012 LECD 05)  
Fundamental principles of biology unique to women. Evolution of sex and gender; sex determination, differentiation, and development; sexual brain differences; anatomy and physiology; menstruation; oogenesis; ovulation; fertilization; pregnancy and birthing; birth control; menopause; aging; cancer; and nutrition. (2 hrs lect)

**BIOL 2769. Human Anatomy.** (4 cr; A-F or Aud. Prereq–[1761], 1011, 1012)  
Lectures in the structure of organs and tissues of the major body systems including skeletal, articular, muscular, nervous, respiratory, digestive, cardiovascular, urinary and reproductive in the context of the science of biology. The lecture material will be reinforced through observations of microscope slides and models, plus dissections of a cat and a number of sheep organs. Suitable for biology majors/minors and pre-professional students interested in entering health related professions. Provides (2hrs lect, 4hrs lab)

**BIOL 2801. General Ecology.** (3 cr; A-F or Aud. Prereq–1012 or #)  
Relationships between life and environment for individuals, populations, communities, and ecosystems; surveys of environmental factors and biomes. May be taken without lab 2802. (3 hrs lect)

**BIOL 2802. Ecology Laboratory.** (2 cr; A-F or Aud. Prereq–&2801)  
Experience in methods of measuring environmental factors, interpreting data. (4 hrs lab)

**BIOL 2961. Introduction to Veterinary Medicine.** (1 cr; S-N or Aud. Prereq–1012 or #)  
Lecture and discussion on principles and practices of veterinary medicine.

**BIOL 3101. Molecular Biology of Cancer.** (3 cr; A-F or Aud. Prereq–2101)  
Overview of mechanisms underlying the development of human cancer. Topics include intracellular signaling systems including oncogenes and tumor suppressors, cell cycle, tumorigenesis, multi-step carcinogenesis, invasion and metastasis and genetic instability in cancer. The detection and modern treatment of cancer will also be discussed.

**BIOL 3601. Plant Diversity.** (3 cr; A-F or Aud. Prereq–1012)  
Evolutionary survey of plants, focusing on diversity of life histories and patterns of organization. Fossil and extant groups, including algae and nonvascular and vascular land plants. (2 hrs lect, 2 hrs lab, field trip)

**BIOL 3603. Plant Taxonomy.** (3 cr; A-F or Aud. Prereq–1012)  
Introduction to taxonomy of vascular plants, emphasizing seed plants; representative families; terminology; literature; use of keys. (2 hrs lect, 2 hrs lab)

**BIOL 3701. Animal Diversity.** (4 cr; A-F or Aud. Prereq–1012)  
Survey of major animal phyla, focusing on phylogeny, anatomy, physiology, and ontogeny. (2 hrs lect, 4 hrs lab)

**BIOL 3703. Animal Physiology.** (3 cr; A-F or Aud. Prereq–1011, 1012, one semester college chemistry)  
Examination of principles, patterns, and mechanisms of biological function from the level of cells and tissues to the whole animal. Primary focus on comparative vertebrate physiology.

**BIOL 3760. Marine Biology.** (3 cr; A-F only. Prereq–1011, 1012)

A multidisciplinary approach will be used to explore the diverse ecosystems of the marine realm. Emphasis will be on the ecological and physiological adaptations that have allowed animals to colonize habitats ranging from the intertidal zone to the abyss. A field trip to the Shedd Aquarium will serve as a capstone to the course.

**BIOL 3987. Biology Seminar.** (1 cr; A-F only. Prereq–Min 90 cr, Biol or Cell & Molecular Biol major, =(3997 AND 3998))

Prepare, attend, evaluate, and discuss the content and mechanics of department seminars. Students also prepare an oral presentation of their field, lab, or library research findings.

**BIOL 3990. Special Topics: (Various Titles to be Assigned).** (1-5 cr [max 5 cr]; Stndt Opt. Prereq–1012 or #)  
Specific topics submitted for biology department review. Topic announced before course offered.

**BIOL 3993. Laboratory Teaching Experience.** (1-2 cr [max 2 cr]; S-N or Aud. Prereq–#, biol or cell biol major, 90 cr incl 25 cr Biol; max 2 cr may be applied toward Biol major)  
Participation in teaching biology lab courses: help set up labs, participate in teaching of labs, and share in instruction of review labs.

**BIOL 3994. Undergraduate Research.** (1-3 cr [max 6 cr]; S-N or Aud. Prereq–1012, 60 cr, #; max 4 cr may be applied to biol or cell biol major or biol minor as upper div elective)  
Advanced independent work in special fields.

**BIOL 3996. Internship in Biology.** (1-2 cr [max 2 cr]; S-N or Aud. Prereq–1012, #; max 1 cr may be applied to biol or cell biol major)  
Credit given for professional work experience outside an academic department. Requires prior department approval and coordination with faculty sponsor.

**BIOL 4231. Molecular Biology.** (3 cr; A-F only. Prereq–=[5231], 2101, 2201 or #, or Biol or IBS Grad School student)  
Contemporary molecular biology techniques, linkage analysis, mutation, DNA repair and recombination, genetics of viruses and bacteria, transposable genetic elements, genetics of mitochondria and chloroplasts, genomics, genetic control of animal development and the vertebrate immune system.

**BIOL 4361. Developmental Biology.** (3 cr; A-F or Aud. Prereq–=[5361], 2101, 2201 or #, or Biol or IBS Grad School student)  
Molecular and cellular mechanisms of development, emphasizing animal systems and including cell cycle, gametogenesis, fertilization, morphogenetic movements, cytodifferentiation, cell interactions, pattern formation, gene expression, organogenesis, metamorphosis, regeneration, and aging. (2 hrs lect, 3 hrs lab)

**BIOL 4501. General Microbiology.** (4 cr; A-F or Aud. Prereq–2101 or #, or Biol or IBS Grad School student)  
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. (2 hrs lect, 4 hrs lab)

**BIOL 4503. General Microbiology offered in Wroclaw, Poland.** (4 cr; A-F or Aud. Prereq–2101, @; no Grad School cr)  
Microbial cell structure, metabolism, nutrition, growth, and genetics. Structure and pathogenicity of viruses. Microbial taxonomy and diversity. Microbial diseases, immunity, serology, and control. Applied and environmental microbiology

including medical, food, aquatic, and soil microbiology. Offered at Wroclaw University, Poland.

**BIOL 4603. Plant Physiology.** (3 cr; A-F or Aud. Prereq–2101, one year of college chem, or Biol or IBS Grad School student)  
Overview of the mechanisms underlying plant function, growth and development. Topics include plant metabolism, plant water relations, mineral nutrition, transport, internal and external regulators of plant growth and development, plant stress physiology and plant biotechnology.

**BIOL 4731. Entomology.** (3 cr; A-F or Aud. Prereq–1012 or #, or Biol or IBS Grad School student)  
Structure, life history, ecology, classification, evolution, principles of control, and significance of insects in our society. Field collections. (2 hrs lect, 3 hrs lab and field)

**BIOL 4761. Ichthyology.** (3 cr; A-F or Aud. Prereq–2801 or #, or Biol or IBS Grad School student)  
Physiologic, taxonomic, ecologic, economic, and behavioral aspects of fishes. Lab emphasis on fishes of Great Lakes region, including field conducted independent study. (2 hrs lect, 3 hrs lab, field)

**BIOL 4763. Ornithology.** (3 cr; A-F or Aud. Prereq–2801 or #, or Biol or IBS Grad School student)  
Lab and field identification of birds, their migration and habitats; biological, taxonomic, and economic considerations.

**BIOL 4764. Mammalogy.** (3 cr; A-F or Aud. Prereq–2801 or #, or Biol or IBS Grad School student)  
Origin, taxonomy, distribution, physiology, ecology and behavior of mammals. Laboratory and fieldwork includes collection, preparation and identification of Minnesota species. (2 hrs lecture, 3 hours lab, field)

**BIOL 4802. Evolution.** (3 cr; A-F or Aud. Prereq–=[4801], 1012, 2201 or #, or Biol or IBS Grad School student)  
Origin, history, opposition, and evidence supporting evolutionary ideas. Basic concepts: origin of life, phylogeny, biological history, mechanisms of evolutionary change, population genetics, speciation, tempo of evolution, macroevolution, extinction, biogeography, evolution of social systems, altruism. (2 hrs lect)

**BIOL 4803. Ecology Field Methods: Identification and Natural History of Terrestrial and Aquatic Organisms.** (4 cr; A-F or Aud. Prereq–1011, 1012, no Grad School cr)  
Provides undergraduates with an introduction to field ecology, including field identification of northern Minnesota terrestrial and aquatic flora and fauna and basic field methods to quantify distribution and abundance of plants and animals. Sampling methods taught include relevés, variable radius plots, point-counts, random plots, line transects, calling surveys, dip nets and tow nets. Fieldwork will include exploration of issues related to project design and data collection, summarization and evaluation. Additional hours in the field may be required beyond regular course hours.

**BIOL 4805. Ecological Invasions.** (2 cr; A-F or Aud. Prereq–2801 or Biol or IBS Grad School student)  
Characteristics of successful invaders, ecological effects of invasive species, genetic effects on native populations, impacts on human societies, options for control, relationships to other global changes. Case studies

**BIOL 4807. Plant Physiological Ecology offered in Poland.** (4 cr; A-F or Aud. Prereq–2101 or 2801, #, no Grad School cr)  
Physiological mechanisms which individual plants, plant populations, and plant communities have evolved in response to their abiotic and biotic environment. Integrated lecture/laboratory/field

## Course Descriptions

study course offered at Wroclaw and Karpacz Ecological Field Station in the Karkonosz Mountains, Poland.

**BIOL 4891. Animal Behavior.** (2 cr; A-F or Aud. Prereq-1012, 2801 or #, or Biol or IBS Grad School student) Known behavior of various vertebrate and invertebrate phyla, emphasizing adaptive significance and the genetics and ontogeny of behavioral patterns. Mating, aggressive, nutritive, and nurturing behavior and relation to ecology of animal populations. (2 hrs lect)

**BIOL 4992. Senior Seminar: Classic Readings in Natural History.** (1 cr; S-N or Aud. Prereq-Seniors who have declared a natural history minor, no Grad School cr) Readings and discussion of the classics of natural history writing from authors such as Charles Darwin, Charles Lyell, John Wesley Powell, Peter Freuchen, Rachel Carson, Paul Errington, and E. O. Wilson, among others.

**BIOL 5232. Molecular Biology Laboratory.** (2 cr; A-F only. Prereq-=[4232], (4231 or &4231) or #, or Biol or Biochemistry and Molecular Biology or IBS Grad School student) Regulation of gene expression in prokaryote and eukaryotes explored through use of recombinant DNA technologies.

**BIOL 5235. Biotechnology.** (4 cr; A-F or Aud. Prereq-(2101, 2102, 2201, Chem 3322 or Chem 4341) or Biol or IBS Grad School student) Genetic engineering with emphasis on large-scale production and isolation of recombinant proteins and metabolites. Microbial, plant and animal cell culture. Comparison of recombinant DNA technology to selective breeding and natural isolate use. Practical, legal and ethical considerations of genetic engineering.

**BIOL 5240. Ecological Genetics.** (3 cr; A-F or Aud. Prereq-1012, 2201, Stat 1411 or Biol or IBS Grad School student) Examines basic concepts in population and quantitative genetics. Focus is on techniques that reveal the genetic structure and adaptive value of ecologically important traits.

**BIOL 5401. Coevolution of Plants, Animals and Microbes.** (3 cr; A-F or Aud. Prereq-2801, 2802, or Biol or IBS Grad School student) Explores the evolution of interactions between species ranging from strongly antagonistic such as predator-prey interactions to strongly cooperative such as obligate mutualisms. The behavior, ecology and genetics of interacting organisms will be studied to understand their evolution. Includes two hours lecture and one three-hour lab per week.

**BIOL 5511. Virology.** (3 cr; A-F or Aud. Prereq-4501, or Biol or IBS Grad School student) Viruses and hosts; effects of viral infections on cells; expression of viral genome in prokaryotic and eucaryotic cells; epidemiology and pathogenesis of viruses, including emerging ones; viral evolution. (2 hrs lect, 2 hrs lab)

**BIOL 5515. Microbial Diversity and Phylogeny.** (3 cr; A-F only. Prereq-2101 or 4501 or #, or Biol or IBS Grad School student) Evolutionary survey and characteristics of microorganisms focusing on autotrophic and heterotrophic prokaryotes from various habitats. Isolation, examination, and identification of bacteria from field collections using microscopic, physiological, biochemical, molecular, phylogenetic, and computer database techniques.

**BIOL 5603. Plant Physiology Laboratory.** (2 cr; A-F or Aud. Prereq-2101, one year of college chemistry, prior or concurrent enrollment in 4603 or #, or Biol or IBS Grad School student) Lab exercises that evaluate the physiological processes that enable plants to grow under the varied conditions found in nature such plant water relations, mineral nutrition, metabolism, and plant growth and development. Exposure to modern

plant physiology techniques includes gas exchange, chlorophyll fluorescence, spectrophotometry, and pressure chamber methods to assess plant function. Independent projects include hypothesis testing data analysis and communication of results.

**BIOL 5772. Mechanisms of Neural Behavior.** (3 cr; A-F or Aud. Prereq-1012, 3703 or Biol or IBS Grad School student) Review of the basic neurophysiological components of animal behavior. Emphasis will be on well studied neuroethological models such as weakly electric fish, bats, owls and crayfish.

**BIOL 5777. Plankton Biology.** (2 cr; A-F or Aud. Prereq-2801, 2802 or Biol or IBS Grad School student) Explores topics in the biology of plant and animal plankton with emphasis on lake communities. Topics include biogeography, life-history, anatomy, physiology, and ecology of plankton. Basic limnology covered as relevant. Meets twice weekly for lecture and literature discussion.

**BIOL 5801. Microbial Ecology.** (2 cr; A-F or Aud. Prereq-(2101, (2801 or 4501) or #), or Biol or IBS Grad School student) Microorganisms in natural environments: diversity, distribution, energetics, and growth of heterotrophic and autotrophic microbes in oxic and anoxic habitats. Roles of microbial populations and communities in biogeochemical cycling, ecosystem functioning, landscapes, and industrial, agricultural, and environmental applications.

**BIOL 5802. Microbial Ecology Laboratory.** (2 cr; A-F or Aud. Prereq-#5801 or # or Biol or IBS Grad School student) Lab and field-oriented exercises that teach concepts about microbial populations and their communities, energetics, food webs, biogeochemistry, and biodiversity while providing an introduction to research methods. Students master advanced microscopic, culturing, spectroscopic, molecular, radioisotopic, and computational techniques.

**BIOL 5805. Fisheries Ecology.** (3 cr; A-F or Aud. Prereq-2801, 2802, college-level course in statistics or Biol or IBS Grad School student) Lectures, readings and computer exercises relating to current issues in fisheries ecology. Computer exercises will emphasize techniques used by scientists working in the field and prepare the student for the use of quantitative research tools for independent research. Includes 2 one-hour lectures and 1 three-hour lab weekly.

**BIOL 5807. Mathematical Ecology.** (3 cr; A-F or Aud. Prereq-(2801, (Math 1290 or Math 1297)) or Biol or IBS Grad School student) Development and use of mathematical models to describe ecological patterns and processes.

**BIOL 5808. Landscape Ecology: Theory and Application.** (3 cr; A-F or Aud. Prereq-2801, 2802 or Biol or IBS Grad School student) Key issues in landscape ecology including scale, measuring landscape patterns, mechanisms shaping landscapes, implications of landscape patterns on plant and animal populations, communities, and ecosystems, and implementing landscape principles for natural resource management.

**BIOL 5809. Ecological Statistics.** (3 cr; A-F only. Prereq-Stat 1411 or Stat 2411 or Biol Grad Student or IBS Grad Student) Directed toward the upper-level undergraduate student and MS-level graduate student, with previous introductory statistical experience. Provides an introduction to many of the data-manipulation, analysis, and display techniques currently available. Seeks to provide students with the background and practical experience necessary to make appropriate decisions regarding the

treatment of data, the interpretation of statistical analyses, and the formal presentation of study results.

**BIOL 5811. Plant Autecology.** (2 cr; A-F or Aud. Prereq-2801 or Biol or IBS Grad School student) Survey of environmental factors, responses to these by an individual plant. Ecological life histories. Biotic interactions. Intraspecific variation. Use of instrumentation. Emphasizes seed plants.

**BIOL 5833. Stream Ecology.** (4 cr; A-F or Aud. Prereq-2801 or # or Biol or IBS Grad School student) Studies of stream communities and ecosystems as influenced by biological interactions and physical factors. Emphasis on North Shore streams. (2 hrs lect, 6 hrs lab and field)

**BIOL 5839. Coral Reef Field Studies.** (3 cr; A-F or Aud. =GEOL 5839. Prereq-2801 or # or Biol or IBS Grad School student) Biological studies of the coral reef complex and associated habitats of Florida Keys. Ecology and taxonomy of associated biota. Field study in Florida.

**BIOL 5861. Lake Ecology.** (3 cr; A-F or Aud. Prereq-2801 or # or Biol or IBS Grad School student) Ecology of lakes and reservoirs. (3 hrs lect)

**BIOL 5862. Advanced Lake Ecology.** (3 cr; A-F or Aud. Prereq-#5861 or Biol or IBS Grad School student) Lake and laboratory approaches to evaluation of ecosystem health and experimental aquatic ecology. (1 hr lect, 4 hrs lab)

**BIOL 5863. Ecosystems Ecology.** (3 cr; A-F or Aud. Prereq-2801 or #, or Biol or IBS Grad School student) Survey of terrestrial and aquatic ecosystems, emphasizing current literature on ecosystem processes. (3 hrs lect) Hershey

**BIOL 5865. Conservation Biology.** (2 cr; A-F or Aud. Prereq-2801 or Biol or IBS Grad School student) Introduction to science of species, habitat, and ecosystem conservation and management.

**BIOL 5866. Algal Ecology and Physiology.** (3 cr; A-F or Aud. Prereq-4603) Review of fundamental algal processes and application of traditional and modern techniques to quantify these processes.

**BIOL 5868. Ecotoxicology.** (3 cr; A-F or Aud. Prereq-2101, 2801, college-level statistics course or #, or Biol or IBS Grad School student) Examines the effects of toxicants on constituents of the biosphere at levels of biological organization from cells to ecosystems. Toxicant identification, toxicity testing, exposure routes, bioaccumulation, toxicant effects, regulations, and current issues.

**BIOL 5870. Wetland Ecology.** (3 cr; A-F or Aud. Prereq-2801, 2802 or Biol or IBS Grad School student) Hydrology, nutrient cycling, and productivity of wetland ecosystems and the adaptations and interactions of resident biota; assessment, management, conservation, restoration, and creation of wetlands. Two day-long weekend field trips required.

**BIOL 5990. Special Topics: (Various Titles to be Assigned).** (1-5 cr [max 10 cr]; A-F or Aud. Prereq-1012, #) Special topics submitted for biology department review. Topic announced before course offered.

**BIOL 8139. Seminar in Cell Biology.** (1 cr [max 10 cr]; S-N or Aud. Prereq-Grad School student in biol or related field) Analysis of current topics.

**BIOL 8333. FTE: Master's.** (1 cr; No grade. Prereq—Master student, adviser and DGS consent)

**BIOL 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**BIOL 8899. Seminar in Ecology.** (1 cr [max 10 cr]; A-F or Aud. Prereq—Grad School student in biol or related field) In-depth analyses of topics in ecology.

**BIOL 8993. Graduate Seminar.** (1 cr [max 10 cr]; S-N or Aud. Prereq—Grad student in biol or related field) Reports on recent developments in biology and on research projects in the department.

**BIOL 8994. Graduate Research.** (1-4 cr [max 10 cr]; S-N or Aud. Prereq—Grad student in biol or related field) Directed research or study on an advanced topic.

## Business Law (BLAW)

Labovitz School of Business and Economics

**BLAW 2001. The Legal Environment.** (3 cr; A-F only. Prereq—Min 30 cr. LE 8)

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

**BLAW 3001. Law and Ethics for Financial Professionals.** (3 cr; A-F only. Prereq—LSBE cand or %) Examination of the legal and ethical issues faced by financial professionals. Topics include agency, bankruptcy, insider trading and other securities laws, obligations of corporate directors and officers, negotiable instruments and secured lending transactions.

**BLAW 3201. Law for Entrepreneurs.** (3 cr; A-F only. Prereq—SBE cand or @)

Introduction to legal topics relevant to entrepreneurs, including law of agency, government regulation of employment, property and bailments, forms of business organizations bankruptcy.

## Chemical Engineering (CHE)

Swenson College of Science and Engineering

**CHE 1011. Introduction to Chemical Engineering.** (3 cr; A-F or Aud. Prereq—High school chem, high school algebra LE 5)

Differences between natural sciences and chemical engineering. Continuous processing concept and waste disposal. Hazardous waste; engineering economy, including value of money and rate of return. Chemical engineering equipment and flow sheets. Process paths based on economics. Species allocation and separation.

**CHE 2001. Introduction to Environmental Engineering.** (3 cr; A-F or Aud. Prereq—High school chem, Math 1250 LE 4)

Comprehensive survey of environmental engineering. Fundamental science and engineering principles as basis for analyzing environmental issues. Federal laws on air pollution, wastewater discharge, and hazardous waste. Wastewater treatment, air pollution control, waste minimization, resource recovery, and recycling.

**CHE 2011. Design of Engineering Experiments.** (3 cr; A-F or Aud. Prereq—Math 1297)

Basic theories of experimental design, data analysis, and statistical process control, emphasizing their application to chemical engineering practice.

**CHE 2111. Material and Energy Balances.** (3 cr; Stdnt Opt. Prereq—Chem 1151 or Chem 1161)

Elementary principles of chemical processes, emphasizing material and energy balances.

**CHE 2121. Chemical Engineering Thermodynamics.** (3 cr; A-F or Aud. Prereq—2111, Math 1297, &1011)

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

**CHE 3031. Computational Methods in Chemical Engineering.** (3 cr; A-F or Aud. Prereq—B.S.Ch.E. candidate, 2111, Math 3280)

Modeling and simulation of chemical engineering processes; computational methods applied to chemical engineering; use of computation and process simulation tools.

**CHE 3111. Fluid Mechanics.** (3 cr; A-F or Aud. Prereq—Engr 2015, Math 3280)

Mass and energy balances, Bernoulli's equation, momentum balance, laminar and turbulent flow, boundary layer theory, pumps, compressors, and turbines.

**CHE 3112. Heat and Mass Transfer.** (3 cr; A-F or Aud. =ME 4112. Prereq—3111)

Theory and practice of heat and mass transfer. Fundamentals of diffusion, conduction, convection, and radiation with application to design of heat and mass transfer equipment and systems.

**CHE 3211. Chemical Engineering Laboratory I.** (3 cr; A-F or Aud. Prereq—3111)

Introduction to statistical uncertainty analysis and design of experiments. Experiments illustrating physicochemical, fluid mechanics, and heat and mass transfer principles. Technical report writing and presentation. Standard laboratory practice and safety.

**CHE 3231. Properties of Engineering Materials.** (3 cr; A-F or Aud. =CHEM 2521, ENGR 2110. Prereq—2121, Chem 2521)

Thermodynamic, mechanical, and kinetic properties of materials: structure and bonding in metals, alloys, corrosion, crystals, semiconductors, polymers, colloids, ceramics, interfaces, and composites.

**CHE 3241. Principles of Particle Technology.** (3 cr; A-F or Aud. =CHE 4621. Prereq—B.S.Ch.E. candidate, 2111, Phys 2012, Math 3280 or #)

The science and engineering dealing with the production, handling, modification and use of a wide variety of particulate materials, both wet and dry, in sizes ranging from the sub-micron to the centimeter scale.

**CHE 3791. Independent Study.** (1-3 cr [max 3 cr]; Stdnt Opt. Prereq—BSChE cand, %)

Directed individual study arranged with instructor and head of department before registration.

**CHE 3894. Chemical Engineering Research.** (1-3 cr [max 6 cr]; Stdnt Opt. Prereq—BSChE cand, max 6 cr in 3994)

Experience in a selected research area. Student must present a satisfactory written report and oral presentation. Course may also be used for portion of a research proposal.

**CHE 3951. Cooperative Education.** (1-6 cr [max 20 cr]; Stdnt Opt. Prereq—BSChE cand, %)

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 completed must be submitted to department at end of experience.

**CHE 4111. Separations.** (3 cr; A-F or Aud. Prereq—3112; no Grad School cr)

Application of principles of mass transfer. Design of distillation, gas absorption, liquid extraction, drying, leaching, and membrane separation processes.

**CHE 4211. Chemical Engineering Laboratory II.** (3 cr; A-F or Aud. Prereq—3211; no Grad School cr)

Statistical design of engineering experiments. Experiments illustrating principles of separations and reactor design. Technical report writing and presentation. Standard laboratory practice and safety.

**CHE 4301. Chemical Reaction Engineering.** (3 cr; A-F or Aud. Prereq—3112; no Grad School cr)

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

**CHE 4402. Process Dynamics and Control.** (3 cr; A-F or Aud. =CHE 4401. Prereq—B.S.Ch.E. candidate, 2121, 3112, CS 11xx, Math 3280, #, no Grad School cr)

Dynamic behavior of open- and closed-loop systems. Design and operation of automatic controllers for chemical process systems. The programming of a microcontroller.

**CHE 4501. Chemical Engineering Design I.** (4 cr; A-F or Aud. Prereq—2121, 3231 and (prereq or coreq 4111, 4211, 4301); no Grad School cr)

Preliminary design of chemical processing or hazardous waste treatment plant. Use of engineering economics and calculation of rate return and hazardous waste management as applied to chemical plants. Market survey, flow sheet preparation, material and energy balances.

**CHE 4502. Chemical Engineering Design II.** (4 cr; A-F or Aud. Prereq—4501; no Grad School cr)

Continuation of ChE 4501. Equipment design, instrumentation, process control, hazardous waste management plan, plant safety, economic feasibility, and institute analysis for process chosen.

**CHE 4601. Biochemical Engineering.** (3 cr; A-F or Aud. Prereq—2111)

Application of chemical engineering principles to design and operation of industrial biological processes, emphasizing enzyme and cell growth kinetics.

**CHE 4602. Bioseparations.** (3 cr; A-F or Aud. Prereq—2111, Math 1297)

Application of engineering principles to the isolation, purification, and finishing of biologically derived products. Design of unit operations specific to biochemical processes, including cell disruption, sedimentation, precipitation, filtration, extraction, chromatography, crystallization and drying. Integration of operations with upstream processing.

**CHE 4612. Hazardous Waste Processing Engineering.**

(3 cr; A-F or Aud. Prereq—2111, Chem 2521) 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 4613. Air Pollution Control.** (3 cr; A-F or Aud. Prereq—2111, Math 3280, min 60 cr)

Analysis of what air pollution is, where it comes from and where it goes on the local, regional and global scales. Discussion of the regulatory apparatus concerning air quality. Design of air pollution control equipment.

## Course Descriptions

**CHE 4621. Particle Technology.** (3 cr; A-F or Aud. =CHE 3241. Prereq=2111, 3111)  
Applications of particle technology, especially in the chemical and minerals industry context. Particle concepts including: particle characterization, slurry characterization, size reduction, size enlargement, particle separation, and multi phase processes. The major unit operations common to solids processing: mining, crushing, concentration by sedimentation, filtration, flotation, and pyrometallurgy.

**CHE 5022. Transport Processes in Wells and Pipelines.** (3 cr; A-F or Aud. Prereq=3111, 3112 or Grad student or #)  
Exposes students to various elements of fluid and heat flows that occur in oil/gas wells and pipelines. The fundamentals of multiphase flow are explained in terms of single-phase flow mechanics and configuration of the phases. Simplicity in modeling approach is retained. Field examples are used to reinforce understanding of the models.

**CHE 5895. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 10 cr]; Stdnt Opt. Prereq=#, no Grad School cr)  
Study of current and special topics not available in regular department curriculum. May involve specialties of department or visiting faculty.

## Chemistry (CHEM)

Swenson College of Science and Engineering

**CHEM 1102. Aspects of Chemistry.** (3-4 cr [max 4 cr]; A-F or Aud. Prereq=[1113, 1151, 1161 or 2172] LE 4)  
Topics in general, organic, and biological chemistry. Study of chemical principles, their application, and their impact on daily life. Independent unit in contrast to Chem 1113, 1151, 1161 or 2172; 4 credit option with lab. Three cr meets lib ed cat 5, four cr meets lib ed cat 4.

**CHEM 1105. From the Industrial Revolution to Green Chemistry.** (3 cr; Stdnt Opt. LE 5)  
The study of the chemistry associated with scientific and technological discoveries made during the Industrial Revolution in England from 1750-1850. Twenty-first Century "green chemistry" solutions to reduce detrimental impacts of industrialization such as those that occurred during the Industrial Revolution. The study of the lives of selected chemists and natural scientists whose work was located in the Midlands of England.

**CHEM 1113. Introduction to General, Organic, and Biological Chemistry I.** (5 cr; A-F or Aud. Prereq=[1151, 1161, 2172], for students terminating study of chem with no more than 10 cr LE 4)  
Chemical principles and their applications: atomic and molecular structure, solutions, acids, bases, salts, equilibria.

**CHEM 1114. Introduction to General, Organic, and Biological Chemistry II.** (5 cr; A-F or Aud. Prereq=1113)  
Chemical principles and their applications: physical and chemical properties of organic compounds, organic chemistry of living systems; carbohydrates, lipids, proteins, enzymes, nucleic acids, and metabolic pathways.

**CHEM 1151. General Chemistry I.** (5 cr; A-F or Aud. Prereq=[1161 or 2172], One year high school chem, high school algebra, Math ACT 21 or higher or a grade of at least C- in Math 1005, SCSE student or student in exercise science or athletic training or teaching life science or teaching earth and space science or teaching physical science or B.A. majors in biology or chemistry or geology LE 4)  
Fundamental principles exemplified by study of elements, compounds, and their reactions.

**CHEM 1152. General Chemistry II.** (5 cr; A-F or Aud. Prereq=[1162 or 2172], 1151 or 1161)  
Fundamental principles exemplified by study of elements, compounds, and their reactions.

**CHEM 1161. Honors: General Chemistry I.** (5 cr; A-F or Aud. Prereq=[1151 or 2172], High school chem and high school algebra, Math ACT 21 or higher or a grade of at least C- in Math 1005, SCSE student or exercise science or athletic training or teaching life science or teaching earth and space science, or teaching physical science LE 4)  
Fundamental principles exemplified by study of elements, compounds, and their reactions.

**CHEM 1162. Honors: General Chemistry II.** (5 cr; A-F or Aud. =CHEM 2172. Prereq=1151 or 1161)  
Fundamental principles exemplified by study of elements, compounds, and their reactions.

**CHEM 1191. Independent Study.** (1-2 cr [max 4 cr]; A-F or Aud. Prereq=#)  
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 2095. Special Topics: (Various Titles to be Assigned).** (4 cr; A-F or Aud. Prereq=10 cr college chem or #)  
Selected topics that fall outside currently offered courses. Topic announced before course offered.

**CHEM 2212. Environmental Chemistry.** (4 cr; A-F or Aud. Prereq=1152 or 1162, =2222 or 2223 or 2242)  
Study of chemical processes in natural air, water, soil and sediment environments. Sources, reaction, transport, effects, and fates of natural and anthropogenic chemical species will be covered. Methods of analysis of environmental samples, with emphasis on quantitative treatment of data.

**CHEM 2222. Quantitative Analysis.** (3 cr; A-F or Aud. Prereq=1152 or 1162, &2223, =2212 or 2242)  
Theory in analytical techniques; introduces gravimetric, volumetric, and spectrophotometric methods.

**CHEM 2223. Quantitative Analysis Laboratory.** (1 cr; A-F or Aud. Prereq=1152 or 1162, &2222, =2212 or 2242)  
Lab companion to 2222 involving the quantitative analysis of organic and inorganic samples using classical and instrumental techniques. Students are instructed in the use of classical and modern computer-controlled instrumentation and techniques, as applied to the acquisition and analysis of experimental data.

**CHEM 2242. Analytical Chemistry and the Environment in Poland.** (4 cr; A-F or Aud. Prereq=[2222, 2232], 1152 or 1162, #)  
Theory and practice in quantitative analysis, covering statistics, acid-base equilibria, chelometry, spectrometry, and chromatography, including volumetric, spectrophotometric, and separation methods, to be offered in Poland, with field trips to sites of environmental concern.

**CHEM 2541. Organic Chemistry I.** (3 cr; A-F or Aud. Prereq=[2521, CHE 3231, ENGR 2110], 1152 or 1162, &2543)  
Structure and bonding, stereochemistry, functional group reactions.

**CHEM 2542. Organic Chemistry II.** (3 cr; A-F or Aud. Prereq=[2522, 2532], 2521 or 2541, &2544 or &2545)  
Functional group reactions, bioorganic chemistry.

**CHEM 2543. Organic Chemistry I Laboratory.** (1 cr; A-F or Aud. Prereq=[2521, CHE 3231, ENGR 2110], 1152 or 1162, &2541)  
Laboratory companion to CHEM 2541. Structure and bonding, stereochemistry, functional group reactions.

**CHEM 2544. Organic Chemistry II Laboratory.** (1 cr; A-F or Aud. Prereq=[2522, 2532, 2545], 2521 or (2541 and 2543), &2542)  
Laboratory companion to Chem 2542, for non-chemistry majors. Functional group reactions, bioorganic chemistry.

**CHEM 2545. Organic Chemistry II Laboratory for B.S. Chemistry Majors.** (2 cr; A-F or Aud. Prereq=[2532], 2521 or (2541 and 2543), &2542)  
Laboratory companion to Chem 2542, for B.S. Chemistry majors. Functional group reactions, bioorganic chemistry.

**CHEM 3097. Internship in Chemistry.** (1-2 cr [max 2 cr]; S-N only. Prereq=2521 or 2541 or 2223, chem or biochem/molecular biol majors and #)  
Experience in a commercial, government, or industrial setting. Prior department approval and coordination with faculty sponsor are required.

**CHEM 3194. Chemistry Undergraduate Research.** (1-3 cr [max 30 cr]; S-N or Aud. Prereq=#)  
Experience in a selected area of research.

**CHEM 3322. Biochemistry.** (3 cr; A-F or Aud. Prereq=2522 or 2532 or 2542, &3324)  
Survey of biochemistry, emphasizing enzyme catalysis, cellular energetics, and major metabolic processes.

**CHEM 3324. Biochemistry Laboratory.** (1 cr; A-F or Aud. Prereq=2522 or 2532 or 2542, &3322)  
Identification and analysis of biological molecules with emphasis on the macro-molecules, polysaccharides, proteins, and nucleic acids (RNA, DNA).

**CHEM 3432. Descriptive Inorganic Chemistry.** (2 cr; A-F or Aud. Prereq=(2222 and 2223) or 2242 and 2542 and (2544 or 2545 or 2522 or 2532))  
Survey of the chemistry of the elements. Organometallic chemistry. Bioinorganic chemistry.

**CHEM 4184. Undergraduate Seminar I.** (1 cr; S-N or Aud. Prereq=BS Chem or BS BMB Major; min 90 cr)  
First course of a two-course senior seminar requirement for B.S. Chemistry and B.S. Biochemistry and Molecular Biology majors. Students will learn to prepare and present scientific talks. Use of visual aids and computer technology, presentation organization and delivery, and use of scientific literature will be among the skills students will learn. In addition, students will attend and evaluate weekly departmental seminars.

**CHEM 4185. Undergraduate Seminar II.** (1 cr; S-N or Aud. Prereq=4184)  
Second course of a two-course senior seminar requirement for B.S. Chemistry and B.S. Biochemistry and Molecular Biology majors. Students will learn to prepare and present scientific talks. Use of visual aids and computer technology, presentation organization and delivery, and use of scientific literature will be among the skills students will learn. In addition, students will attend and evaluate weekly departmental seminars. Students will participate in and present at the annual Departmental Undergraduate Symposium.

**CHEM 4242. Instrumental Analysis.** (3 cr; A-F or Aud. Prereq=2222, 4632 or 4634 or 4642, &4363)  
Theory of instrumental methods of chemical analysis, including electrochemistry, spectroscopy, and separations.

**CHEM 4243. Instrumental Chemistry Laboratory.** (2 cr; A-F or Aud. Prereq=2223, &4242)  
Lab companion to 4242 involving the use of computerized chemical instrumentation in the analysis of organic and inorganic samples. Students learn the use of modern programming tools as applied to the control of chemical instrumentation and acquisition and analysis of data there from.

**CHEM 4351. Biochemistry I.** (3 cr; A-F or Aud. =PHAR 6151. Prereq=2222, 2522 or 2532 or 2542, Math 1296, concurrent registration in physical chem recommended - &4363)

Introduction to structural classes of biologically relevant molecules. Descriptions of monomeric small molecules and their incorporation into macromolecules. Covers amino acids, proteins, fatty acids, lipids, sterols, carbohydrates, nucleic acids, RNA, and DNA structures.

**CHEM 4352. Biochemistry II.** (3 cr; A-F or Aud. =PHAR 6152. Prereq=4351)

Introduction to metabolism of carbohydrates, fatty acids, sterols, nucleic acids, amino acids, and xenobiotics. Common metabolic pathways of glycolysis, gluconeogenesis, citric acid cycle, et. The interrelated nature of these pathways and their cellular regulation will be covered.

**CHEM 4363. Biochemistry Laboratory.** (2 cr; A-F or Aud. Prereq=2223, 2522 or 2532 or 2544 or 2545, &4351) Applications of biochemistry and molecular biology techniques.

**CHEM 4373. Physical Biochemistry.** (3 cr; A-F or Aud. Prereq=(4632 or 4634 or 4641) and (4351 or 3322)) The study of biological macromolecules including their thermodynamic and kinetic properties, quantum mechanics and statistical applications.

**CHEM 4435. Inorganic Chemistry Laboratory.** (1 cr; A-F or Aud. Prereq=3432, &4436) Preparation and study of the properties of selected inorganic compounds.

**CHEM 4436. Inorganic Chemistry.** (3 cr; A-F or Aud. =CHEM 4434. Prereq=3432, (4634 or 4642), &4435) Atomic structure and properties of elements based thereon. Chemical bonding. Chemistry of coordination compounds. Mechanisms of selected inorganic reactions. Group theory and spectroscopy applied to inorganic systems.

**CHEM 4633. Physical Chemistry Laboratory.** (1 cr; A-F or Aud. Prereq=2yrs of college-level chemistry,(2222 or 2212 or 2242), Math 1297, Phys 2012 or Phys 1001, &4634) Laboratory program in physical chemistry, including thermodynamics, spectroscopy, kinetics and quantum mechanics.

**CHEM 4634. Physical Chemistry.** (3 cr; A-F or Aud. Prereq=(Phys 2012 or Phys 1002), 2 yrs of college-level chemistry, Math 1297, (Chem 2222 or 2212 or 2242), &4633) Properties of gases, liquids, and solutions; thermodynamics and equilibria; chemical kinetics, principles of quantum chemistry.

**CHEM 4641. Physical Chemistry I.** (3 cr; A-F or Aud. Prereq=2 yrs chem,(222 or 2212 or 2242), Math 3280, Phys 2012, &4643) Quantitative treatment of physical principles and theories in chemistry, including topics in thermodynamics and kinetics.

**CHEM 4642. Physical Chemistry II.** (3 cr; A-F or Aud. Prereq=4641, &4644) Quantitative treatment of physical principles and theories in chemistry, including topics in quantum mechanics and spectroscopy.

**CHEM 4643. Physical Chemistry Laboratory I.** (1 cr; A-F or Aud. Prereq=2 yrs chem, (2222 or 2212 or 2242), Math 3280, Phys 2012, &4641) Laboratory program in physical chemistry, accompanying lecture Chem 4641.

**CHEM 4644. Physical Chemistry Laboratory II.** (1 cr; A-F or Aud. Prereq=4643, &4642) Laboratory program in physical chemistry, accompanying lecture Chem 4642.

**CHEM 5150. Organic and Stable Isotope Biogeochemistry.** (3 cr; A-F or Aud. Prereq=Chem 1152 or 1162 or #, Geol 1110 or 2610 or #, Biol 1012 or #, upper level undergrad or grad standing in the sciences or engineering or #, Chem 2222 or 2212 or 2242, and 2521 or 2541 (recommended))

Production and chemical composition of natural organic matter (OM), diagenesis and catagenesis of OM; stable isotopic

**CHEM 5350. Research Topics for High School Chemistry Teachers.** (2-4 cr [max 8 cr]; Stndt Opt. Prereq=Ed MA or MEd student, %)

Experimental work and philosophy associated with a selected research topic.

**CHEM 5424. Advanced Inorganic Chemistry I.** (3 cr; A-F or Aud. Prereq=4436 or equivalent or Grad student) Advanced topics in inorganic chemistry including the following: Applications of Group Theory to inorganic chemistry such as molecular orbital theory and valence bond theory as well as vibrational analysis, organometallic chemistry including structure and bonding in organometallic compounds, reactions and reaction mechanisms of organometallic compounds, and the application of organometallic compounds as reagents and catalysts in organic synthesis, other advanced aspects of inorganic chemistry, e.g. Bioinorganic Chemistry and Aspects of Material Science.

**CHEM 5524. Advanced Organic Chemistry I.** (3 cr; A-F or Aud. Prereq=2542 or equivalent or Grad student) Advanced topics of Organic Reaction Mechanisms and Aspects of Organic Synthesis

**CHEM 5624. Advanced Physical Chemistry I.** (3 cr; A-F or Aud. Prereq=4642 or equivalent or Grad student) Classical and statistical thermodynamics, chemical kinetics, other selected topics in physical chemistry.

**CHEM 5650. Computational Chemistry.** (3 cr; A-F or Aud. Prereq=4642 or equivalent or Grad student) Molecular Mechanics, Quantum Mechanics, semiempirical and ab initio molecular orbital calculations, density functional theory, and selected additional topics in computation chemistry such as biochemical applications, QSAR, and ligand modeling and docking.

**CHEM 5714. Applications of Spectroscopy.** (4 cr; A-F or Aud. Prereq=4436 or equivalent or Grad student) Application of spectroscopic techniques to structure elucidation, including NMR, FTIR, MS, UV-Vis, X-ray, EPR spectroscopy. Includes practical component.

**CHEM 5725. Advanced Analytical Chemistry I.** (3 cr; A-F only. Prereq=Grad student or 4242 or equivalent) Intended for advanced undergraduate and beginning graduate students in chemistry and related fields. Augment basic coursework in wet and instrumental analytical chemistry. Topics include statistical and chemometric methods for experimental design and data analysis, electronics and computers in chemical instrumentation, and selected techniques of instrumental analysis such as mass spectrometry, inductively coupled optical emission spectroscopy and analytical gas chromatography.

**CHEM 5994. Directed Research in Chemistry.** (1-3 cr [max 9 cr]; Stndt Opt. Prereq=Min 90 cr or Grad in the sciences or engineering or #) Directed laboratory or theoretical research in the chemical sciences.

**CHEM 8184. Seminar.** (1 cr; S-N or Aud. Prereq=Grad chem major or #) Practice in preparation and oral presentation of reports on articles from the literature or on graduate research.

**CHEM 8224. Advanced Analytical Chemistry II.** (4 cr; A-F or Aud. Prereq=5725) Advanced treatment of selected methods in analytical chemistry.

**CHEM 8333. FTE: Master's.** (1 cr; No grade. Prereq=Master s student, adviser and DGS consent)

**CHEM 8424. Advanced Inorganic Chemistry II.** (4 cr; A-F or Aud. Prereq=5424)

Discussion of structure, reactions, and bonding in inorganic and organometallic compounds in terms of valence bond, molecular orbital, and ligand field theories.

**CHEM 8444. FTE: Doctoral.** (1 cr; No grade. Prereq=Doctoral student, adviser and DGS consent)

**CHEM 8524. Advanced Organic Chemistry II.** (4 cr; A-F or Aud. Prereq=5524) Advanced treatment of synthetic methods and reaction mechanisms in organic chemistry.

**CHEM 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. Prereq=Max 6 cr per semester or summer; doctoral student who has not passed prelim oral; no required consent for the first two registrations up to 12 cr; departmental consent for the third and fourth registrations up to an additional 12 cr, or 24 cr total (for doctoral students admitted summer 2007 and beyond; doctoral students admitted prior to summer 2007 may register up to 4 times totaling 60 cr))

**CHEM 8750. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 8 cr]; Stndt Opt. Prereq=Grad student or #) Topics not available in standard curriculum.

**CHEM 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq=Max 18 cr per semester or summer, 10 cr total required [Plan A only])

**CHEM 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq=Max 18 cr per semester or summer; 24 cr required)

## Chinese (CHIN)

### College of Liberal Arts

**CHIN 1101. Beginning Chinese I: A Practical Introduction to Everyday Mandarin Chinese.** (3 cr; A-F or Aud. Prereq=Little or no prior formal study of this language or # LEIP 03)

Introduction to Mandarin Chinese for students with little or no prior study. Emphasis will be on expressions for daily living with appropriate grammar and vocabulary. Writing in the phonetic pin yin system will be introduced as will high frequency characters.

**CHIN 1102. Beginning Chinese II: A Practical Introduction to Everyday Mandarin Chinese.** (3 cr; A-F or Aud. Prereq=1101 LEIP 03)

Introduction to Mandarin Chinese for students with little prior study. Emphasis will be on expressions for daily living with appropriate grammar and vocabulary. Writing in the phonetic pin yin system will be introduced as will high frequency characters.

**CHIN 1103. Beginning Chinese III: A Practical Introduction to Everyday Mandarin Chinese.** (3 cr; A-F or Aud. Prereq=1102 or equiv, or # LE 3)

Continued introduction to Mandarin Chinese for students with six credits prior study. Emphasis on expressions for daily living with appropriate grammar and vocabulary. Writing in the phonetic pin yin system will be introduced as will high frequency characters.

## Course Descriptions

**CHIN 1104. Beginning Chinese IV: A Practical Introduction to Everyday Mandarin Chinese.** (3 cr; A-F or Aud. Prereq-1103 or equiv, or # LE 3)

Continued introduction to Mandarin Chinese for students with nine credits prior study. Emphasis on expressions for daily living with appropriate grammar and vocabulary. Writing in the phonetic pin yin system will be introduced as will high frequency characters.

**CHIN 1201. Intermediate Chinese I: Mandarin Chinese.** (3 cr; A-F or Aud. Prereq-1104 or equivalent or # LEIP 03)

Consolidation and enrichment of previously acquired abilities speaking and understanding Mandarin Chinese. Emphasis on oral and aural skills, vocabulary building, some reading and writing in the phonetic pin yin system with high frequency characters.

**CHIN 1202. Intermediate Chinese II: Mandarin Chinese.** (3 cr; A-F only. Prereq-1201 or equivalent LEIP 03)

Consolidation and enrichment of previously acquired abilities speaking and understanding Mandarin Chinese. Emphasis on oral and aural skills, vocabulary building, some reading and writing in the phonetic pin yin system with high frequency characters.

**CHIN 1399. Chinese: Mandarin Chinese in China.** (6 cr; A-F only. LEIP 03)

Conversation and communicative course for students with little or no previous study of Chinese. Emphasis on oral and aural skills, some grammar. For study in China.

## Civil Engineering (CE)

Swenson College of Science and Engineering

**CE 1025. Introduction to Civil Engineering.** (1 cr; A-F only)

Definition and description of Civil Engineering. Introduction to transportation, water resources, structures, and geotechnical design. Introduction to ethics, professionalism, globalization, and contemporary issues in civil engineering. Faculty and facilities of the civil engineering program at UMD. Typical civil engineering careers.

**CE 2026. Surveying and Geometrics.** (3 cr; A-F only. Prereq-Math 1297, Engr 2015)

Introduction to error theory. Fundamentals of observing distances, elevations, and angles. Traversing. Irregular areas. Circular and parabolic curves. Earthwork including mass diagrams. Construction staking. Computer applications and introduction to photogrammetry, geographic information systems and global positioning systems technology.

**CE 3015. CADD/Computational Tools for Civil Engineers.** (3 cr; A-F only. Prereq-Engr 2026, Math 3280, Math 3298)

Introduction to computer tools/methods for solving civil engineering problems. Spreadsheets, AutoCAD, MathCAD, Numerical integration, curve fitting, linear/nonlinear equations, differential equations with applications in civil engineering.

**CE 3025. Environmental Engineering.** (3 cr; A-F only. Prereq-Chem 1152, Geol 1110)

Introduction to environmental engineering systems and infrastructure. Fundamentals including application of mass/energy balances and equilibrium to environmental systems. These concepts applied to environmental topics: risk assessment, water quality modeling, water/wastewater treatment, air quality modeling, municipal/hazardous solid waste management.

**CE 3026. Project Management.** (3 cr; A-F only. =IE 3265, IE 4020. Prereq-3015, IE 3125, Stat 3411)

Study of basic concepts and models for successful management of projects in engineering. Topics include structured approach to project management: selection, life cycle, evaluation.

Organizational concepts: planning, conflict, budgeting and cost estimation, scheduling, resource allocation, monitoring, project control and termination.

**CE 3027. Infrastructure Materials.** (3 cr; A-F only. Prereq-Engr 2016, Stat 3411)

Introduction to the behavior and structure of civil engineering materials, including laboratory investigation of physical and mechanical properties; includes concrete, steel, wood, and polymers.

**CE 3115. Structural Engineering.** (4 cr; A-F only. Prereq-Engr 2015, 2016, Math 3298)

Provides a solid background on the principles of structural engineering design. Includes the theories and concepts of both concrete and steel design and analysis at element and system levels. Hands-on design experience and skills through problem sets and a comprehensive design project. Real-world open-ended design issues will be developed.

**CE 3225. Hydrology.** (4 cr; A-F only. Prereq-=[IE 3265], 3015 and (ME 3111 or ChE 3111).)

Introduces the science of hydrology; it describes the components of the hydrologic cycle and analytical methods commonly used to quantify the components; and to outline and discuss application of key hydrologic principles and concepts to selected types of related engineering analytical and design problems.

**CE 3316. Transportation Engineering.** (4 cr; A-F only. Prereq-3015, Math 1297, Stat 3411)

Introduction to transportation systems planning, land use, and management, transportation decision-making process using economic analysis tools. Introduction to design, construction, maintenance, and operations of transportation facilities.

**CE 3426. Soil Mechanics.** (4 cr; A-F only. Prereq-=[IE 3265], 3015, Engr 2016, Geol 1110)

Study of soil as an engineering material. Including description and classification of soil, the analysis of stress in soil, and soil behavior in conditions of engineering significance including the characteristics of water flow through soil, consolidation, settlement and strength. The development and application of earth pressure theory.

**CE 4115. Design of Steel Structures.** (3 cr; A-F only. Prereq-no Grad School cr)

The design of steel structural components; beams, columns, trusses, frames, composite members and connections; an extension of stability theory introduced earlier and the development of codes for metal structural elements; details of design.

**CE 4126. Concrete Design.** (3 cr; A-F only. Prereq-BSCE Candidate, 3115, no Grad School cr)

Design of reinforced concrete structures. Behavior, strength, and design of reinforced concrete members subjected to moment, shear, and axial forces.

**CE 4155. Senior Design I.** (2 cr; A-F only. Prereq-BSCE Candidate, 3026, 3115, 3225, 3316, 3426 and Comp 3130, #, no Grad School Cr)

Selection and specification of team design project, approved and supervised by a faculty advisor. Project is completed through CE 4255.

**CE 4215. Coastal and Marine Engineering.** (3 cr; A-F only. Prereq-=[IE 3265], 3225, no Grad School cr)

An introduction to the principles of coastal hydraulic and sedimentary processes. Design of coastal and harbor works such as ship channels, marinas, jetties, breakwaters, groins, seawalls and beach nourishment projects. Study of Human/Coastal interactions including legal considerations of shorelines and bodies of water.

**CE 4226. Ground Water Development and Management.** (3 cr; A-F only. Prereq-=[IE 3265], 3225, no Grad School cr)

Introductory studies of the occurrence and movement of groundwater, and its natural hydrochemistry, including interactions with surface water systems. Review standard and advanced techniques to evaluate the properties and temporal evolution of groundwater flow and solute transport systems.

**CE 4255. Senior Design II.** (2 cr; A-F only. Prereq-4155, #, no Grad School cr)

Completion of design project started in CE 4155. Formal written and oral reports describing the project. Complete professional documentation of results.

**CE 4315. Traffic Systems Operations and Safety.** (3 cr; A-F only. Prereq-3316, Math 1297, Stat 3411, no Grad School cr)

Basic Knowledge of traffic operations and safety issues using flow modeling/simulation. Micro- and macroscopic modeling approaches, calibration given traffic networks, improving safety on various highways, statistical procedures for incident trends safety measures will be discussed. Computer-aided tools to model accidents at intersections.

**CE 4326. Highway Planning and Design.** (3 cr; A-F only. Prereq-3316, Math 1297, Stat 3411, no Grad School cr)

Provides a broad understanding of highway design principles, practical design tools and methodologies to evaluate the effectiveness of alternative design strategies for operational efficiency, economy and safety. Potential interrelationship between design parameters and traffic safety will be introduced for each design element.

**CE 4415. Geotechnical Design.** (3 cr; A-F only. Prereq-3426, Geol 1110, no Grad School cr)

Topics in design and analysis of soil site investigation and construction, such as instrumentation, soil improvement, water control and remedial measures.

**CE 4426. Rock Mechanics.** (3 cr; A-F only. Prereq-BSCE Candidate, 3426, no Grad School cr)

Stress and strain analysis; introductory elasticity; mechanical behavior of rock and rock masses; rock testing; discontinuity deformation and slip; failure; in-situ state of stress; stresses around underground openings; rock mass classification; support design.

## Coaching (CC)

College of Education and Human Service Professions

**CC 3117. Functional Anatomy and Sport Injury Management.** (3 cr; A-F or Aud. =CC 3116, CHEM 2522, CHEM 2532. Prereq-Min 30 cr, current Red Cross First Aid and CPR card or Hlth 1600)

Functional anatomy, care and prevention of sport injuries, emergency care and external support application. Principles and techniques appropriate for coaches, recreational personnel, pre-professional physical therapists and nurses.

**CC 3150. Coaching Methods.** (3 cr; A-F or Aud. Prereq-Coaching minor, min 30 cr or #)

Study and application of educational methods in an athletic setting. Skill development, learning styles, communication skills, technology skills and practice development as it pertains to sport.

**CC 3160. Psychological Aspects of Coaching and Athletic Performance.** (3 cr; A-F or Aud. Prereq—Coaching minor, min 30 cr or #)  
Psychological techniques and interventions to enhance athletic performance. Emphasizes the implementation of mental skills that enhance athletic performance into sport practice by the coach and/or athlete.

**CC 3161. Administrative Aspects of Coaching.** (3 cr; A-F or Aud. Prereq—Coaching minor, min 30 cr or #)  
Examines state governing organizations, budgeting, scheduling, insurance, contest administration, and public relations procedures in athletic programs.

**CC 3170. Coaching and Officiating Football.** (2 cr; A-F or Aud. Prereq—Coaching minor or #)  
Systems of offense and defense, strategy, and methods of organizing practices and working with team members.

**CC 3171. Coaching and Officiating Basketball.** (2 cr; A-F or Aud. Prereq—Coaching minor or #)  
Fundamentals, styles of offense and defense, training suggestions.

**CC 3172. Coaching and Officiating Volleyball.** (2 cr; A-F or Aud. Prereq—Coaching minor or #)  
Coaching and officiating offenses and defenses; conditioning programs; coaching and officiating philosophies.

**CC 3173. Coaching and Officiating Baseball.** (2 cr; A-F or Aud. Prereq—Coaching minor or #)  
Fundamentals, practice sessions, training techniques, and offensive and defensive strategies.

**CC 3174. Coaching and Officiating Soccer.** (2 cr; A-F or Aud. Prereq—Coaching minor or #)  
Fundamental skills, systems of offense and defense, strategy and rules of the game, methods of organizing practices.

**CC 3175. Coaching and Officiating Ice Hockey.** (2 cr; A-F or Aud. Prereq—Coaching minor or #)  
Fundamental skills, systems of offense and defense, strategy and rules of the game, methods of organizing practices.

**CC 3178. Coaching and Officiating Track and Field.** (2 cr; A-F or Aud. Prereq—Coaching minor or #)  
Fundamentals, mechanical analysis of events, training techniques and strategies.

**CC 3179. Coaching and Officiating Softball.** (2 cr; A-F or Aud. Prereq—Coaching minor or #)  
Fundamentals, practice sessions, training techniques, and offensive and defensive strategies.

**CC 3991. Independent Study.** (2 cr; A-F or Aud. Prereq—Coaching minor and #)  
A coaching methods experience. Directed individual study must be arranged with the instructor before registration.

**CC 3997. Coaching Practicum.** (2 cr; S-N only. Prereq—Coaching minor and #)  
Supervised coaching in a school or agency setting. Coaching practicum must be arranged with the instructor before registration.

## College of Liberal Arts (CLA)

College of Liberal Arts

**CLA 1001. Learning Community Integrative Seminar.** (1 cr [max 2 cr]; A-F only. =SSP 1000. Prereq—Freshman, fewer than 30 cr, @)  
Designed to facilitate integration of learning community courses and collegiate academic expectations. The seminar supports integration of liberal education curriculum within the context of intellectual growth, academic goal setting, and major exploration. Study group practicum required.

**CLA 1101. Leader(ship) Ethics.** (3 cr; A-F only. Prereq—=Comm 3510 or Phil 1003 or Phil 3281)  
Applied ethics course focusing on leader(ship) challenges in dyads, groups, organizations, and the larger community. Topics include: key approaches/perspectives, power, control, and identity in the exercise of ethical decision making, and codes of conduct. Case and personal examinations at dyadic, group, organizational, and community levels.

**CLA 1199. Applied Leader(ship) Practicum.** (1-3 cr [max 3 cr]; S-N or Aud. Prereq—#)  
Supervised opportunity for students interested in gaining practical leadership experience. Location, type, duration, and assessment of experience are determined in consultation with faculty supervisor.

**CLA 2102. Leader(ship): Theory and Practice.** (3 cr; A-F only. Prereq—Min 30 cr; =Comm 2200 or Mgts 4431 or MAPL 5307)

Theories, research, and complexity of leader and leadership activities in group, organizational, and community contexts. Topics include leadership emergence, transactional and transformational perspectives, followership, power, creativity, ethics, and shared leadership.

**CLA 3001. Learning Community Teaching Assistant Practicum.** (1-2 cr [max 6 cr]; S-N only. Prereq—#)  
Practical experience in teaching CLA 1001-LC Integrative Seminar. Teaching assistants collaborate with the faculty instructor to achieve course objectives, coordinate study groups and social events, and serve as a resource and role model to learning community participants. TA responsibilities outlined in contract with learning community coordinator.

**CLA 4191. Leader(ship) Seminar.** (2 cr; S-N or Aud. Prereq—1101, 2102, min 80 cr, no Grad School cr)  
Advanced study and individual research on leadership, followership, leadership ethics, and students' career choices.

## Communication (COMM)

College of Liberal Arts

**COMM 1000. Human Communication Theory.** (3 cr; A-F or Aud. LE 3)

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

**COMM 1010. Persuasion.** (3 cr; A-F or Aud. LE 6)  
Social scientific theory and research on communication techniques used to influence attitudes, perceptions, knowledge, and behavior of others. Research evidence regarding processes and effects on individuals and society in multiple contexts.

**COMM 1112. Public Speaking.** (3 cr; A-F or Aud. =COMM 1511. LE 3)  
Application of the theoretical bases of rhetoric to the public speaking situation.

**COMM 1222. Interpersonal Communication.** (3 cr; A-F or Aud. LECD 03)  
Analysis of the role communication plays in interpersonal relationships.

**COMM 1500. Media and Society.** (3 cr; A-F or Aud. LE 8)  
Manipulative influence of contemporary media on American society. Examples drawn from campaigns, commercial advertising, and editorials.

**COMM 1511. Honors: Public Speaking.** (3 cr; A-F only. =COMM 1112. Prereq—Honors student LE 3)  
Application of the theoretical bases of rhetoric to the public speaking situation.

**COMM 1600. Argumentation and Debate: A Practical Approach.** (3 cr; A-F or Aud)

Utilizes a symbolic action approach to introduce the theory and practice of argumentation, particularly within practical contexts; aiming at the related goals of making students more effective arguers, more critical consumers of arguments, and more critical thinkers generally.

**COMM 1625. Philosophy and Rhetoric.** (3 cr; A-F or Aud)  
Introduction to the philosophy and history of rhetoric from ancient to modern times, including rhetoric's role in reasoning about values, defining the duties and methods of citizenship, and shaping self-awareness.

**COMM 2025. Communication Inquiry: Rhetorical and Historical Methods.** (3 cr; A-F or Aud)  
Exploration/survey of rhetorical and historical approaches to understanding the role that communication plays in social influence.

**COMM 2030. Communication Inquiry: Social Scientific Methods.** (3 cr; A-F or Aud)  
Introduction to social scientific inquiry related to the study of communication, and will provide an overview of research methods and an introduction to statistics.

**COMM 2101. Foundations of Mass Communication.** (3 cr; A-F or Aud. LE 8)

Theories, research, regulation, and ethical concerns surrounding contemporary mass media. Identifies U.S. media's role within the international marketplace. Survey of contemporary media content, industry structures, technology, and delivery systems.

**COMM 2102. Media Effects.** (3 cr; A-F or Aud. LE 8)

Theory and research on the effects of media. Topics include media violence effects, sexual media content, fright reactions to media, news and political content effects, the impact of stereotyping, advertising effects, and the impact of new media technologies.

**COMM 2202. Introduction to Organizational Communication.** (3 cr; A-F or Aud)

Introduction to theories, systems, structures, and processes of communication in the organization. Explores the relationship between organizational characteristics (i.e., selection, socialization, training, and evaluation) and communication.

**COMM 2505. Analysis of Public Discourse.** (3 cr; A-F or Aud. Prereq—1112)

Guided investigation of public discourse within selected periods. Topics vary.

**COMM 2929. Intercultural Communication.** (4 cr; Stdnt Opt. LEIP 06)

Understanding variations among international cultures regarding communication practices. Potential difficulties in intercultural communication; effective means of engaging in intercultural communication.

**COMM 3115. Persuasion and Argumentation in Public Speaking.** (3 cr; A-F or Aud. Prereq—1112, 2505)

Advanced theories. Developing persuasive strategies, carefully managing logical and argumentational structures within the speech, and fostering critical thinking tools in creation, analysis, and evaluation of persuasive speech.

**COMM 3116. Professional Communication.** (3 cr; A-F or Aud. Prereq—1112, 2505)

Theory and practice of communication skills related to the workplace. Skill development in presentational speaking and vocational interviewing.

**COMM 3200. Interpersonal Communication Theory.** (3 cr; A-F or Aud. Prereq—1000 or 1222)

Role of communication in developing, maintaining, and changing personal relationships.

## Course Descriptions

**COMM 3203. Communication and the Social Environment of the Internet.** (3 cr; A-F or Aud)  
Familiarizes students with major theories, perspectives, and principles associated with Internet as a social realm. Facilitates student understanding of role of technology and communication in a variety of contexts available on the Internet.

**COMM 3205. Relationship Communication.** (3 cr; A-F or Aud. Prereq=1222)  
Study of advanced interpersonal communication skills in context of family and gender issues.

**COMM 3210. Group Communication.** (3 cr; A-F or Aud. Prereq=Min 30 cr or #)  
Small group approaches to problem management. Useful for anyone intending to participate in decision-making groups.

**COMM 3211. Communication and Technology in the Information Age.** (3 cr; A-F or Aud)  
Explores communication technologies in the information society; introduces students to new technologies used in contemporary organizations; explores implications of those technologies for human communication; and provides hands-on experience within a theoretical framework.

**COMM 3215. Conflict Management.** (3 cr; A-F or Aud. Prereq=Min 30 cr or #)  
Application of interpersonal conflict management theory and skills to small group, organizational, and community conflicts.

**COMM 3223. Communication and Creativity.** (3 cr; A-F or Aud. Prereq=Min 30 cr or #)  
Examines the relationship between communication and creative processes. Content includes techniques of deliberate creativity; creativity audits; the necessity of creative approaches to group, organizational, and social circumstances; the psychological and social aspects of creativity; and creative versus critical thinking.

**COMM 3300. Teaching Assistantship in Communication.** (1-3 cr [max 6 cr]; S-N or Aud. Prereq=Min 60 cr, Comm major or minor, #, may not be applied to elective cr for a Comm major or minor)  
Practical experience in teaching beginning courses in the department. Students serve as intern teachers assisting the instructor in administration of the course. Application deadline is one week before beginning of registration for following semester.

**COMM 3310. Research Assistant in Communication.** (1-3 cr [max 18 cr]; S-N or Aud. Prereq=#)  
Practical experience in assisting communication faculty in ongoing research projects. Comm 3310 and 4397 carry variable credit, only some of which may count toward the comm major or minor. While all credits for these courses apply to the 120 cr required for graduation, the max number of credits from these courses (either one course or combined from the two courses) that may apply to the student's major or minor is three (3).

**COMM 3390. Special Topics: (Various Titles to be Assigned).** (3 cr [max 6 cr]; A-F or Aud)  
Relationship between communication and creative process. Techniques of deliberate creativity audits. Necessity for creative approaches in group, organizational, and social circumstances. Physical/social aspects of creativity.

**COMM 3392. Special Topics: (Various Titles to be Assigned).** (3 cr [max 9 cr]; A-F or Aud)  
Topics not included in regular curriculum. Announced before course offered and will fit into Cluster A (Interpersonal Communication/Social Groups) electives.

**COMM 3395. Special Topics: (Various Titles to be Assigned).** (3 cr [max 9 cr]; A-F or Aud)  
Topics not included in regular curriculum. Announced before course offered and will fit into Cluster B (Rhetoric/Persuasion/Media) electives.

**COMM 3400. Health Communication.** (3 cr; A-F only)  
Survey course examines the critical role communication plays in health promotion, specifically in the area of doctor-patient interaction and health campaigns. Important communicative issues such as the social construction of health, the role of culture in health and healing, health disparities, media literacy, and social support are addressed.

**COMM 3505. Media Communications.** (3 cr; A-F or Aud. Prereq=Comp 1120)  
Journalistic and public relations writing techniques: fact gathering; selection and editing of news-editorial content of newspapers, magazines, television, and radio; reporting and editing court and municipal and county agency news; and practical application of public relations principles.

**COMM 3510. Ethics in Human Communication.** (3 cr; A-F or Aud. Prereq=1112, =CLA 1101)  
Examination of the recurring ethical questions faced by people as we communicate both in interpersonal/non-professional contexts and as practitioners in communication professions.

**COMM 3525. Deciding What's News.** (3 cr; A-F or Aud)  
Review history of news in the United States, examine definitions of news, engage in critical evaluations of news in its various genres (news magazines, infotainment, investigative journalism, checkbook journalism, tabloid journalism, etc.), and apply news writing skills.

**COMM 3550. Children and Media.** (3 cr; A-F or Aud)  
Theory and research on the impact of media on children.

**COMM 3560. Video Game Entertainment.** (3 cr; A-F or Aud)  
Research and theory on video games, including work on content, uses, and effects. Overviews of game history, industry economics, design, and policy. Hands-on exposure to game technologies. Information about careers in video games.

**COMM 3605. Public Relations.** (3 cr; A-F or Aud)  
Examines functions of public relations in society and surveys concepts, theories, and principles of effective, ethical public relations.

**COMM 3612. Rhetorical Criticism.** (3 cr; A-F or Aud. Prereq=1112, min 60 cr)  
Survey of approaches to rhetorical analysis of communicative acts, events, and artifacts.

**COMM 3620. Controversy in the Boundary Waters.** (3 cr; A-F or Aud)  
Considers the rhetorical and political processes conditioning the debate over the Boundary Waters Canoe Area's wilderness designation. Culminates in a class field trip to the BWCA, and a group project pertaining to contemporary environmental rhetoric.

**COMM 3625. Rhetoric of Globalization.** (3 cr; A-F only. Prereq=1112)  
Study and reflection of global civil society, with special focus on the ways that new and changing forms of communication have altered the meaning of a democratic press, civic participation, human rights and shared experience.

**COMM 3700. Interpersonal Influence.** (3 cr; A-F or Aud)  
Social scientific theory and research on communication techniques used to influence attitudes, perceptions, knowledge, and behavior of others. Research evidence regarding processes and effects on individuals and society in multiple contexts.

**COMM 4200. Communication in Organizations.** (4 cr; A-F or Aud. Prereq=Min 60 cr or #)  
Relationship between communication and organization design. Emphasis on development and impact of organization culture. Communication issues, including power, networks, gender, race, and decision making. Explores qualitative and field research.

**COMM 4300. Communication Teaching Methods.** (3 cr; A-F or Aud. =COMM 5300. Prereq=1112, 1222, 60 cr, no Grad School cr)  
Issues in teaching communication theory and skills, suggested methods and materials of instruction. Specific focuses on public speaking, interpersonal communication, effective listening, and media literacy.

**COMM 4394. Directed Research in Communication.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq=Min 60 cr, comm major, #; may not be applied to elective cr for comm major or minor)  
Individual research project, written under the supervision of a regular faculty member, to result in a research paper.

**COMM 4397. Internship in Communication.** (1-8 cr [max 8 cr]; S-N or Aud. Prereq=Min 79 cr, comm major/minor (20 cr. in major), 2.50 GPA in major/minor; no Grad School cr)  
Students work in pre-approved program with a public agency, private organization, or other service agency; work must be in specific area of communication. Application deadline is one week before beginning of registration for following semester. Comm 3310 and 4397 carry variable credit, only some of which may count toward the comm major or minor. While all credits for these courses apply to the 120 cr required for graduation, the max number of credits from these courses (either one course or combined from the two courses) that may apply to the student's major or minor is three (3).

**COMM 4399. Directed Projects in Communication.** (1-3 cr [max 6 cr]; S-N only. Prereq=Min 60 cr, comm major, #; may not be applied to elective cr for comm major or minor; no Grad School cr)  
Individual projects in the communication discipline, undertaken under the supervision of a regular faculty member.

**COMM 4500. History of Rhetoric.** (3 cr; A-F or Aud. Prereq=1112 or #; no Grad School cr)  
Development of rhetorical thought as expressed by representative writers.

**COMM 4505. Media Theory and Research.** (3 cr; A-F or Aud. Prereq=1500 or 2101, min 60 cr or #; no Grad School cr)  
Theoretical concepts and research perspectives currently used to understand intricacies of a mediated society. Introduction and application of basic research methods to study questions concerning impact of media on society and individuals.

**COMM 4525. Foundations of Media Literacy.** (4 cr; A-F or Aud. Prereq=2101 or #)  
Historical overview of the Media Literacy movement. Social scientific, critical and economic knowledge bases about media industries; appreciation of the production and content of media messages; development of media literacy skills and strategies for media literacy instruction.

**COMM 4949. Intercultural Communication Practicum.** (4-12 cr [max 12 cr]; S-N or Aud. Prereq=#; no Grad School cr; repeatable 3 times at different designated sites)  
Practice of intercultural communication at culturally diverse sites. Students will immerse themselves in Non-European/American cultures and participate in intercultural communication with members of those cultures. Offered at various sites within the U.S. and internationally.

**COMM 5000. Senior Seminar.** (3-6 cr [max 6 cr]; A-F or Aud. Prereq—Min 90 cr, Comm major or #, no Grad School cr)

Advanced study and individual research on a selected topic or theme in communication; senior seminar course for communication majors.

**COMM 5200. Communication and Organizational Creativity.** (3 cr; A-F or Aud. Prereq—4200 or Grad Student or #)

Role of communication in establishing organization cultures that value and promote creativity and innovation. Emphasis on importance of social networks, narrative construction of organizational verity, intrinsic and extrinsic motivation, and understanding group and organizational creativity as communication events. Case studies.

**COMM 5390. Communication Workshop.** (1-3 cr [max 6 cr]; S-N only. Prereq—Min 60 cr or #)

Intensive study of various aspects of communication.

**COMM 5391. Independent Study in Communication.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—#)

Individual research project written under supervision of communication graduate examining faculty member, to result in a research project.

## Communication Sciences and Disorders (CSD)

College of Education and Human Service Professions

**CSD 1100. Phonetics.** (2 cr; Stdnt Opt. LE 3)

Study and practice of International Phonetic Alphabet. English and non-English speech sounds as they occur separately and in connected speech. Variations in speech production as related to regional and/or class distinctions.

**CSD 2230. Human Communication Disorders.** (3 cr; Stdnt Opt. LECD 08)

Receptive and expressive human communication disorders. Importance of communication to human behavior; influence that communication disorders exert on broad spectrum of human activities. Professional roles and responsibilities of speech-language pathologists and audiologists.

**CSD 3103. Anatomy of Speech and Hearing Mechanisms.** (3 cr; A-F only. Prereq—CSD candidate or #)

Anatomy and physiology as they relate to hearing and speech processes including respiration, phonation, and articulation.

**CSD 3130. Language Development and Disorders.** (4 cr; A-F only. Prereq—Pre CSD candidate or #)

Normal processes of language development in children. Incidence, etiology, diagnosis, and intervention strategies for children with language disorders.

**CSD 3131. Language Development.** (4 cr; A-F or Aud. Prereq—CSD candidate or #)

Emphasis on the acquisition and development of language, verbal and nonverbal, as children learn to communicate effectively by selecting the most appropriate communication strategies.

**CSD 3150. Fundamentals and Clinical Applications of Speech Science.** (3 cr; A-F or Aud. Prereq—CSD candidate or #)

Basic principles of speech science including, acoustic characteristics of speech; physiology of respiration, phonation, and resonance; and theories of speech perception and production. Clinical and research applications of speech science will also be discussed.

**CSD 3160. Fundamentals of Hearing Science.** (3 cr; A-F only. Prereq—3103, CSD candidate or #)

Introductory study of acoustics and psychoacoustics.

**CSD 3200. Articulation and Phonological Disorders.**

(3 cr; A-F only. Prereq—1100, 2230, CSD candidate or #) Differential diagnosis, assessment, and treatment considerations for articulation and phonological disorders. Outside observation required.

**CSD 3232. Language Disorders.** (3 cr; A-F or Aud. Prereq—3131, CSD candidate or #)

Focuses on the functional applications in the assessment and intervention of language disorders including a review of the various formal and informal assessment tools, and the approaches to language intervention.

**CSD 3241. Foundations of Treatment in Communication Disorders.** (3 cr; A-F or Aud. Prereq—3103, 3131, 3150, 3200, CSD candidate or #)

Focuses on foundational principals of treatment, applicable to a variety of communication disorders.

**CSD 4010. Portfolio Development.** (1 cr; A-F or Aud. Prereq—CSD candidate or #, no Grad School cr)

Introduction to the ongoing process of developing and updating an undergraduate student portfolio that may be used for purposes of reflection and self assessment, documentation of professional organization designated competencies, and/or application to graduate programs.

**CSD 4097. Introduction to Clinical Practicum in Communication Disorders.** (1 cr; A-F only. Prereq—CSD candidate, C grade or better in 3241, 25 hrs clinical observation)

Clinical practicum with speech, language, and/or hearing impaired persons in an on-campus clinic under supervision of an ASHA-certified speech-language pathologist. (1 hr seminar per wk)

**CSD 4197. Clinical Practicum in Communication Disorders.** (3 cr; A-F only. Prereq—3241 with C grade or better, CSD candidate or #, no Grad School cr)

Clinical practicum with speech, language, and/or hearing impaired individuals in the on-campus clinic under the supervision of an ASHA-certified speech-language pathologist. (1 hr seminar per wk)

**CSD 4200. Introduction to Fluency Disorders.** (3 cr; A-F or Aud. Prereq—2230, CSD candidate or #, no Grad School cr)

Etiologies, characteristics, and development of stuttering and other fluency disorders.

**CSD 4297. Advanced Clinical Practicum in Communication Disorders.** (3 cr; A-F or Aud. Prereq—4197 with C grade or better, CSD candidate or #, no Grad School cr)

Clinical practicum with speech, language, and/or hearing impaired individuals in the on-campus clinic, under the supervision of an ASHA certified speech-language pathologist, with expectation for increased level of independence than demonstrated in CSD 4197.

**CSD 4400. Hearing Disorders and Evaluation.** (3 cr; A-F only. Prereq—3103, 3160, CSD candidate or #)

Characteristics, development, and etiologies of typical auditory pathologies. Overview of basic hearing assessment and diagnostic techniques. Clinical observation required.

**CSD 4500. Voice Disorders.** (3 cr; A-F or Aud. Prereq—CSD candidate)

Theoretical and practical study of voice and voice disturbances in children and adults.

**CSD 5000. Departmental Seminar.** (1-3 cr [max 6 cr]; Stdnt Opt. Prereq—CSD candidate or #)

Recent developments in speech, language, and hearing; reports on current faculty/student research projects within department.

**CSD 5010. Portfolio Development.** (1 cr; A-F only. Prereq—CSD Grad student or #)

Introduction to the ongoing process of developing and updating a graduate student portfolio that may be used for purposes of reflection and self assessment, documentation of professional organization designated competencies. Used for ASHA standards

**CSD 5091. Independent Study.** (1-3 cr [max 6 cr]; Stdnt Opt. Prereq—CSD candidate with 90 cr or CSD Grad student)

Directed study, readings, and/or projects of student interest in communication disorders.

**CSD 5095. Special Topics: (Various Titles to be Assigned).** (.5-3 cr [max 6 cr]; Stdnt Opt. Prereq—no Grad School cr)

Special topics of interest to speech-language pathologists, audiologists, special educators, and related professionals. Workshop and seminar format.

**CSD 5098. Communication Sciences and Disorders Workshop.** (1-3 cr [max 6 cr]; Stdnt Opt)

Opportunities for speech-language pathologists, audiologists, other related professionals, and students to concentrate study on a specific topic presented in a workshop format.

**CSD 5100. Research Methods in Communication Disorders.** (3 cr; A-F only. Prereq—CSD Grad)

Especially designed for new CSD graduate students to introduce them to the research process. Topics will include generating a research question, experimental designs, data collection, analysis, and interpretation, and writing the research paper. Students will conduct a guided class research project and begin their Plan B project.

**CSD 5142. Introduction to Diagnosis of Communication Disorders.** (2 cr; A-F or Aud. Prereq—[4142], CSD Grad or #)

General issues of evaluation and diagnosis of communication disorders pertinent to all age groups and disorders.

**CSD 5195. Special Topics: (Various Titles to be Assigned).** (.5-3 cr [max 6 cr]; A-F or Aud. Prereq—#)

Special topics of interest to speech-language pathologists, audiologists, special educators, and related professionals. Workshop and seminar format. Topics vary and will be announced in class schedule.

**CSD 5200. Dysphagia.** (3 cr; Stdnt Opt. Prereq—CSD Grad or #)

Anatomy and physiology of normal and disordered deglutition. Etiology, diagnosis, and management of swallowing disorders, including head and neck cancer.

**CSD 5230. Advanced Applications in Communication Modalities.** (4 cr; Stdnt Opt. Prereq—CSD Grad or #)

Advanced seminar and clinical practicum of augmentative and alternative communication (AAC) systems, assistive technologies and visual communication modalities. The decision-making process for identifying AAC candidates, selecting appropriate communication modality systems and developing effective communication programs and strategies involving visual communication modalities.

**CSD 5240. Dementia: Communication Impairment and Management.** (1-2 cr [max 2 cr]; A-F only. Prereq—CSD candidate or CSD Grad or #)

Examines the issue of communication with people with dementia. It will identify the features of communication as observed in the different stages of dementia. It will develop strategies for speech language pathologists and health professionals that will assist them to communicate more effectively with their clients.

**CSD 5250. Seminar in Augmentative and Alternative Communication.** (1 cr; A-F only. Prereq—CSD Grad School Student or #)

Examines the assessment and treatment issues for speech language pathologists working with individuals requiring augmentative and alternative communication systems.

## Course Descriptions

**CSD 5301. Language Disorders in Infants, Toddlers, and Preschoolers.** (2 cr; A-F or Aud. Prereq=%) Advanced study of language disorders in individuals birth to 6 years old. The course includes an examination of etiology, diagnosis, clinical techniques, and study of relevant research.

**CSD 5302. Language Disorders in School-Age Children.** (2 cr; A-F or Aud. Prereq=%) Advanced study of language disorders in individuals 6 to 21 years old. The course includes an examination of etiology, diagnosis, clinical techniques, and study of relevant research.

**CSD 5400. Rehabilitative Procedures for the Hard of Hearing.** (3 cr; A-F only. Prereq=4400, CSD candidate or CSD Grad or #) Theories, principles, and methods regarding current approaches to aural rehabilitation of hard-of-hearing children and adults.

**CSD 8097. Internship: Communication Disorders.** (1-3 cr [max 12 cr]; A-F only. Prereq=Can apply max 4 cr to a Graduate School program. 25 hrs supervised clinical observation, CSD Grad student or #) Supervised clinical practicum in on-campus clinic and/or an approved professional setting under supervision of an ASHA-certified speech-language pathologist. (1 hr seminar per wk)

**CSD 8099. Projects in Communication Disorders.** (2 cr; A-F only. Prereq=CSD Grad student or #) Plan B project or individual research under faculty supervision.

**CSD 8197. Externship: Communication Disorders.** (4 cr; A-F only. Prereq=8097, CSD Grad student or #) Full-time professional clinical experience in an approved professional setting under supervision of an ASHA-certified speech-language pathologist.

**CSD 8205. Advanced Fluency Disorders.** (3 cr; Stdnt Opt. Prereq=4200 or equiv, CSD Grad student or #) Differential diagnosis, assessment, and treatment considerations for developmental stuttering and other fluency disorders.

**CSD 8210. Professional Issues in Speech-Language Pathology.** (1 cr; Stdnt Opt. Prereq=CSD Grad student or #) Identification and discussion of current issues and trends in the profession of speech-language pathology. Topics include professional work settings, credentialing agencies and requirements, federal and state laws influencing delivery of services, advocacy organizations, securing employment.

**CSD 8230. Neurogenic Language Disorders.** (3 cr; Stdnt Opt. Prereq=CSD Grad student or #) Advanced study of diagnosis, treatment, and research of acquired language disorders resulting from neurological impairment: aphasia, right brain damage, dementia, and traumatic head injury.

**CSD 8231. Neurogenic Speech Disorders.** (3 cr; Stdnt Opt. Prereq=CSD Grad student or #) Advanced study of neuroanatomical bases for motor speech disorders; diagnostic and therapeutic procedures used in speech disorders related to central and peripheral nervous system damage.

**CSD 8232. Mgmt of Communication Disorders in Persons with Tracheostomy, Ventilator Dependency, and Laryngectomy.** (1 cr; A-F only. Prereq=CSD Graduate School Student or #) Advanced study of the effects of tracheostomy tubes, ventilators and laryngectomies on the production of speech; diagnostic and therapeutic procedures used in working with individuals with trach vents, or laryngectomies.

**CSD 8235. Counseling Applications in Communication Disorders.** (2 cr; Stdnt Opt. Prereq=CSD Grad student, at least 4 cr of 8097 or #) Applications of interviewing and counseling theories and behaviors to field of speech-language pathology.

**CSD 8297. Audiology Practicum.** (1-2 cr [max 4 cr]; S-N only. Prereq=5400, 8400, CSD grad student or #; Cannot apply more than 2 cr to a Graduate School program) Clinical assessment and rehabilitative experiences in an on-campus clinic under supervision of an ASHA-certified audiologist.

**CSD 8333. FTE: Master's.** (1 cr; No grade. Prereq=Master's student, adviser and DGS consent)

## Computer Science (CS)

Swenson College of Science and Engineering

**CS 1011. Introduction to Computers and Software.** (3 cr; A-F or Aud. =FMIS 1201, FMIS 2201, FMIS 3201. Prereq=1 yr high school algebra, WRIT 1120 or # LE 3) Introduction to the personal computer, hardware and software. Recognition of the computer's role as a productivity tool in business and society as a whole. Focus on developing a broad understanding of computing systems and widely used software applications.

**CS 1094. Freshman Seminar: Computers and Society.** (3 cr; A-F or Aud. Prereq=Freshman, fewer than 30 credits LE 8) Explores the impact of computers on daily life. Topics include history of computing, information overload, the digital divide, privacy and security issues, piracy and copyright, concerns, hacker culture, the Open Source movement, international issues, and future trends.

**CS 1121. Introduction to Programming in Visual BASIC.NET.** (3 cr; A-F or Aud. =FMIS 2225. Prereq=1 yr high school algebra or # LE 3) Introduction to programming in the modern Visual BASIC language. Projects are developed in a .NET environment using the Visual Studio. Includes GUI interface development and expert-driven Windows programming. Major topics include variables, datatype, arithmetic expressions, control structures, arrays and database file processing. For students with no prior programming experience.

**CS 1131. Introduction to Programming in FORTRAN.** (3 cr; A-F or Aud. =CS 1135. Prereq=3 1/2 yrs high school algebra or Math 1250 or # LE 3) Study of FORTRAN and its application in science and engineering. Basic syntax and data types, operators, input and output, expressions, subprograms, control structures, data files, arrays, pointers, and programmer-defined types.

**CS 1135. Introduction to Programming in FORTRAN 90.** (2 cr; A-F or Aud. =CS 1131. Prereq=3 1/2 yrs high school algebra or Math 1250 or # LE 3) Study of FORTRAN and its application in science and engineering. Basic syntax and data types, operators, input and output, expressions, subprograms, control structures, and single-dimensional arrays.

**CS 1301. Introduction to 3D Game Development: Learning to Program Computers by Creating Video Games.** (4 cr; A-F or Aud. LE 3) Introduces skills used to solve problems with computers. Students learn fundamental computer programming skills through the development of 3D animation and 3D games.

**CS 1511. Computer Science I.** (5 cr; A-F or Aud. =CS 1211, CS 1581. Prereq=3 1/2 yrs high school math or # LE 3) Introduction to the discipline of computer science. Emphasis on problem analysis, design, and development using event-driven programming in a graphical user interface environment. Programming concepts include control structures, arrays, recursion, pointers, classes and introduction to the object-oriented approach.

**CS 1521. Computer Science II.** (5 cr; A-F or Aud. =CS 2111. Prereq=1511 or 1581) Continuation of introduction to computer science. Methods for procedural and data abstraction. Focus on classical data structures, procedural and data abstraction, and the abstract data type. Introduction to software engineering technique. Algorithm analysis, principles of object-oriented programming issues in ethical use of computers. Requires implementation of significant programming projects.

**CS 1581. Honors: Computer Science I.** (5 cr; A-F or Aud. =CS 1211, CS 1511. Prereq=Honors student, 3 1/2 yrs high school math LE 3) Similar to 1511, but in greater depth and with more challenging assignments. For high-ability students.

**CS 2121. Introduction to Programming in Java.** (3 cr; A-F or Aud. Prereq=3 yrs high school math, or # LE 3) Introduction to the Java language including data types, variables, operators and expressions, control structures and arrays. Design and implementation of graphical user interface Java applets for web-based applications.

**CS 2511. Software Analysis and Design.** (4 cr; Stdnt Opt. Prereq=1521 or #) Techniques for analyzing, designing, and creating medium-scale software through object-oriented design and implementation. Introduction to design patterns. Emphasis on polymorphism and abstraction to increase software modularity, reusability, and flexibility. Includes a medium-scale team-development project.

**CS 2521. Computer Organization and Architecture.** (4 cr; Stdnt Opt. Prereq=1521, ECE 1315, Math 1296 or #) Internal representation of programs and data. Computer organization and introduction to computer architecture. Machine and assembly language programming. Data and procedural structures. Addressing methods. Systems software including linking and loading. Introduction to hardware performance analysis and measurements.

**CS 2991. Independent Study.** (1-4 cr [max 8 cr]; Stdnt Opt. Prereq=#) Directed study of special interest topics not available in standard curriculum. Must be arranged with instructor before registration. May include readings, research, or special projects.

**CS 3011. Information Technology Hardware and Software.** (4 cr; A-F or Aud. Prereq=FMIS 3201 or FMIS 2201 or SBE 1101, 2511 or #) Principles and application of telecommunication and computer systems hardware and software focusing on coding of data and programs, system hardware organization, and operating systems.

**CS 3111. Computer Ethics.** (4 cr; A-F or Aud. Prereq=Comp 3100 or 3110 or 3121 or 3130 Or 3140 or 3150 or 3160 or Engr 4001, min 60 cr or #) Ethical issues posed by computer use, including those related to networking, intellectual property, privacy, crime and security, risk and reliability, and effects on work and wealth. Includes significant writing and a class presentation

**CS 3121. Interactive Multimedia Technology.** (4 cr; A-F or Aud. Prereq=FMIS 3201 or FMIS 2201 or SBE 1101, 2511 or #) Fundamentals of multimedia computing and interactive technologies; digitizing and manipulating images, audio, and video materials; perception, cognition, and communication issues; software engineering, design, and analysis; web-related languages (e.g., JavaScript, HTML, CSS); media formats and compression; copyright and ethics. Includes practical labs and authoring a large-scale project.

**CS 3211. Database System Concepts.** (4 cr; A-F or Aud. Prereq—FMIS 3201 or FMIS 2201 or SBE 1101, 2511 or #) Design and use of database management systems. Emphasis on the relational data model, SQL, integrity constraints, relational database design, file structures, indexing, query processing, and optimization. Oracle-based laboratory work.

**CS 3221. Operating Systems Practicum.** (4 cr; A-F or Aud. Prereq—3011 or #, CIS majors only, min 60 cr) Hands-on introduction to operating systems and tools. Systems administration experience with operating systems such as Linux, Unix, or Windows. Concepts of processor management and scheduling, memory management, file systems.

**CS 3512. Computer Science Theory.** (4 cr; A-F or Aud. Prereq—1296 or 1596, CS 2511 or #) Sets, relations, functions. Recursive definitions of functions and sets. Proof methods, including mathematical and structural induction, diagonalization. Program correctness, asymptotic time/space complexity. Formal language theory, including regular languages and expressions, deterministic/nondeterministic finite automata, Kleene's Theorem.

**CS 3996. Internship in Computer Science.** (1-3 cr [max 3 cr]; S-N or Aud. Prereq—Comp sci jr, #) Practical, independent computer science experience in commercial, industrial, or educational setting. Department approval required before beginning internship.

**CS 4411. Data Communications and Network Technology.** (4 cr; A-F or Aud. Prereq—3011 or #, CIS majors only, min 60 cr) In-depth experience with telecommunications fundamentals, including voice-video-data transmission in LAN and Internet. Network protocol analysis and implementation. Network layered architecture and abstractions. Installation, configuration, systems integration, and management of the technologies.

**CS 4511. Computability and Complexity.** (4 cr; A-F or Aud. Prereq—3511 or 3512 or #) Fundamentals of the mathematical theory of computation. Turing machines, Church-Turing Thesis, recursive and recursively enumerable languages, unsolvable problems, Rice's Theorem, deterministic and nondeterministic time and space complexity, complexity classes, NP-completeness, Cook's Theorem, P vs NP.

**CS 4521. Algorithms and Data Structures.** (4 cr; A-F or Aud. Prereq—(2511, 3511) or 3512 or #) Asymptotic analysis of algorithms. Methods for proving correctness. Implementation of algorithms. Survey of algorithms and data structures, such as: heaps and heapsort, quicksort, binary search trees, red-black trees, B-trees, hash tables, graph algorithms, dynamic programming, and greedy algorithms.

**CS 4531. Software Engineering.** (4 cr; A-F or Aud. Prereq—2511 or #) Formal methods of software design and development. Recognition of conditions for production of high quality software. Organization and management of software development projects. Includes large team project.

**CS 4611. Database Management Systems.** (4 cr; A-F or Aud. Prereq—2511, 2521 or #) Study of database management fundamentals focusing on the relational data model. Topics include database organization, file organization, query processing, concurrency control, recovery, data integrity, optimization and view implementation.

**CS 4821. Computer Security.** (4 cr; A-F or Aud. Prereq—[4711], (2511, 2521, 3511) or (2521, 3512) or #) Entropy and the underlying characteristics of text. Encryption-basic techniques based on confusion and diffusion and modern day encryption. Access, information flow and inference control. Program threats and intrusion detection. Network and Internet security. Firewalls, trusted systems, network authentication.

**CS 4991. Independent Study.** (1-4 cr [max 8 cr]; A-F or Aud. Prereq—#) Directed study of special interest topics not available in standard curriculum. Must be arranged with instructor before registration. May include readings, research, or special projects.

**CS 4993. Seminar.** (1 cr; A-F or Aud. Prereq—2511, Comm 1112, Comp 3130 or 3150, CS or CIS major and 90 cr; no Grad School cr) Written report and oral presentation of a topic relating to the social and ethical implications of computing.

**CS 4994. Honors Project.** (2-3 cr [max 3 cr]; A-F or Aud. Prereq—Consent of comp sci honors prog committee) Required for students who wish to participate in the computer science honors program. Students must complete a research project under supervision of a faculty adviser.

**CS 4995. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 8 cr]; A-F or Aud. Prereq—#) Study of selected topic announced in [Class Schedule].

**CS 5541. Artificial Intelligence.** (4 cr; A-F or Aud. Prereq—(2511, 3511) or 3512 or #) Principles and programming methods of artificial intelligence. Knowledge representation methods, state space search strategies, and use of logic for problem solving. Applications chosen from among expert systems, planning, natural language understanding, uncertainty reasoning, machine learning, and robotics. Lectures and labs will utilize suitable high-level languages (e.g., Python or Lisp).

**CS 5551. User Interface Design.** (4 cr; A-F or Aud. Prereq—2511, (Math 1297 or Math 2326) or #) Design and layout of interactive programs using components, containers, events, menus, and dialogs. The use of graphics primitives, color and images; giving user feedback and help. Rapid prototyping and interface management systems. Design for accessibility and usability.

**CS 5621. Computer Architecture.** (4 cr; A-F or Aud. Prereq—2521 or #) Advanced concepts in processor and computer system organization and their impact on performance. Exploitation of parallelism, multilevel memory organization, system interconnection, and input-output organization.

**CS 5631. Operating Systems.** (4 cr; A-F or Aud. Prereq—2511, 2521 or #) Operating system as resource manager. Processor management and scheduling, deadlocks, concurrency, memory management and protection and security as applied in modern operating systems. Concepts are illustrated via laboratory assignments which heavily emphasize concurrency.

**CS 5641. Compiler Design.** (4 cr; A-F or Aud. Prereq—(2511, 2521, 3511) or (2521, 3512) or #) A selection from the following topics: finite-state grammars, lexical analysis, and implementation of symbol tables. Context-free languages and parsing techniques. Syntax-directed translation. Run-time storage allocation. Intermediate languages. Code generation methods. Local and global optimization techniques.

**CS 5651. Computer Networks.** (4 cr; A-F or Aud. Prereq—2511, 2521 or #) Introduction to computer networking, network programming, networking hardware and associated network protocols. Layered network architecture, network services, and implementation of computer networking software.

**CS 5721. Computer Graphics.** (4 cr; A-F or Aud. Prereq—2511, (CS 3511 or Math 2326) or #) Mathematics for computer graphics, basic raster algorithms, 2D and 3D transformations and viewings. The graphics pipeline including visible surface determination, shading, transformations, and viewings. The graphic pipeline including visible surface determination, shading, ray-tracing, texture mapping, and clipping. Data structures: triangle meshes, scene graphs, ray-tracing, texture mapping, and clipping. Data structures: triangle meshes, scene graphs. Graphics applications using software systems such as Open GL.

**CS 5741. Object-Oriented Design.** (4 cr; A-F or Aud. Prereq—(2511, 3511) or 3512 or #) Overview of software design and design methods, focusing on object-oriented design. Impact of object and class organization on software maintenance and reusability. Implementation of a significant project using object-oriented methods and tools.

**CS 5751. Introduction to Machine Learning.** (4 cr; A-F or Aud. Prereq—(2511, 3511, Stat 3611) or (3512 or Stat 3611) or #) Survey of methods in machine learning including supervised and unsupervised methods. Topics covered may include clustering, decision trees, neural networks, support vector machines, genetic algorithms and reinforcement learning. Theoretical concepts associated with machine learning.

**CS 5761. Introduction to Natural Language Processing.** (4 cr; A-F or Aud. Prereq—(2511, 3511) or 3512 or #) Techniques for creating computer programs that analyze, generate, and understand natural human language. Topics include syntactic analysis, semantic interpretation, and discourse processing. Applications selected from speech recognition, conversational agents, machine translation, and language generation. Substantial programming project required.

**CS 5831. Information and Text Processing.** (4 cr; A-F or Aud. Prereq—(2511, 2521, 3511) or (2521, 3512) or #) The properties that underlie text processing and their application in terms of compression and encryption. Retrieval models. Digital libraries. Web applications.

**CS 5991. Independent Study.** (1-4 cr [max 8 cr]; A-F or Aud. 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 5994. Advanced Topics in Computer Science.** (4 cr; A-F or Aud. Prereq—Grad student or #) Research-oriented study of topics of current academic or industrial interest, such as parallel algorithms, VLSI design, computational geometry, logic programming languages, program correctness, information retrieval systems, and decision support systems.

**CS 8333. FTE: Master's.** (1 cr; No grade. Prereq—Master's student, adviser and DGS consent)

**CS 8511. Advanced Theory of Computation.** (4 cr; Stdnt Opt. Prereq—4511 or #) Mathematical theory of computability and computational complexity. Deterministic and nondeterministic Turing machines. Recursive and recursively-enumerable languages. Undecidable problems, Rice's Theorem, the Church-Turing thesis. Time and space complexity. P-time

## Course Descriptions

reductions, completeness for complexity classes, Cook's Theorem,  $P=NP$ , and the polynomial hierarchy.

**CS 8561. Human Computer Interaction.** (4 cr; A-F only. Prereq-5551 or 5721)

Introduction to the software algorithms, hardware components, and concepts for building and evaluating virtual environments for effective human-computer interaction (visual, auditory, haptic, and mechanical aspects). Includes the perceptual components for constructing effective human-computer interaction with a virtual environment.

**CS 8621. Advanced Computer Architecture.** (4 cr; A-F or Aud. Prereq-5621, 5631 or #)

Algorithmically-specialized functional units. Principles of advanced memory subsystem organization, including virtual memory and caches. Novel hardware technologies. Foundations of parallel architectures: from supercomputers to cluster environments. Advanced hardware/software performance analysis.

**CS 8631. Advanced Systems Programming.** (4 cr; A-F or Aud. Prereq-5631, 5641 or #)

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

**CS 8721. Advanced Computer Graphics.** (4 cr; A-F or Aud. Prereq-5721 or #)

Contemporary computer graphics techniques. Focus on advanced graphics algorithms and programming, curve and surface representations, physically based rendering, visible surface determination, illumination, texturing, and real time rendering.

**CS 8731. Information Retrieval.** (4 cr; Stdnt Opt. Prereq-5731 or #)

Methods, major models, and theoretical issues in automatic processing and retrieval of text. Statistical and syntactic approaches, very large database issues (data mining), distributed retrieval, web retrieval and relevant applications.

**CS 8751. Advanced Machine Learning.** (4 cr; A-F or Aud. Prereq-5751 or #)

Survey of emerging research topics in machine learning and data mining plus the relation of machine learning to fields such as bioinformatics. Topics drawn from emerging techniques such as support vector machines, ensemble methods and Bayesian networks.

**CS 8761. Natural Language Processing.** (4 cr; A-F or Aud. Prereq-5761 or #; Grad student)

Techniques to analyze, generate, and understand human language via computational techniques. This course focuses on empirical approaches to lexical and syntactic analysis, semantic interpretation, and discourse processing. Applications include part-of-speech tagging, parsing, lexical acquisition, and machine translation.

**CS 8771. Advanced Computational Logic.** (4 cr; A-F or Aud. Prereq-4511 or #; Grad student)

Mathematically sound reintroduction to classical logic. Syntax, semantics, and proof theory for propositional and first-order logic. Soundness and completeness. Incompleteness. Additional topic(s) from among: automated theorem proving, second-order logic, nonmonotonic logics and knowledge representation, logic programming.

**CS 8777. Thesis Credits: Master's.** (1-24 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**CS 8993. Seminar.** (1 cr [max 3 cr]; A-F or Aud. Prereq-#) Presentation and discussion of articles in literature and/or of current research in department.

**CS 8995. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 8 cr]; A-F or Aud. Prereq-CS Grad student, #) Topics not available in standard curriculum. Topic announced in *Class Schedule*.

## Continuing Education (CNED)

### Continuing Education

**CNED 2535. Major and Career Exploration.** (2 cr; A-F or Aud. Prereq-Fewer than 45 credits or #)

Major and career exploration through the use of theoretical models and practical experience. Students explore interests, skills, values, and personality; research educational and occupational possibilities; and learn how to integrate the information about themselves and the world of work to assist them in choosing a major.

**CNED 3535. Strategic Career Planning.** (2-3 cr [max 3 cr]; A-F or Aud. =PSY 3535. Prereq-Min 45 cr or #, 2 cr option available if 2535 has been completed, [max 2 cr if completed 2535], 3 cr is required if cr has not been received for 2535)

Theoretical base and practical experiences integrating knowledge of self with knowledge of the marketplace. Course emphasizes learning effective job/internship search strategies.

## Criminology (CRIM)

### College of Liberal Arts

**CRIM 8100. Criminology and Criminal Justice Systems.** (3 cr; A-F or Aud. Prereq-Grad student or #)

Review of the historical development of criminology and the criminal justice system. Emphasis on a systems/organizational approach to the structural aspects of the criminal justice system including comparative analyses of systems in other countries.

**CRIM 8110. Correctional Systems.** (3 cr; A-F or Aud. Prereq-Grad student or #)

Corrections consists of a continuum of sanctions ranging from probation to institutional confinement. This class is an analysis of issues that arise in these settings, including; theory and philosophy of corrections, risk assessment, prison culture and violence, and correctional intervention.

**CRIM 8120. Law, Courts, and The Judiciary.** (3 cr; A-F or Aud. Prereq-Grad student or #)

Investigates the interplay of the form, nature, and contents of law and judicial administration in the United States by investigating a broad range of legal and judiciary issues including law and social control, theories of law, functions of law in society, types of law, processes of law, the American judiciary, principal agents in the court system, adjudication, litigation, features of the U.S. court system, issues and problems facing the legal and court systems.

**CRIM 8130. Law Enforcement and Community.** (3 cr; A-F or Aud. Prereq-Grad student or #)

Focuses on the variety of law enforcement agencies in the U.S. and other countries, the structure of those agencies, the nature and behavior of personnel, role of the agencies in society and in the criminal justice system, and the connection of the law enforcement function to the community.

**CRIM 8200. Criminology Research Methods and Statistics.** (4 cr; A-F or Aud. Prereq-Grad student or #) Survey of research methods and statistics appropriate for the study of criminal behavior and criminal justice system organizations. Focus is on conceptualization, measurement, and the application of designs and statistical techniques.

**CRIM 8220. Advanced Evaluation Research Methods.** (3 cr; A-F or Aud. Prereq-Grad student or #)

Reviews the history and development of evaluative research. Focuses primarily on process/outcome and project/program evaluation. Involves students in the application of formative and summative evaluation in criminal justice.

**CRIM 8230. Qualitative Research Methods.** (3 cr; A-F only)

Focuses on the field of qualitative methodology, engaging both intellectual inquiry and the working practicalities of qualitative methods. Examines issues in qualitative research through a workshop format, drawing from both reading materials and each of our ongoing research projects. Focus on research design, interviewing, ethnography, ethics, self-reflexivity, and writing up research results.

**CRIM 8295. Special Topics: (Various Titles to be Assigned).** (3-4 cr [max 8 cr]; A-F or Aud. Prereq-Grad student or #)

Provide graduate students with a diversity of topics that reflect developments and changes in the field while providing students the opportunity to work with a wide range of faculty.

**CRIM 8300. Theories of Crime and Delinquency.** (3 cr; A-F or Aud. Prereq-Grad student or #)

Looks at the causal explanations of crime and delinquency and to a lesser extent other nonconforming behavior. Various theoretical accounts of deviant behavior and attempts to describe explain, and predict deviance from structural and social psychological perspective. Explore policy directives stemming from alternative theories aimed at elevating what is considered by some as undesirable behavior.

**CRIM 8333. FTE: Master's.** (1 cr; No grade. Prereq-Master's student, adviser and DGS consent)

**CRIM 8600. Practicum in Criminology.** (1-15 cr [max 15 cr]; S-N or Direct. Prereq-Grad student or #)

Supervised direct experience in a criminal justice agency and a concurrent seminar which focus on identification, application, and evaluation of the implementation of concepts, principles, theories and best practices in criminal justice. Experience in law enforcement agencies, juvenile courts, probation and parole departments, correctional institutions, delinquency control programs and public or voluntary agencies. Orientation sessions precede placement. Student must submit internship application during the first 30 days of the preceding spring or fall semester.

**CRIM 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**CRIM 8900. Directed Readings.** (1-6 cr [max 6 cr]; A-F or Aud. Prereq-Grad student or #)

Students conduct intense and detailed reading in a topic area of their choice under the guidance of a professor.

## Cultural Studies (CST)

### College of Liberal Arts

#### **CST 1004. From Classical Antiquity to Medieval Culture.** (4 cr; A-F or Aud. LE 7)

Ancient Greek and Roman world. Historical and cultural contexts. Reorganization of late Roman world from Diocletian to 13th century A.D. Emergence of feudalism and medieval experience. Idea of "Classicism" which the Renaissance discovered and promoted.

#### **CST 1010. Romanticism and Revolutions.** (4 cr; A-F or Aud. LE 9)

Exploration of the changes in the arts and humanities produced by political, scientific, social, and revolutions that spring from the industrial revolution and the Romantic response to that revolution.

#### **CST 1020. Landscapes, Environments, and U.S. Culture.** (3 cr; A-F or Aud. Prereq—[AmS 1031] LE 7)

Interdisciplinary study of U.S. landscapes and environments as an index to the diverse cultures of the United States. Readings from travelers, naturalists, ecologists, geographers, poets, and fiction writers; slides of paintings and photographs; films.

#### **CST 1022. The Bible as Literature.** (3 cr; A-F or Aud. LE 9)

The Hebrew Bible, the New Testament, and the Apocrypha examined as literary works of their time.

#### **CST 1050. Freshman Seminar: Bodies and Culture Through Film.** (4 cr; A-F or Aud. Prereq—Freshman, fewer than 30 credits. LE 8)

Explores the ways in which our bodies are culturally constructed through gender, race, and sexual orientation. Using documentary film as a primary pedagogical tool, attention will focus on how marginalization is embodied in everyday life.

#### **CST 1101. Introduction to Cultural Studies.** (4 cr; A-F or Aud. LE 8)

Examines how cultural practices relate to everyday life by introducing students to each of the four core areas of the Cultural Studies minor: Identity Politics, Media Cultures, Cultures of Space & Place, and Cultures of Science, Technology, & Medicine.

#### **CST 1195. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 4 cr]; A-F or Aud)

Topics in cultural studies.

#### **CST 1201. American Working Class History and Culture: The Struggle for Control.** (4 cr; A-F or Aud. LE 7)

Introduces students to working class history and culture and examines the struggle by workers to control their work, communities, identity, and social norms.

#### **CST 2001. Introduction to Gay Lesbian Bisexual and Transgender Studies.** (4 cr; A-F or Aud. LECD 08)

Examines identity politics, GLBT popular media images and analysis, birth and history of GLBT social movement and intersections with other social movements, HIV/AIDS, policy/legislative issues especially immigration, marriage, adoption, and U.S. military policy; all with international comparative analysis.

#### **CST 3010. Popular Culture in the 1960s.** (3 cr; A-F or Aud. Prereq—Min 30 cr)

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.

#### **CST 3030. Science Fiction.** (3 cr; A-F or Aud. Prereq—Min 30 cr)

Selected science fiction short stories, novels, films, videos, and music that explore impact of physical, biological, and social sciences in producing changing views of human nature, values, institutions, and societies.

#### **CST 3040. The Music and Lives of the Beatles.** (3 cr; A-F or Aud. Prereq—Min 30 cr)

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 movements; later careers; their legacy.

#### **CST 3050. Utopian and Dystopian Images.** (3 cr; A-F or Aud. Prereq—Min 30 cr)

How images and narratives of utopia engage with social problems, including divisions of labor and wealth, gender, race, environmental degradation, crime, violence, war, and human interfaces with technology. Emphasis is on film, fiction, and other cultural representations of utopia and dystopia. Course concepts explore human visions of equality, perfection, power, and freedom.

#### **CST 3060. Women and Men in Popular Culture.** (3 cr; A-F or Aud. Prereq—Min 30 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.

#### **CST 3080. Cultural Constructions of the Body.** (4 cr; A-F or Aud. Prereq—Min 30 cr or #)

Contemporary cultural constructions of the human body. How biology and culture intersect in body building, menstruation, childbirth, and tattooing. Students gain skills in reading the body as social text and learn core theoretical approaches to cultural studies of the body.

#### **CST 3095. Special Topics: (Various Titles to be Assigned).** (3-4 cr [max 8 cr]; A-F or Aud. Prereq—1101, min 30 cr)

Special Topics courses will be offered at least one time per year in order to increase possible course offerings in the Cultural Studies minor and give students the opportunity to work with a wide range of interdisciplinary faculty and topics.

#### **CST 3715. Popular Culture.** (3 cr; A-F or Aud. Prereq—Min 30 cr or #)

What qualifies as American popular culture, methodologies used to study popular culture, and sociological significance of such study.

#### **CST 4500. The New Commons: Activism, Culture, History.** (4 cr; A-F or Aud. Prereq—Min 30 cr)

Recent literature and activism concerning the commons-global and local ways of managing shared resources such as water, seeds, the internet, and wisdom. Includes history of the commons as a concept in anthropology, political theory, and law where the framework of "commons" and "enclosure" are being used to articulate a new paradigm for democracy, economic justice, and cross-cultural communication at a local and global scale. Help create radio segments on the current state of the commons for broadcast and podcast by UMD's radio station.

#### **CST 4653. Cultural Studies Senior Seminar/Capstone.** (4 cr; A-F or Aud. Prereq—1101, CSt minor, no Grad School cr)

As the capstone for the cultural studies minor, this course asks students to engage with current work produced in the field of cultural studies, including (but not limited to) texts, documentary videos, and experimental films produced for both popular and academic audiences.

#### **CST 4691. Independent Study in Cultural Studies.** (1-4 cr [max 8 cr]; A-F or Aud. Prereq—#)

Directed reading, research, or involvement in an issue leading to the preparation of a paper or other product.

#### **CST 4997. Teaching Assistant in Cultural Studies.** (1-3 cr [max 3 cr]; A-F only. Prereq—Min 60 cr #, no Grad School cr)

Practical experience in teaching-related activities in cultural studies courses.

## Dance (DN)

### School of Fine Arts

#### **DN 1001. Introduction to the World of Dance.** (3 cr; A-F or Aud. LEIP 09)

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 1011. Tap Dance Fundamentals.** (2 cr [max 4 cr]; A-F or Aud. LE 10)

Fundamental tap dance technique, emphasizing tap dance as a social and performing art form.

#### **DN 1101. Modern Dance Technique I.** (2 cr [max 12 cr]; A-F or Aud. LE 10)

Beginning work, emphasizing modern dance as a performing art form.

#### **DN 1111. Jazz Dance Technique I.** (2 cr [max 8 cr]; A-F or Aud. LE 10)

Beginning work, emphasizing jazz dance as a performing art form.

#### **DN 1121. Tap Dance Technique I.** (2 cr [max 8 cr]; A-F or Aud. Prereq—4 cr of 1101 or 1111, #)

Beginning work, emphasizing tap dance as a performing art form.

#### **DN 1131. Ballet Technique I.** (2 cr [max 12 cr]; A-F or Aud. LE 10)

Beginning work, emphasizing ballet as a performing art form.

#### **DN 3201. Modern Dance Technique II.** (2 cr [max 12 cr]; A-F or Aud. Prereq—#)

Intermediate work, emphasizing modern dance as a performing art form.

#### **DN 3211. Jazz Dance Technique II.** (2 cr [max 18 cr]; A-F or Aud. Prereq—#)

Intermediate work in lyrical and percussive jazz dance techniques.

#### **DN 3221. Tap Dance Technique II.** (2 cr [max 8 cr]; A-F or Aud. Prereq—1121 or #)

Intermediate work, emphasizing tap dance as a performing art form. Tap dance composition and development of improvisational skills.

#### **DN 3231. Ballet Technique II.** (2 cr [max 12 cr]; A-F or Aud. Prereq—#)

Intermediate work, emphasizing ballet as a performing art form.

#### **DN 3401. Dance Composition.** (3 cr; A-F or Aud. Prereq—#)

Study and development of dance choreography through creative experiences.

#### **DN 3611. Dance History.** (3 cr; A-F or Aud. Prereq—1001 or #)

Religious, social, political, and artistic forces that have contributed to development of dance in Western civilization, emphasizing Romantic era through present.

#### **DN 3991. Independent Study in Dance.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—#; undergrads may not take more than 6 cr in 3991 and 5991 combined)

Directed readings and projects arranged between student and faculty mentor.

## Course Descriptions

**DN 4116. Musical Theatre Audition Techniques.** (3 cr; A-F or Aud. Prereq-#, no Grad School cr)  
Advanced dance, song, acting, and marketing capstone course for professionally oriented musical theatre student.

**DN 4311. Jazz Dance Technique III.** (2 cr [max 12 cr]; A-F or Aud. Prereq-#, no Grad School cr)  
Advanced work, emphasizing jazz dance as a performing art form.

**DN 4331. Ballet Technique III.** (2 cr [max 12 cr]; A-F or Aud. Prereq-3231, #; no Grad School cr)  
Advanced work, emphasizing ballet as a performing art form.

**DN 4901. Intern Teaching Dance.** (2 cr [max 6 cr]; A-F or Aud. Prereq-3201 or 3211 or 3221 or 3231, #; no Grad School cr)  
Practical experience teaching introductory level dance classes. Students serve as intern teachers assisting instructor in administration of course.

**DN 5991. Independent Study in Dance.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq-#; undergrads max 6 cr in 3991 and 5991 combined; no Grad School cr)  
Advanced directed readings and projects arranged between student and faculty mentor.

**DN 5997. Internship in Professional Dance.** (1-12 cr [max 12 cr]; A-F or Aud. Prereq-#; 1 cr for each 45 hrs of work; no Grad School credit)  
Internship with a cooperating professional, commercial, or regional dance company.

## Early Childhood Studies (ECH)

College of Education and Human Service Professions

**ECH 2010. Foundational Issues in Early Childhood Studies.** (3 cr; A-F or Aud)  
Historical and cultural perspectives of Early Childhood Studies. Theoretical models for the education of young children from birth through age eight will be addressed through professional exploration. Methods for facilitating child development as well as strategies for collaborating with families and communities will be discussed. Practicum experience with young children will provide a hands on experience for the students.

**ECH 2015. Literature for Young Children.** (3 cr; A-F or Aud)  
Introduces professionals who work with children from birth through age eight to literature for young children. Criteria for selecting book and non-book materials will be presented, discussed and utilized when examining, selecting, and reading such materials. Strategies for sharing the books and non-book materials with children and for integrating the materials into day care, preschool, and primary settings will be explored.

**ECH 2025. Cognitive Development: Theory to Practice.** (3 cr; A-F or Aud)  
Issues related to early brain development and the biological underpinnings of early emotional and cognitive development. A biological view of attachment and social vulnerability.

**ECH 3006. Early School Years.** (2 cr; A-F or Aud. Prereq-Pre-ElEd major, &ElEd 1010)  
Theoretical, historical, and cultural influences that impact early childhood education. Environments, methods, and materials that facilitate development. Collaborating with families and communities. Practicum required.

**ECH 3021. Teaching Mathematics: Birth-Age Eight.** (4 cr; A-F or Aud. Prereq-Admission to the ECh program)  
Development and instruction in play-based and problem-based mathematics in birth to age 8 settings. Methods, materials, and research findings related to teaching of mathematics. Practicum required.

**ECH 3022. Literacy for Young Children: Teaching Reading, Writing, Speaking, and Listening.** (4 cr; A-F or Aud. Prereq-Admission to the ECh program)  
Prepares professionals who work with children from birth to age eight to introduce and teach developmentally appropriate skills and strategies related to reading, writing, speaking, and listening. Course assignments will be linked to practicum experiences. Practicum required.

**ECH 3030. Inquiry, Social Studies, and Science Learning: Birth-Age Eight.** (5 cr; Stdnt Opt. Prereq-ECh major, 2010, 3010, &3020, 4011 and SpEd 3105)  
Exploratory and socially sensitive environments for children from birth through age 8; inquiry, physical knowledge, social processes in children's play; planning, implementing, evaluating culturally and developmentally appropriate science and social studies learning experiences; integrated, thematic curricula and use of technology to enhance learning. Practicum required.

**ECH 3050. Observing and Guiding Behavior: Birth-Age Eight.** (4 cr; Stdnt Opt. Prereq-UECh major, 2010, &the following: 3010, SpEd 3103)  
Observing, recording, and guiding behaviors in children from birth through age eight. Focuses on informal methods for observation. Practicum is required. Use of technology for behavioral observation.

**ECH 3055. Creative Expressions in Early Childhood: Birth-Age Eight .** (3 cr; A-F or Aud. Prereq-Admission to the UECh program)  
Exploration of developmentally appropriate methods and materials for the integration of art, music and movement experiences for children's overall growth, ages birth-age 8.

**ECH 3104. Family Partnerships.** (1 cr; A-F or Aud. Prereq-Admission to the UECh program)  
Practicum experience in which students partner with a young child and their family. Through this experience, students practice advocacy skills, integrate theory in early childhood, and observe children in the context of the family.

**ECH 4009. Leadership in Early Childhood Studies.** (3 cr; A-F or Aud. Prereq-Admission to UECh program; no Grad School cr)  
Develops knowledge and competencies in the area of educational leadership, including development and administration of early childhood programs, professionalism, ethics and social policy.

**ECH 4010. Infant and Early Childhood Perceptual and Psychomotor Development.** (2 cr; A-F or Aud. Prereq-Unified early childhood major, no Grad School cr)  
Issues related to typical and atypical perceptual and psychomotor development in children from birth to age eight will be examined. The interaction of the mover with the contextual features of the environment and the demands of the movement task will provide an opportunity to explore developmentally appropriate methods and materials for the integration of physical activities and movement for children's overall growth.

**ECH 4011. Parent Education.** (4 cr; A-F or Aud. Prereq-&3020, 3030, SpEd 3105, #; no Grad School cr)  
Planning, presenting, and evaluating educational programs for parents; adult learning and development; philosophy of Minnesota early childhood family education program; teaching strategies; curriculum development.

**ECH 4251. Parenting.** (3 cr; A-F or Aud. Prereq-UECh major, Educ 1000 or Psy 2021 or Psy 3371 or #; no Grad School cr)  
Parent-child interaction, roles and responsibilities throughout the life cycle; analysis of parenting strategies; contemporary variation of family cultures, structures and lifestyles; sources of education and support.

**ECH 4400. Professional Development Seminar.** (1 cr [max 3 cr]; A-F or Aud. Prereq-#, no Grad School cr)  
Professional development through documentation, reflection, synthesis of learning as related to standards. Development of process and product portfolios. Presentation of and dialogue about emergent learning.

**ECH 4600. Student Teaching in Early Childhood/Primary.** (3-12 cr [max 12 cr]; S-N only. Prereq-3005, 3007 or #; no Grad School cr)  
Application of skills, understanding, and knowledge related to working with children from birth through age eight.

**ECH 4610. Professional Issues Seminar in Early Childhood Education.** (1 cr; Stdnt Opt. Prereq-# 4600; no Grad School cr)  
Reflections on current issues and ethical dilemmas in field of early childhood education, birth through age eight; preparation for professional job-seeking and interviewing.

**ECH 4991. Independent Study.** (1-6 cr [max 6 cr]; A-F or Aud. Prereq-#; no Grad School cr)  
Individualized reading and research in a special topic.

**ECH 4993. Special Area Project.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq-#; no Grad School cr)  
Independent project for advanced students to substantially further their theoretical knowledge base or professional competencies in early childhood, birth through age eight.

**ECH 5050. Observing and Guiding Behavior: Birth-Age Eight.** (4 cr; Stdnt Opt. Prereq-2010, &3010, SpEd 3103)  
Observing, recording, and guiding behaviors in children from birth to age eight. Focuses on informal methods for observation. Practicum is required. Use of technology for behavioral observation.

**ECH 5993. Special Area Project.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq-no Grad School cr)  
Independent project for advanced students to substantially further their theoretical knowledge base or professional competencies.

**ECH 5995. Special Topics: (Various Titles to be Assigned).** (1-6 cr [max 96 cr]; A-F or Aud. Prereq-Grad student or post-baccalaureate status; no Grad School cr)  
Special topics in early childhood education to meet needs and interests of different groups of students.

**ECH 7030. Cognitive Development.** (4 cr; A-F or Aud. Prereq-Collegiate grad program admission or #)  
Issues related to early brain development and the biological underpinnings of early emotional and cognitive development. A biological view of attachment and social vulnerability will also be addressed.

**ECH 7031. Critical Connections During the Early Years.** (3 cr; A-F or Aud. Prereq-7030, collegiate grad program admission or #)  
Issues related to quality care and appropriate support for young children, as well as the role of attachment, and the role teachers, parents and community members play in the facilitation of the development of social skills for young children.

**ECH 7032. Competent Child.** (3 cr; A-F or Aud. Pre-req=7030, collegiate grad program admission or #) Addresses the role early childhood education plays in the facilitation of early regulation, coping strategies, and the development of social and emotional competence within the context of adult relationships.

**ECH 7033. The Child as a Citizen.** (4 cr; A-F or Aud. Pre-req=7030, collegiate grad program admission or #) Children in the context of the family and community. Focuses on the child as a contributor within the family structure and as a member of the greater society. Issues of gender, culture and early citizenship will be discussed as well as the emergence of developmental skills related to these issues.

## Economics (ECON)

### Labovitz School of Business and Economics

**ECON 1003. Economics and Society.** (3 cr; A-F or Aud. Pre-req=Cannot apply cr to econ major or minor or BA or BBA majors LE 8) General description of U.S. economy and analysis of contemporary economic problems. Introduction to major economic issues and problems of the day, providing a simple framework used by economists for analysis.

**ECON 1022. Principles of Economics: Macro.** (3 cr; A-F or Aud. Pre-req=Min 15 cr or % LE 6) Analyzing overall performance of an economic system. National income accounting and theory, unemployment, inflation, fiscal policy, money, monetary policy, economic growth, international trade, non-U.S. economies, and real-world application of these concepts.

**ECON 1023. Principles of Economics: Micro.** (3 cr; A-F or Aud. Pre-req=Min 15 cr or % LE 6) Analyzing free enterprise system through study of product and resource markets. Supply and demand, utility, production and cost, market structure, resource use, market failures, regulatory role of government, and real-world application of these concepts.

**ECON 2030. Applied Statistics for Business and Economics.** (3 cr; A-F or Aud. Pre-req=—[Econ 2020, Stat 1411, Stat 2411, Stat 3611, Soc 3151, Psy 3020], min 30 cr) Introduction to modern business statistics, emphasizing problem solving through statistical decision making using case studies. Topics include organization and presentation of data, summary statistics, probability theory, distributions, statistical inference including estimation, hypothesis testing, introduction to regression and correlation, introduction to use of computers in statistical analysis.

**ECON 3022. Macroeconomic Analysis.** (3 cr; A-F or Aud. Pre-req=1022, 1023, Math 1160 or Math 1296, Econ major or minor or LSBE cand) Determinants of national income, employment, and price levels with particular attention to aggregate demand and aggregate supply, and monetary and fiscal policy.

**ECON 3023. Microeconomic Analysis.** (3 cr; A-F or Aud. Pre-req=1022, 1023, Math 1160 or Math 1296, Econ major or minor or LSBE cand) Behavior of households as consuming units and suppliers of resources; analysis of decision making by firms under various market conditions.

**ECON 3030. Economic Research Methodology.** (3 cr; A-F or Aud. Pre-req=1022, 1023, (2030 or Stat 3611), Math 1160 or Math 1296, Econ major or minor or LSBE cand) Techniques used in analyzing economic and business data; emphasis on computer methods and research applications. Analysis of variance, qualitative data analysis, modeling, regression, residual and influence analysis, time series.

**ECON 3031. History of Economic Thought.** (3 cr; A-F or Aud. Pre-req=1003 or 1022, 1023 LE 7) Development of economic ideas, principles, and systems of analysis from early times to present, emphasizing personalities and historical events surrounding development of economic thought.

**ECON 3036. Radical Economics.** (3 cr; A-F or Aud. Pre-req=1003 or 1022, 1023) Radical Marxist critique of traditional economic models and of methodology used in developing and applying these models. Alternatives to market system. Analysis of current economic issues from radical's perspective.

**ECON 3150. Development Economics.** (3 cr; A-F or Aud. Pre-req=1022, 1023) Overview of the conceptual meaning of economic growth and development, problems facing developing countries, economic models underlying different development paths. Exploration of socio-historical and economic reasons for lack of development in selected areas and policy options to promote economic progress.

**ECON 3311. Money and Banking.** (3 cr; A-F or Aud. Pre-req=1022, Econ major or minor or LSBE cand) 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 3402. Global Economic Issues.** (3 cr; A-F or Aud. Pre-req=LSBE cand; cannot apply cr to econ major or minor) Application of economic theory of markets to analyze major issues shaping the future of the world economy. Emphasizes globalization of markets and the institutions involved in coordinating economic policies among world economies

**ECON 3512. Managerial Economics.** (3 cr; A-F or Aud. Pre-req=1023, (2030 or Stat 3611), Econ major or minor or LSBE cand) Application of economic theory to management decision making and policy formulation within the firm. Demand analysis, production and cost analysis, price analysis, capital budgeting. Strategic interaction of firms.

**ECON 3595. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 3 cr]; A-F or Aud. Pre-req=1003 or 1022, 1023 or #) Topics announced in Class Schedule.

**ECON 3821. Labor Economics: Theory and Issues.** (3 cr; A-F or Aud. Pre-req=1023, preferred but not required 3023, Econ major or minor or LSBE cand) Labor markets from theoretical and institutional perspectives, including wage theories, labor supply, labor demand and employment, human capital investments, and occupational choice.

**ECON 3910. Economics of Health Care.** (3 cr; A-F or Aud. Pre-req=1022, 1023, Econ major or minor or LSBE cand) Explores the health care sector and health policy issues from an economic perspective. Topics to be examined include the demand for health and medical care services, health insurance markets, federal health insurance programs, and the pharmaceutical industry.

**ECON 4040. Tools: Applications of Economic Analysis.** (3 cr; A-F or Aud. Pre-req=3030 or Stat 5511) Development and application of tools of economic research and analysis; emphasis on critical thinking using computer-based statistical methods. Econometrics (theory and practice), applied research techniques, economic forecasting, and time series analysis. Research report.

**ECON 4213. Mathematical Economics.** (3 cr; A-F or Aud. Pre-req=1022, 1023, Math 1160 or Math 1296) Application of fundamentals of differential and integral calculus and linear algebra to static, comparative static, and dynamic topics in microeconomics and macroeconomics.

**ECON 4315. Monetary Theory and Policy.** (3 cr; A-F or Aud. Pre-req=3022) Development of monetary theory and implications of theory for Federal Reserve System's control of money supply and financial institutions, money market strategy, and monetary policy, including goals, targets, and indicators.

**ECON 4397. Half-Time Internship.** (3 cr [max 6 cr]; S-N only. =ECON 4497. Pre-req=Econ major, 3022, 3023, #) Following written approval of proposal, student engages in supervised program of half-time work experience in public agency, private business, or other organization. Advance, concurrent, and follow-up written and oral presentations required. 20 hr per wk over 15 wk period.

**ECON 4410. International Economics.** (3 cr; A-F or Aud. Pre-req=1022, 1023, 3022, 3023, no Grad School cr) 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 4497. Full-Time Internship.** (6 cr; S-N only. =ECON 4397. Pre-req=Econ major 3022, 3023, #) 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. 40 hr per wk over 15 wk period.

**ECON 4570. Public Finance.** (3 cr; A-F or Aud. Pre-req=1022, 1023) Theory and practice of determining governmental expenditures and revenues, including consideration of public goods, welfare economics, raising of revenues, debt policy, and economic stabilization.

**ECON 4610. Industrial Organization.** (3 cr; A-F or Aud. Pre-req=3023 or 3512) Industrial structure and firm's trade practices. Methodology links observed market behavior with microeconomic models. Strategic behavior of firms analyzed by integrating areas of production, finance, and marketing. Public policies evaluated in terms of their efficiency and equity.

**ECON 4613. The Economics of Antitrust and Regulation.** (3 cr; A-F or Aud. Pre-req=1023, 3023) Alternatives open to a free-enterprise economy when economic goals have not been satisfactorily achieved by the private sector. Public regulation and antitrust legislation and enforcement examined as a means of social control when unacceptable market failures exist.

**ECON 4721. Natural Resource and Energy Economics.** (3 cr; A-F or Aud. Pre-req=1023, preferred but not required: 3023) Microeconomic analysis of natural resource and energy markets. Role of these resources in production processes and waste generation, use and pricing of nonrenewable and renewable resources over time, resource availability, sustainable development, and ecological economics.

## Course Descriptions

**ECON 4777. Environmental Economics.** (3 cr; A-F or Aud. Prereq=1023, preferred but not required: 3023) Microeconomic analysis of environmental quality as an economic good. Pollution control, benefit-cost analysis, valuation methodologies and their application to air and water quality, hazardous waste management, preservation, and global pollutants.

**ECON 4935. Urban/Regional Economics.** (3 cr; A-F or Aud. Prereq=1003 or 1022, 1023, preferred but not required 3023) Allocation of unevenly distributed and imperfectly mobile resources. Alternative theories relating to urban and regional growth processes. Analysis of intraregional structures as contributors to growth process. Selected economic problems unique to urban communities.

**ECON 4991. Independent Study.** (1-6 cr [max 6 cr]; A-F or Aud. Prereq=Econ major, 12 cr of Econ 3xxx or above, #) For students wishing to do special work in areas useful to individual programs and objectives and not available in regular course offerings.

## Education (EDUC)

### College of Education and Human Service Professions

**EDUC 1000. Human Development.** (3 cr; A-F or Aud) Patterns and theories of development from conception through late adulthood emphasizing early childhood through adolescence; analysis of individual, family, and environmental factors which affect development over the life span.

**EDUC 1100. Human Diversity.** (3 cr; A-F or Aud. LECD 08) Cultural, physical, socially constructed, and psychological differences in people. Social, political, and economic implications of human diversity in modern society. Practicum in community agency.

**EDUC 1101. Education in Modern Society.** (3 cr; A-F or Aud. LE 7) Survey of educational institutions and practices used in different sectors of society. Historical and philosophical foundations of American education.

**EDUC 1201. Managing Planet Earth.** (3 cr; A-F or Aud. LE 8) Environmental education; exploration of key concepts and principles that govern how nature works; potential solutions to environmental and resource problems.

**EDUC 3412. The Computer in Education.** (1-4 cr [max 6 cr]; A-F or Aud. Prereq=Pre educ or educ majors or cand) Introduction to computer use in instructional settings. PC and Mac platforms. Develops basic skills using software commonly used by educators. Teaching strategies using computer-based instruction.

**EDUC 3416. Teaching Elementary Keyboarding and Computer Applications.** (2 cr; A-F or Aud. =EDUC 5416. Prereq=3412 or 5412, pre-EIEd, EIEd, pre-UECh, UECh, or non-degree cand) Developing the competencies and skills to provide students in grades K-8 age-appropriate instruction that focuses on keyboarding knowledge, application, and skills, including keyboarding terminology, techniques, ergonomics, and appropriate fingering on computer keys, and basic computer applications, including word processing, graphics, multimedia presentations, and gathering information from electronic sources.

**EDUC 3417. Teaching Elementary Keyboarding and Computer Applications Practicum.** (1 cr; S-N or Aud. =EDUC 5417. Prereq=3416, pre EIEd, EIEd, pre UECh, UECh) Supervised practicum in elementary schools with a specific focus on elementary keyboard and computer applications. Supervision conducted by University faculty in conjunction with licensed elementary teacher or the school's designated elementary computer instructor.

**EDUC 4226. Geometry for Teachers in Grades 5-8.** (3 cr; A-F or Aud. Prereq=Math 1141 or #; no Grad School cr) The development of geometry concepts through investigations of geometric relationships and informal properties provides the basis for examining the teaching and learning of geometry in grades 5-8.

**EDUC 4227. Number Theory for Teachers in Grades 5-8.** (3 cr; A-F or Aud. Prereq=Math 1141 or #; no Grad School cr) The development of number concepts and theories through investigations and applications of discrete mathematics strategies provides the basis for examining the teaching and learning of number theory in grades 5-8.

**EDUC 4228. Teaching Mathematics with Technology.** (3 cr; A-F only. Prereq=Math 1141 or declared secondary mathematics education major; no Grad School cr) Using mathematics-based technology such as computer software, calculators, and Internet applets to examine the teaching and learning of mathematics.

**EDUC 4234. Science, Technology, and Society.** (3 cr; A-F or Aud. Prereq=Min 30 cr, no Grad School cr) Nontechnical study of historical and cultural impact of natural science and technology on the earth and its inhabitants.

**EDUC 4360. Teaching Methods for Ojibwe Language.** (1-4 cr [max 12 cr]; A-F or Aud. Prereq=Admitted to EIEd or pre-EIEd, no Grad School cr) Prepares teachers to teach the Ojibwe language including: Hands-on micro teaching; demonstration of various methods; and a developmental and theoretical understanding of teaching an Indigenous language.

**EDUC 4381. Teaching Indigenous Students.** (2 cr; A-F or Aud. Prereq=EDSE 4100; no Grad School cr) Survey of contemporary and historical Indian education; evaluation of attitudes toward Indian students; direct interaction with Indian parents and students; development of culturally sensitive teaching plans; specific cultural characteristics of indigenous groups; examination of American Indian outcomes.

**EDUC 4500. Professional Issues and Ethics.** (1 cr; A-F or Aud. Prereq=Admission to the elementary education program, successful completion of courses in block one and block two, no Grad School cr) Provides an overview of several topics affecting practicing teachers including: employment preparation (resume, cover letter, interviewing skills), licensure application, professional organizations, professional codes of ethics, and district procedures. Offered concurrent with student teaching in order to provide options for discussion during practica.

**EDUC 4991. Independent Study.** (.5-3 cr [max 6 cr]; A-F or Aud. Prereq=#; no Grad School cr) Directed independent study, readings, and/or projects of interest to education students.

**EDUC 4993. Special Area Project.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq=#; no Grad School cr) Independent project for advanced students to substantially further their theoretical knowledge base or professional competencies.

**EDUC 5128. Urban Education.** (3 cr; Stndt Opt. Prereq=No Grad School cr) Combines on-site experience in an urban educational setting with reading and reflection. Develops knowledge, skills, attitudes, motivation, and commitment to work individually and collectively with poor children in urban schools.

**EDUC 5295. Special Topics: (Various Titles to be Assigned).** (.5-4 cr [max 8 cr]; A-F or Aud. Prereq=No Grad School cr) Current issues in Education to meet needs and interests of various groups, particularly practicing professionals.

**EDUC 5340. Interacting With Diverse Families.** (3 cr; A-F or Aud. 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 5381. Teaching Indigenous Students.** (2 cr; A-F or Aud. Prereq=No Grad School cr) Survey of contemporary Indian education; evaluation of one's attitudes toward Indian students; direct interaction with Indian parents and students; development of culturally sensitive teaching plans regarding Indians.

**EDUC 5401. Creative and Intellectually Gifted Children.** (2 cr; A-F or Aud. Prereq=No Grad School cr) Identification, characteristics, and service needs of creative and intellectually gifted children; various programs to meet needs.

**EDUC 5412. The Computer in Education.** (.5-4 cr [max 6 cr]; A-F or Aud. Prereq=No Grad School cr) Introduction to 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; A-F or Aud. Prereq=3412 or 5412, min 60 cr or coll grad or #, no Grad School cr) Develops basic computer and educational technology skills focusing on using microcomputers for communications.

**EDUC 5414. Using Technology for the Administrative Tasks of Teaching.** (4 cr; A-F or Aud. Prereq=Min 60 cr or coll grad; 3412 or 5412, 5413 or #, no Grad School cr) Develops basic computer and educational technology skills focusing on using microcomputers for administrative tasks of teaching.

**EDUC 5415. Advanced Educational Media Production.** (4 cr; A-F or Aud. Prereq=Min 60 cr or coll grad, 3412 or 5412, 5413, 5414 or #, no Grad School cr) Advanced multimedia design; hardware, software and peripherals including video and audio production and editing, compression software, virtual reality; development of an advanced multimedia project for production to CD Rom or the World Wide Web.

**EDUC 5416. Teaching of Elementary Keyboarding and Computer Applications.** (2 cr; A-F or Aud. =EDUC 3416. Prereq=3412 or 5412, pre-EIEd or EIEd or pre-UECh or UECh or non-degree cand, no Grad School cr) Competencies and skills to provide students in grades K-8 age-appropriate instruction that focuses on keyboarding knowledge, application, and skills, including keyboarding terminology, techniques, ergonomics, and appropriate fingering on computer keys, and basic computer applications, including word processing, graphics, multimedia presentations, and gathering information from electronic sources.

**EDUC 5417. Teaching Elementary Keyboarding and Computer Applications Practicum.** (1 cr; S-N or Aud. =EDUC 3417. Prereq=3416 or 5416, pre EIEd, EIEd, pre UECh, UECh or non degree cand, no Grad School cr) Supervised practicum in elementary schools with a specific focus on elementary keyboarding and computer applications. Supervision conducted by University faculty in conjunction with licensed elementary teacher or the school's designated elementary computer instructor.

**EDUC 5560. Current Research and Issues in Science Education.** (2-3 cr [max 6 cr]; A-F or Aud. Prereq=MEd student; offered summer only, #) Examines science education research literature. Trends in research and teaching.

**EDUC 5570. Exemplary Models for Science Education.** (2-3 cr [max 6 cr]; A-F or Aud. Prereq=MEd student; offered summer only, #) Emphasis on hands-on and/or integrated curriculum models.

**EDUC 5600. Practicum in Education.** (1-12 cr [max 12 cr]; S-N or Aud. Prereq=#; no Grad School cr) Arranged opportunity for persons interested in gaining practical experience in a nontraditional educational program under direction and supervision of faculty. Location, type of experience, duration of experience, and assessment are determined in consultation with faculty supervisor.

**EDUC 5650. Families in Crisis.** (3 cr; A-F or Aud. Prereq=Grad student or #) Examines impact of various crises on family members. Analysis of coping strategies, reorganization of family roles, and survey of community resources for assistance in crisis situations.

**EDUC 5850. Classroom Learning Applications.** (2 cr; A-F or Aud. Prereq=Admission to MEd or #) Cognitive processes in education in preparation for developing curriculum and teaching. Emphasis on application of brain-based learning theory to development of knowledge systems in education.

**EDUC 5991. Independent Study.** (.5-4 cr [max 8 cr]; A-F or Aud. Prereq=#; no Grad School cr) Directed independent study, readings, and/or projects of interest to students in education.

**EDUC 5993. Special Area Project.** (.5-4 cr [max 14 cr]; A-F or Aud. Prereq=No Grad School cr) Independent project for advanced students to substantially further their theoretical knowledge base or professional competencies.

**EDUC 5995. Special Topics: (Various Titles to be assigned).** (.5-4 cr [max 16 cr]; A-F or Aud. Prereq=No Grad School cr) Topics selected from education to meet needs and interests of different groups of students.

**EDUC 7001. Introduction to Graduate Study.** (2 cr; A-F or Aud. Prereq=[EHS 7001], MEd candidate or #; no Grad School cr) Expectations of graduate study, scholarly writing and online learning. Develop skills in using the Internet for scholarly research and writing, culminating in writing of a literature review.

**EDUC 7002. Human Diversity and Exceptionality.** (2 cr; A-F or Aud. Prereq=[EHS 7002], MEd candidate or #, no Grad School cr) Stresses the importance of diversity and exceptionality in educational settings, and its relevance to teaching and learning strategies, assessment, and professional community building. The concepts of privilege and power will be explored from the standpoint of the educator and his/her role in the educational setting.

**EDUC 7004. Foundations of Educational Research.** (4 cr; A-F or Aud. Prereq=[EHS 7004], MSpEd student or MEd student or #; no Grad School cr)

Provides foundational knowledge in being a consumer of and conducting scholarly educational research. Designed to provide an orientation to existing educational research and research methods, with a focus on defining a topic, writing a problem statement, and investigating current literature and research on that topic. Includes emphasis on ethical and responsible research protocol with underlying foundations in social justice and reform.

**EDUC 7005. Teaching and Learning in a Systems Context.** (3 cr; A-F or Aud. Prereq=[EHS 7005], Ed.D. student or #)

Provides an in depth investigation of systems theory in an educational context: teaching and learning systems in curriculum, in teaching methods, educational administration and leadership, and educational change. History, current theory, application and tools of systems thinking will be studied.

**EDUC 7006. Ethics and Professionalism in Education.** (2 cr; A-F or Aud. Prereq=[EHS 7006], MEd cand or #; no Grad School cr)

Offers a synthesis of previous courses, reviewed from the context of ethics and ethical dilemmas that touch on diversity, systems change, educators' roles, professional competencies, and leadership roles.

**EDUC 7008. Foundations of Teaching and Learning: Curriculum Theory and Design.** (4 cr; A-F or Aud. Prereq=[EHS 7008], MEd student or #; no Grad School cr)

Broad-based foundational course designed to study advanced learning theory and curriculum design, and develop skills in critical analysis of teaching application and student outcomes. Focuses on the importance of working in the context of a professional community.

**EDUC 7009. Assessment of Learning.** (3 cr [max 12 cr]; A-F or Aud. Prereq=[EHS 7009], MEd candidate, no Grad School cr)

Focuses on the design and application of appropriate learning assessment strategies that consider the pedagogical intent, state, federal, and subject standards, and the diversity for all learners. Teaching theory and practice will be viewed in the context of learning assessment.

**EDUC 7010. Current Issues, Theories and Practices in Educational Technology.** (3 cr; A-F only. Prereq=No Grad School cr)

Critical reflection on current issues, theories and practices in educational technology; development of skills in and understanding of how to use technology as a tool to enhance professional educational practices.

**EDUC 7011. Integrated Research in Practice.** (3 cr; A-F or Aud. Prereq=7004 or #, no Grad School cr)

Provides in depth knowledge and skills in quantitative, qualitative and mixed methods research methodology, and is designed to guide students through the process of designing and conducting a scholarly research project.

**EDUC 7020. Writing for Publication.** (1 cr; A-F or Aud. Prereq=No Grad School cr)

Develop writing skill needed to prepare research article, grant proposal, or other material for publication.

**EDUC 7030. World Indigenous Language Revitalization.** (4 cr; A-F only. Prereq=7008, no Grad School cr)

Survey course on world language revitalization, special emphasis on indigenous languages. Includes basic introduction to language acquisition, readings from Hawaii, New Zealand, and indigenous nations within the US; principles

of endangered language revitalization, context specific circumstances of several indigenous languages.

**EDUC 7032. Instructional Materials Design for Indigenous Language Revitalization.** (3 cr; A-F only. Prereq=7030, no Grad School cr)

Curriculum development and materials design for indigenous language revitalization. Builds on students' prior knowledge of planning and on proficiency in a language other than English. Includes design of curriculum and materials, such as creation of books, audio and video production with Elders and native communities, strategic design of materials as related to language and content objectives.

**EDUC 7033. Integrated Curriculum: History, Theory, Rationale, and Models of Implementation.** (3 cr; A-F or Aud. Prereq=No Graduate School cr)

Overview of the history, theory, rationale, and models for the implementation of integrated curriculum in the classroom.

**EDUC 7040. Principles of Adult Education.** (3 cr; A-F or Aud. Prereq=No Grad School cr)

Philosophy and application of adult education principles.

**EDUC 7444. Principles of Program Evaluation in Educational Settings.** (3 cr; A-F or Aud. Prereq=Acceptance to Master's of Special Education program; no Grad School cr) Models, theories, and philosophies of program evaluation in education settings; evaluation of general and special education curriculum; specific strategies for family and professional involvement in educational planning, implementation, and evaluation.

**EDUC 8001. Historical, Social, and Philosophical Foundations of Education.** (3 cr; A-F only. Prereq=Ed.D. majors or #)

Survey of the historical, social, and philosophical issues in education, in order to prepare and build a foundation for doctoral level students in education.

**EDUC 8003. Educational Policy.** (3 cr; A-F only. Prereq=Ed.D. majors or #)

Modes of educational policy analysis; assessment of educational policy in its political, cultural, and economic contexts; and techniques for effective communication about education policy.

**EDUC 8005. Curriculum: Theory into Practice.** (3 cr; A-F only. Prereq=Ed.D. majors or #)

Overview of curriculum mapping, methods for analysis of scope and sequence and articulation, current curriculum theory, standards, and curriculum audit strategies, purposes and responsibilities.

**EDUC 8007. Research on Knowledge and Learning in Education.** (3 cr; A-F only. Prereq=Ed.D. majors or #)

An exploration of theoretical definitions of knowledge and a review of research on the processes of learning.

**EDUC 8009. Distance Education: From Theory to Practice.** (3 cr; A-F only. Prereq=Ed.D. majors or #)

Theoretical framework, historical development and practical applications of different models of distance education. Topics: theory and perspectives, adult education principles, course design, teaching strategies, assessment, and current and emerging technologies applied to distance education.

**EDUC 8015. Research Design.** (3 cr; A-F only. Prereq=Psy 5052 or equiv, Ed.D. majors or #)

An overview of research designs that span qualitative, quantitative, and mixed methods. The learners will critically examine and select the appropriate research methodology based on a specific question, hypothesis, or problem statement; and interpret and evaluate various research studies.

## Course Descriptions

**EDUC 8016. Theory and Practice of Qualitative Research Methods.** (3 cr; A-F only. Prereq—8015 or equivalent, Ed.D. majors or #)  
Qualitative research traditions and methods, and practice with the skills and attitudes necessary to successfully conduct qualitative research.

**EDUC 8017. Theory and Practice of Quantitative Research Methods.** (3 cr; A-F only. Prereq—8015 or equivalent, Ed.D. majors or #)  
In-depth focus on quantitative research methods. Issues related to data collection methods and analysis using computer software packages.

**EDUC 8018. Statistical Analysis in Educational Research.** (3 cr; A-F only. Prereq—Ed.D. major or permission of instructor (Student enrolled in other Graduate School or collegiate graduate programs))  
Intermediate statistics course for doctoral level students in education and other human service professions; basic concepts of descriptive statistics, graphic representation, probability, statistical inference, significance testing using correlation coefficients, linear regression, t-tests, one-way analysis of variance, factorial analysis of variance, split-plot analysis of variance, and analysis of covariance.

**EDUC 8020. Doctoral Seminar.** (1 cr [max 6 cr]; S-N only. Prereq—Ed.D. majors)  
Review of current research around best practices, or focused strategies for progression with the program or the dissertation.

**EDUC 8021. Theories, Principles, and Methodology of Assessment in Organizational Systems.** (3 cr; A-F only. Prereq—Ed.D. majors)  
Designed to provide an understanding of assessment methods in organizational systems. Examines current practice and theory regarding the use of assessment as feedback to improve system processes.

**EDUC 8444. FTE: Doctoral.** (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

**EDUC 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. Prereq—Max 6 cr per semester or summer; doctoral student who has not passed prelim oral; no required consent for the first two registrations up to 12 cr; departmental consent for the third and fourth registrations up to an additional 12 cr, or 24 or total (for doctoral students admitted summer 2007 and beyond; doctoral students admitted prior to summer 2007 may register up to 4 times totaling 60 cr))

**EDUC 8888. Thesis Credit: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

## Education and Human Service Professions (EHS)

College of Education and Human Service Professions

**EHS 799. CEHSP Masters Active Status.** (0 cr; No grade. Prereq—MEd or MSpEd students only)  
Maintains continuous enrollment for collegiate masters students who have finished required coursework and are finishing the final product. Does NOT include eligibility (athletic, defer loans, etc).

**EHS 5595. Special Topics: (Various Titles to be Assigned).** (.5-4 cr [max 16 cr]; A-F or Aud. Prereq—Course in human dev or ed psy or multicultural ed or spec ed, coll grad student or #; no Grad School cr)  
Topics announced in [Class Schedule].

**EHS 5713. American Indian Culture and Tradition: Oral Tradition and History.** (2 cr; A-F or Aud. Prereq—No Grad School cr)  
Explores historical and current methods and issues in oral tradition and education with emphasis on Woodlands and Plains Indians.

**EHS 5990. Research Project.** (1-12 cr [max 12 cr]; S-N only. Prereq—No Grad School cr)  
Faculty-supervised research project required for MEd

## Education, Secondary (EDSE)

College of Education and Human Service Professions

**EDSE 3204. Designing Learning Environments and Lessons.** (3 cr; A-F or Aud. Prereq—Admission to EdSe program)  
Topics will include: Characteristics of effective teachers, various developmentally appropriate teaching strategies, design of lessons using UBD framework, designing effective learning environments, goals and action plans, site data, collaborative review of student work, collaborative planning, integrated and exploratory curriculum, content standards, technology, observation skills, and readiness.

**EDSE 3205. Apprenticeship: Middle School.** (2 cr; A-F or Aud. Prereq—Admission to EdSe program, concurrent registration is required (or allowed) for 3204)  
Fifty hours of experience in a middle school, including observing, teaching, tutoring, working with individual students and small groups. Focuses on classroom management, multicultural education, and students with special needs. Weekly seminar.

**EDSE 3206. Apprenticeship: Secondary School.** (2 cr; A-F or Aud. Prereq—Admission to EdSe program, &3204)  
Fifty hours of experience in a high school, including observing, teaching, tutoring, working with individual students and small groups. Focuses on classroom management, multicultural education, and students with special needs. Weekly seminar.

**EDSE 4100. Teaching in a Diverse Society.** (3 cr; A-F or Aud. Prereq—Admission to EdSe program)  
Examination of cultural differences; planning instruction to accommodate individual differences in race, gender, ethnic background, cultural background, and physical and mental development; Including the diverse needs of learners in middle school and secondary school settings; integrated and exploratory curriculum, utilization of technology, community resources, structured service learning and humanizing classroom environments and classroom management procedures.

**EDSE 4120. Philosophy and Organization of the Middle School.** (2 cr; A-F or Aud. Prereq—[5120], Secondary majors admitted to teacher education or pre-elementary education majors, 45 cr)  
Philosophies and organization and structure of middle schools. Assessment of benefits, drawbacks, and rationale.

**EDSE 4212. Literature for Adolescents.** (3 cr; A-F or Aud. =EDSE 4214, EDSE 4215. Prereq—Teaching comm arts/lit major, minor or pre students or elem-middle educ comart/lit specialization)  
Extensive reading in literature written for adolescents; analysis of studies of adolescent choices in literature; principles of selection; critical reading in broad fields of literary, biographical, historical, scientific interests of both genders; pedagogy and critical theory appropriate for adolescent study of literature.

**EDSE 4214. Teaching Content-Area Reading.** (2 cr; A-F or Aud. =EDSE 4212, EDSE 4215)  
Teaching reading within 5-12 content-area courses as pedagogy for improving literacy. Developing an understanding of the brain, cognition, and reading. Exploration of stages of literacy, methods for promoting reading, and strategies for improving comprehension. Lesson planning for content-area reading. Diverse learners and critical literacy in the content-area classroom.

**EDSE 4215. Teaching Reading and Literature: Grades 5-12.** (5 cr; A-F or Aud. =EDSE 4212, EDSE 4214. Prereq—Major, minor or pre teaching comm arts/lit students)  
Teaching procedures, objectives, and materials; emphasis on teaching of reading in various subject-matter fields, practicum experience.

**EDSE 4222. Teaching Mathematics: Grades 5-12.** (4 cr; A-F or Aud. Prereq—Admission to EdSe program, 3204 or #; no Grad School cr)  
Standards for secondary mathematics as they apply to learning, teaching, curriculum, and integration of technologies in mathematics grades 5-12; emphasis on use of problematic approach to mathematical sense-making.

**EDSE 4244. Teaching Social Studies: Grades 5-12.** (3 cr; A-F or Aud. Prereq—Admission to EdSe program, 3204 or #; no Grad School cr)  
History and philosophy of social studies education; social studies objectives; curriculum design; instructional planning and use of resources; evaluation procedures.

**EDSE 4255. Teaching Science: Grades 5-12.** (3 cr; A-F or Aud. Prereq—Admission to EdSe program, 3204 or #; no Grad School cr)  
Historical development of science education. Goals and purposes of science education in secondary schools; methods and materials; evaluation procedures; current trends.

**EDSE 4400. Professional Development Seminar for Secondary Education Majors.** (1 cr [max 3 cr]; A-F or Aud. Prereq—Acceptance into EdSe program; no Grad School cr)  
Professional development for Secondary Education majors through documentation, reflection, synthesis of learning as related to standards. Development of process and product portfolios. Presentation of and dialogue about emergent learning.

**EDSE 4501. Educational Psychology.** (3 cr; A-F or Aud. Prereq—Admission to EdSe program; no Grad School cr)  
Principles of psychology applied to teaching; examination of adolescent growth and development; classroom management.

**EDSE 4525. Assessment for Secondary Education Majors.** (3 cr; A-F only. Prereq—No Grad School cr)  
An exploration of topics in responsive and responsible assessment of student learning. Topics include types and appropriate uses of classroom assessment strategies, large-scale and high stakes testing, backwards design, rubrics, checklists, and other evaluative tools and techniques.

**EDSE 4600. Student Teaching.** (6-12 cr [max 12 cr]; S-N or Aud. Prereq—4100, 4501, appropriate methods course; no Grad School cr)  
Supervised practicum in secondary or middle school under direction of licensed teacher. Demonstration of subject matter, teaching competence, and potential for future improvement.

**EDSE 4993. Special Area Project.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq—#; no Grad School cr)  
Independent project for advanced students to substantially further their theoretical knowledge base or professional competencies.

**EDSE 5495. Special Topics: (Various Titles to be Assigned).** (.5-4 cr [max 8 cr]; A-F or Aud. Prereq—no Grad School cr)

Current issues in secondary education to meet needs and interests of various groups, particularly practicing professionals.

## Educational Administration (EDAD)

College of Education and Human Service Professions

**EDAD 5911. Leadership and Personal Growth.** (3 cr; A-F or Aud. Prereq—EdAd lic program or collegiate grad program admission or #, no Grad School cr)

An overview of leadership from a theoretical perspective. Learners will begin to see the role and styles of leadership in relationship to the culture of schools and communities.

**EDAD 5912. Supervision of Teachers and School Staff.** (3 cr; A-F or Aud. Prereq—EdAd lic program or collegiate grad program admission or #; no Grad School cr)

Includes applications and philosophies of supervision of teachers/principals, staff development, motivation, attention to diversity, evaluation, MN teacher tenure rules ad process for hiring and for dismissal, interpersonal communications, and human resource management.

**EDAD 5913. Communication and Community Relations.** (3 cr; A-F or Aud. Prereq—EdAd lic program or collegiate grad program admission or #; no Grad School cr)

Schools' public and media relations, communication needs of internal/external publics, processes to solicit support for initiatives, review of crises plans.

**EDAD 5914. Education Policy.** (3 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program admission or #, no Grad School cr)

Decision-making and school governance based on current laws and mandates. Rules, reporting, and regulations governing private, public, parochial, BIE, Community Education, and Alternative schools will be studied including special education, data privacy, right to know, liability. Tribal school policy and relations with independent districts will be examined.

**EDAD 5915. Operations Resource Management and Scheduling in Education.** (3 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program admission or #; no Grad School cr)

Focus on skills, knowledge and dispositions that enable administrators to plan and schedule work in ways that ensure that resources are used appropriately and goals are met.

**EDAD 5916. Curriculum and Instruction and Assessment.** (3 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program admission or #; no Grad School cr)

Overview of curriculum design. Both traditional and backwards design with practice in mapping, scope and sequence, large-scale testing, assessment of individual and systemic growth, early child education, and providing opportunities for all students.

**EDAD 5917. Technology Seminar.** (1 cr [max 10 cr]; S-N or Aud. Prereq—No Grad School cr)

Showcases school management systems and innovation in educational technology, research in area schools, and current trends in leadership and educational administration.

**EDAD 5918. Continuous Improvement Processes for Schools.** (3 cr; Stdnt Opt. Prereq—EdAd lic program or collegiate graduate program admission or #, no Grad School cr)

Examines effective data-driven continuous improvement best practices in schools. Learners will examine strategic planning, accreditation processes, state and federal accountability, AYP, reporting in order to continue funding flow and establishment of effective leadership terms.

**EDAD 5919. Superintendency.** (3 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program admission or #, no Grad School cr)

Examine the level of decision making that differentiates district administration and responsibility unique to the position including creating district level mission, vision, and strategic planning; contract negotiation; working with local, state, and federal agencies, program coordination at all levels, school board relations, and clear establishment of expectations.

**EDAD 5920. Problem Solving for Principals: Student Discipline and Behavior Management.** (3 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program admission or #, no Grad School cr)

Case-study based course will examine theories of behavior management and evaluate the effectiveness of discipline approaches through lenses of development, culture, leadership styles and legal aspects of discipline for all students.

**EDAD 5921. Principalship.** (3 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program admission or #, no Grad School cr)

Orients individuals to the responsibilities of the principal's positions in schools and districts.

**EDAD 5922. Problem Solving for Superintendents.** (3 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program admission or #, no Grad School cr)

Presents solutions and pathways for superintendents, including labor relations, contract negotiations, bonds and referenda, policy creation and relationships with school boards and communities.

**EDAD 5923. Field Exploration.** (2 cr; A-F or Aud. Prereq—EdAd lic program or collegiate grad program admission or #, no Grad School cr)

Candidates for licensure as educational administrators will experience working in school systems that do not follow the traditional American model of delivery of programs and instruction. Travel is required and 20 hours of internship will be coordinated through the office of the Educational Administration Program Coordinator.

**EDAD 5997. Professional Competency Assessment: Principals.** (1 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program admission or #; no Grad School cr)

Capstone for the educational administrative program for principals. Learners will complete an electronic portfolio which includes valid evidence of competency for each core leadership and principal's competencies required for certificate approval. Candidates will prepare for final panel presentations.

**EDAD 5998. Professional Competency Assessment: Superintendents.** (1 cr; A-F or Aud. Prereq—EdAd Lic program ro collegiate graduate program admission or #, no Grad School cr)

Learners will complete an electronic portfolio which includes valid evidence of competency for each Core Leadership and Superintendent's Competencies required for certificate approval. Candidates will prepare for final panel presentations.

**EDAD 6997. Internship: Principals.** (6 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program or #, no Grad School cr)

To place the candidate for licensure with practicing, licensed principals for a minimum of 320 total hours. Candidates must serve 80 hours of internship with a mentor and students that are not at the level of the candidate's teacher licensure.

**EDAD 6998. Internship: Superintendents.** (6 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program admission or #; no Grad School cr)

Candidates for licensure will be working with a practicing, licensed superintendent for a minimum of 320 total hours. UMD candidates are also encouraged to serve additional hours in a situation of alternative delivery.

**EDAD 6999. Internship: Principals Additional Field.** (4 cr; A-F or Aud. Prereq—EdAd lic program or collegiate graduate program admission or #; no Grad School cr)

Places the candidate for additional licensure fields in schools, working with a practicing, licensed principal for a minimum of 40 total hours at the level of the requested additional field.

## Electrical and Computer Engineering (ECE)

Swenson College of Science and Engineering

**ECE 1001. Introduction to Electrical and Computer Engineering.** (2 cr; A-F or Aud. Prereq—Pre-Engr, ChE, CS, ECE, IE majors only)

Definition and description of electrical and computer engineering. Digital and analog systems. Electrical and computer engineering lab equipment and software. Selected specialties. (2 hrs lect)

**ECE 1315. Digital System Design.** (4 cr; A-F or Aud. Prereq—Pre-Engr, ChE, CS, ECE, IE majors only)

Binary number system and digital coding techniques. Boolean algebra, combinational logic circuits, and minimization techniques. Synchronous sequential circuits and state reduction techniques. Medium Scale Integration (MSI) combinational components.

**ECE 1501. Freshman Seminar Honors: Renewable Energy.** (3 cr; A-F only. Prereq—Freshman, fewer than 30 cr, Honors Program LEIP 05)

Introduces energy resource and consumption patterns and current issues on global and local levels. Considers how social, political, financial and technical aspects of renewable energy relate to climate change and resource constraints. Exploration of energy's impact on all aspects of human life through discussion, selected readings and guest lectures.

**ECE 2006. Electrical Circuit Analysis.** (4 cr; A-F or Aud. Prereq—Phys 2011, &Math 3280)

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. SPICE analysis. (3 hrs lect, 3 hrs lab)

**ECE 2111. Linear Systems and Signal Analysis.** (4 cr; A-F or Aud. Prereq—2006)

Signal and system modeling concepts, system analysis in time domain, Fourier series and Fourier transform. Discrete time domain signals and systems, Z transform, applications. (3 hrs lect, 3 hrs lab)

**ECE 2212. Electronics I.** (4 cr; A-F or Aud. Prereq—2006) Diodes, BJTs, FETs, ideal operational amplifiers, DC analysis, small signal models, and analysis; single-stage circuits design; power amplifiers. (3 hrs lect, 3 hrs lab)

## Course Descriptions

**ECE 2325. Microcomputer System Design.** (4 cr; A-F or Aud. Prereq=1315)

Microcomputer components. Instruction set, machine and assembly language programming. Addressing modes. Signed/unsigned arithmetic. Stack uses. Assembly-level translation of high-level language constructions. Input/Output interfacing. Interrupt programming. Microcomputer system hardware. (3 hrs lect, 3 hrs lab)

**ECE 3151. Control Systems.** (3 cr; A-F or Aud. Prereq=2111)

System mathematical modeling: differential equations, Laplace transform, block diagrams, signal flow graphs. System performance characteristics: time response, sensitivity, steady-state error. Stability analysis: Routh-Hurwitz, root locus and Nyquist. State variables. Compensation design, software tools. (3 hrs lect)

**ECE 3235. Electronics II.** (4 cr; A-F or Aud. Prereq=2212)

Multistage circuits, frequency analysis, non-ideal operational amplifiers, feedback and stability, oscillators, filters. (3 hrs lect, 3 hrs lab)

**ECE 3341. Digital Computer Circuits.** (4 cr; A-F or Aud. Prereq=2325)

Digital logic family characteristics. Medium Scale Integration (MSI) components and applications. Programmable Logic Devices (PLDs). Alternative clocking techniques. Computer arithmetic circuits and memory design. Fundamental mode asynchronous finite-state machine design. (3 hrs lect, 3 hrs lab)

**ECE 3445. Electromagnetic Fields.** (3 cr; A-F or Aud. Prereq=Math 3280, 3298, Phys 2011, 2012)

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. (3 hrs lect)

**ECE 3611. Introduction to Solid-State Semiconductors.** (3 cr; A-F or Aud. Prereq=Phys 2012)

Fundamentals of solid-state semiconductors and devices. Quantum mechanical concepts and atomic states, solid-state structure, band structure, semiconductor statistics, and transport. (3 hrs lect)

**ECE 4305. Computer Architecture.** (4 cr; A-F or Aud. Prereq=3341)

Advanced assembly language programming techniques. Memory design principles. Virtual memory. Cache memory. Processor design. Pipelined and Reduced Instruction Set Computers (RISC). Advanced microprocessor features. (3 hrs lect, 3 hrs lab)

**ECE 4311. Design of Very Large-Scale Integrated Circuits.** (3 cr; A-F or Aud. Prereq=3235, 3341 or #)

Philosophy of and techniques for designing VLSI circuits in CMOS technology. Full- and semi-custom design techniques. Digital, analog, and hybrid CMOS circuits and systems. Substantial design project required. (3 hrs lect)

**ECE 4321. Computer Networks.** (3 cr; A-F or Aud. Prereq=3341, Stat 3611)

Network classification and services. Protocol and communication architectures. Hardware components: multiplexers, concentrators, bridges, routers, access servers. (3 hrs lect)

**ECE 4501. Power Systems.** (4 cr; A-F or Aud. Prereq=2006; no Grad School cr)

Fundamentals of rotating machines: 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. (3 hrs lect, 3 hrs lab)

**ECE 4899. Senior Design Project I.** (1 cr; A-F or Aud.

Prereq=[4951], 3341, BSECE cand, #, no Grad School cr) Selection and completion of team project approved and supervised by faculty. See also ECE 4999.

**ECE 4951. ECE Design Workshop.** (4 cr; A-F or Aud.

Prereq=[4899 or 4999], WRIT 3130, BSECE cand, 100 cr, #; no Grad School cr) Study of a selected topic; its application to a design project, completed individually or in a small group. Focuses on a different method each semester offered. Completion satisfies requirement for a senior design project.

**ECE 4991. Independent Study.** (1-3 cr [max 3 cr]; A-F or Aud. Prereq=#; does not qualify as ECE technical elective; no Grad School cr)

Special projects not available in regular curriculum. Independent investigation, research studies, or survey of selected projects or problems.

**ECE 4999. Senior Design Project II.** (3 cr; A-F or Aud.

Prereq=[4951], 4899, BSECE cand, #, no Grad School cr) Students present senior design project results in formal written and oral reports after making refinements. Complete documentation of results in professional manner required. Results must be presented in an oral report with other senior project team members. ECE 4899 and ECE 4999 must be completed within one year for credit.

**ECE 5151. Digital Control System Design.** (3 cr; A-F or Aud. Prereq=[4151], 3151, 3341.)

Digital control system characteristics: transient and steady-state responses, frequency response, stability. Digital control system design using transform techniques. Controllability and observability. Design of digital control systems using state-space methods: pole placement and observer design, multivariable optimal control. Implementation issues in digital control

**ECE 5211. Advanced Analog Integrated Circuit Design.** (3 cr; A-F only. Prereq=3235 or equiv)

Provides ECE students with fundamental analysis and design skills for transistor-level analog integrated circuits, such as operational amplifiers, transconductance amplifiers, bandgap references, amplifier-based filters, analog-to-digital converters, digital-to-analog converters and phase-locked loop. Project-oriented with a focus on transistor-level design of analog circuits from transistor sizing to layout in an integrated circuit environment such as Cadence tool sets. The expected outcomes are that students are able to design an analog system of medium complexity at transistor-level.

**ECE 5315. Multiprocessor-Based System Design.** (3 cr; A-F or Aud. Prereq=[4315], 3341)

Parallelism, interconnection networks, shared memory architecture, principles of scalable performance, vector computers, multiprocessors, multicomputers, dataflow architectures, and supercomputers.

**ECE 5351. Introduction to Robotics and Mobile Robot Control Architectures.** (3 cr; A-F or Aud. Prereq=3151, CS 1521, no Grad School cr)

Basic concepts and tools for the analysis, design, and control of robotic mechanisms. Topics include basic robot architecture and applications to dynamical systems, mobile mechanisms, kinematics, inverse kinematics, trajectory and motion planning, mobile robots, collision avoidance, and control architectures.

**ECE 5477. Antennas and Transmission Lines.** (3 cr; A-F or Aud. Prereq=[4477], 3445)

Concepts and theory of antennas and transmission lines; emphasis on design and applications. Topics: nonlinear source and loads, cross talk, interconnecting circuits, line characteristics, radiation, measurements. EM propagation, scattering and antenna design techniques. Numerical analysis of wire, aperture, reflector antennas; diffraction theory.

**ECE 5741. Digital Signal Processing.** (3 cr; A-F or Aud.

Prereq=[4741], 2111) Discrete linear shift-invariant systems, z- & Fourier transform, sampling, discrete-time processing of signals, reconstruction of analog signals, filters and filter structures in direct, parallel, and cascaded forms, FIR & IIR digital filter design, impulse-invariant, bilinear transform & window functions, FFT, introduction to image processing.

**ECE 5765. Modern Communication.** (4 cr; Stdnt Opt. Prereq=[4765], 2111, 3235)

Design and analysis of modern communication systems; evaluation of analog and digital modulation techniques. (3 hrs lect, 3 hrs lab)

**ECE 5831. Fuzzy Set Theory and Its Application.** (3 cr; A-F or Aud. Prereq=[4831], CS 1521, Math 3280.)

Fuzzy sets and operations on fuzzy sets. Fuzzy relations and the extension principle. Linguistic variable and fuzzy IF-THEN rules. Fuzzy arithmetic. Fuzzy logic and approximate reasoning. Design of Fuzzy Systems from I/O data. Fuzzy logic—based control. Pattern Classifications.

**ECE 5995. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 3 cr]; A-F or Aud. Prereq=#)

Current problems and research. Discussions, selected reading, and/or invited speakers.

**ECE 8151. Linear Systems and Optimal Control.** (3 cr; A-F only. Prereq=3151)

State-space representations of dynamic systems. Input-output stability. Lyapunov stability. Controllability and observability. Minimal realizations. State and output feedback. Pole placement design. State observers. Linear quadratic optimal control: fixed and free end point, finite and infinite horizon. Pontryagin's Minimal Principle. Dynamic programming.

**ECE 8315. Embedded Systems and Microcomputer Interfaces Design.** (4 cr; A-F or Aud. Prereq=2325, 3341, CS 1511, CS 2521)

Introduces students to the design of advanced embedded and microprocessor based system, and microcomputer interfaces, with an emphasis on embedded systems hardware and software design relevant to talking with computer hardware.

**ECE 8333. FTE: Master's.** (1 cr; No grade. Prereq=Master's student, advisor and DGS consent)

**ECE 8741. Digital Image Processing.** (4 cr; A-F or Aud. Prereq=4741)

Mathematical foundations and practical techniques to process and manipulate images. Students will acquire the ability to analyze two-dimensional images, dealing with mathematical representation of images, image sampling and quantization, Image Transforms, Image Enhancement, Image Restoration, Image Coding, Edge Detection, Texture Analysis, and Compression.

**ECE 8765. Digital Communications.** (3 cr; A-F or Aud. Prereq=4765)

Overview of digital data transmission, performance analysis of digital modulation, quadrature multiplexed signaling schemes, signal-space methods in digital data transmission, information theory and block coding, convolutional coding, repeat-request system, spread-spectrum systems, satellite communications.

**ECE 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**ECE 8831. Soft Computing.** (3 cr; A-F or Aud. Prereq—Knowledge of linear algebra and computer programming) Fuzzy set theory, neural networks, genetic algorithms, data clustering techniques, and several stochastic optimization methods that do not require gradient information which is aimed at solving real world decision-making, modeling, and control problem.

## Elementary Education (ELED)

College of Education and Human Service Professions

**ELED 1010. Introduction to Elementary Education.** (3 cr; A-F or Aud. Prereq—Pre elementary education student) The elementary teaching profession; personal goals, teaching-learning environment, learner sensitive model, and career opportunities. Experiences which help students gain accurate knowledge of their field.

**ELED 3113. Learning Environments and Diverse Learning Communities.** (3 cr; A-F or Aud. Prereq—Admission to the elementary education program) Teaching and learning models as a basis for structuring diverse learning environments for children. Curriculum, classroom management, and instructional strategies. Sociocultural and historical backgrounds, issues, and unique learner needs of students.

**ELED 3325. Language and Literacy.** (4 cr; A-F or Aud. Prereq—Concurrent registration is required (or allowed) in the following: 3113, 3331, 3355, 4400, SpEd 3310, admission to the elementary education program) Development and instruction in children's literature-based reading, writing, and oral language in elementary schools. Methods, materials, and research findings related to teaching of integrated language arts.

**ELED 3331. Children's Literature and Integrated Creative Arts.** (4 cr; A-F or Aud. Prereq—Concurrent registration is required (or allowed) in the following: 3113, 3325, 3355, 4400, SpEd 3310, admission to the elementary education program) Purposes of reading; bases for selecting and evaluating reading materials; integrated creative arts: literature, music, drama, and visual arts for elementary classrooms, including those with special needs students.

**ELED 3355. Critical Thinking: Elementary Mathematics.** (4 cr; A-F or Aud. Prereq—Successful completion of block one, concurrent registration is required (or allowed) in the following: 4344, 4345, 4366, SpEd 5310, admission to elementary education program) Concepts learned through discovery, induction, critical reasoning, problem solving. Standards for elementary mathematics, use of a problematic approach to mathematical sense making.

**ELED 3381. Teaching American Indian Students in the Elementary Classroom.** (2 cr; A-F or Aud. Prereq—Elementary education major) Survey of contemporary Indian education; evaluation of one's attitudes toward Indian students; direct interaction with Indian parents and students; development of culturally sensitive teaching plans regarding Indians.

**ELED 4344. Teaching Science and Environmental Education.** (4 cr; A-F or Aud. Prereq—Admission to elementary education program, successful completion of block one, &3381, 4345, 4366, SpEd 5310, no Grad School cr) Curriculum standards and research-based pedagogy. Includes field experience.

**ELED 4345. Instructional Strategies, Assessment, and Management.** (3 cr; A-F or Aud. Prereq—Admission to elementary education program, successful completion of block one, &3381, 4344, 4366, SpEd 5310, no Grad School cr)

Formal and informal assessment strategies to ensure and evaluate continuous intellectual, social, and physical development of students while managing and supporting a positive classroom environment. Includes field experience.

**ELED 4366. Teaching Social Studies and Environmental Education.** (4 cr; A-F or Aud. Prereq—Admission to elementary education program, successful completion of block one, &3381, &4344, &4345, &SpEd 5310; no Grad School cr)

Content and organization of social studies; planning instruction for diverse students; understanding and improving the learning situation; effective use of materials in environmental education.

**ELED 4400. Professional Development Seminar for Elementary Education Majors.** (1 cr; A-F or Aud. Prereq—Admission to elementary education program, &3113, 3325, 3331, 3355, SpEd 3310, no Grad School cr)

Professional development for Elementary Education Majors through documentation, reflection, synthesis of learning as related to standards. Development of process and product portfolios. Presentation of and dialogue about emergent learning.

**ELED 4600. Student Teaching.** (6-12 cr [max 12 cr]; S-N or Aud. Prereq—Admission to elementary education program, successful completion of block one and block two courses, no Grad School cr)

Planning, implementing, and evaluating an elementary curriculum. Assessing learning needs and collaborating with specialists to individualize methods and materials.

**ELED 4650. Student Teaching in Individual Subjects: K-8.** (1-6 cr [max 7 cr]; S-N or Aud. Prereq—Art ed cand or music ed cand , or phy ed cand or #; no Grad School credit)

Student teaching in, e.g., art, music, physical education. Demonstrating subject matter competence, instructional strategies, and management skills; self-evaluation.

**ELED 4991. Independent Study.** (1-6 cr [max 6 cr]; A-F or Aud. Prereq—%; no Grad School cr)

Directed independent study, reading, and/or projects in elementary or middle school education of interest to student.

**ELED 4993. Special Area Project.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq—#; no Grad School cr)

Independent project for advanced students to substantially further their theoretical knowledge base or professional competencies.

**ELED 5695. Special Topics: (Various Titles to be Assigned).** (.5-4 cr [max 8 cr]; A-F or Aud. Prereq—No Grad School credit)

Current issues in Elementary Education to meet needs and interests of various groups, particularly practicing professionals.

**ELED 5993. Special Area Project.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq—#; no Grad School cr)

Independent project for advanced students to substantially further their theoretical knowledge base or professional competencies.

## Engineering (ENGR)

Swenson College of Science and Engineering

**ENGR 1210. Introduction to Design and Reverse Engineering.** (3 cr; A-F only. =IE 1225, IE 2222. Prereq—&Math 1297 or #)

Explores "reverse engineering" (i.e., how engineers evaluate existing products for ideas to improve future products). Learn to communicate product features through engineering design graphics, recognize manufacturing processes involved, and understand how design objectives and constraints impact realization of part designs.

**ENGR 2015. Statics.** (3 cr; Stdnt Opt. Prereq—Math 1297, Phys 2011)

Vector algebra. Applications of equations of equilibrium to analysis of simple engineering structures and machines. Nature and influence of friction. Elementary theory of static determinate framed structures.

**ENGR 2016. Mechanics of Materials.** (3 cr; Stdnt Opt. Prereq—2015, &Math 3280)

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 2026. Dynamics.** (3 cr; Stdnt Opt. Prereq—2015, &Math 3280)

Review of particle dynamics. Mechanical systems and rigid-body model. Kinematics and dynamics of plane systems.

**ENGR 2110. Introduction to Material Science for Engineers.** (3 cr; A-F or Aud. =CHE 3231, CHEM 2521. Prereq—Chem 1151 or 1161, Phys 2011)

Atomic bonding, structure, properties and characteristics of most common engineering materials: metal (ferrous and non-ferrous), polymers, ceramics and composites. Modes of material failure and standard laboratory tests for material properties. Use of equilibrium phase diagrams. Corrosion and their prevention methods

**ENGR 4001. Engineering Professionalism.** (3 cr; A-F or Aud. Prereq—BSECE or BSChE or BSIE or BSME student, min 60 cr, no Grad School cr)

Relationship of engineering to topics in economics, environment, sustainability, manufacturing, ethics, health & safety, society, and politics. Multidisciplinary engineering design lab experience. Written lab reports, proposals, professional letters, resume. Oral lab progress reports.

## Engineering Management (EMGT)

Swenson College of Science and Engineering

**EMGT 4110. Engineering Professionalism and Practice.** (2 cr; A-F only. =IE 3205, IE 4155, ME 4155. Prereq—WRIT 3130 or 3150 or 3180 and BSChE or BSECE or BSIE or BSME candidate within 2 semesters of graduation or #; no Grad School cr)

Professional responsibilities of engineers and expectations of industry and society. Ethics and law for engineers. Codes of ethics and professional engineering societies. Design, intellectual property, record keeping. Environmental and safety issues in design. Group processes, conflict management. Project management.

## Course Descriptions

**EMGT 5110. Management of Engineers and Technology.** (3 cr; A-F only. Prereq—EMgt student or %) Managing the synergism of people and technology. Overview of management functions, tools, methods. Planning, organization, leadership, motivation, control, quality, human resources, effective decision making.

**EMGT 5120. Advanced Project Management.** (3 cr; A-F only. Prereq—EMgt student or %) Project justification and finance. The development and management of project plans and resources. Working with contractors and union personnel. Covers the life cycle of projects. Applications to current practice.

**EMGT 5130. Operations Modeling and Analysis.** (3 cr; A-F only. Prereq—EMgt student or %) Modeling and analysis of manufacturing and service systems. Linear programming, network analysis, queuing theory, Markov chains, and non-linear optimization.

**EMGT 5160. Quality Management.** (3 cr; A-F only. Prereq—EMgt student or %) Global competitiveness, organizational culture, management role responsibilities, concepts for customer value, strategic management, measurement of customer value, organizing to improve systems, employee involvement, culture change and organizational learning. ISO 9000, quality awards.

**EMGT 5210. Information Technology for Management.** (3 cr; A-F only. Prereq—EMgt student or %) Intended to bring the student up to date on developments in the field of information technology (IT) and to prepare the student to manage those technologies in the workplace. Presents a combination of current management and technical topics.

**EMGT 5220. Innovation Management.** (3 cr; A-F only. Prereq—EMgt student or %) Key success factors of technological innovation will be identified by looking at the diverse economic, social, cultural, psychological and technical phenomena that comprise innovation. Questions that will be answered include why certain inventions successfully make it to the market but some others died; why some organizations keep coming up with innovations with tremendous business value but some others stay as followers; how to enhance creativity at individual, team, organizational, and national levels; what the emerging trend is in today's business innovation environment and how organizations should cope with it, etc.

**EMGT 5230. Technical Forecasting.** (3 cr; A-F only. Prereq—EMgt Student or %) Statistical review, data sources, choosing a forecasting technique, moving averages, smoothing, regression analysis, time series analysis, the Box-Jenkins (ARIMA) methodology.

**EMGT 5240. Advanced Operations Management.** (3 cr; A-F only. Prereq—EMgt student or MBA student or %) Emphasis on quantitative methods for designing and analyzing manufacturing and service operations, simulation, and recent paradigms in manufacturing including just-in-time production, synchronous manufacturing, and agile manufacturing. Current competitiveness-enhancing techniques like continuous improvement, benchmarking, and business process re-engineering will also be covered.

**EMGT 5250. Legal, Ethical and Environmental Issues in Engineering.** (3 cr; A-F only. Prereq—EMgt student or %) Covers topics in basic law, contracts, intellectual property, professional ethics, the responsible engineer, moral thinking, risk/safety/liability, employer responsibilities, product liability, and environmental responsibilities. Provides a historical perspective on society's environmental

concerns, and discusses federal environmental statutes, our regulatory system, approaches to preventing and mitigating environmental problems, and the elements of an effective environmental management system.

**EMGT 5991. Independent Study in Engineering Management.** (1-4 cr [max 6 cr]; Stdnt Opt. Prereq—MSEM cand, %)

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

**EMGT 5995. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; A-F or Aud. Prereq—EMgt student or %)

Selected current topics in engineering management. (Various titles to be assigned).

**EMGT 8310. Project Methodology and Practice.** (3 cr; A-F only. Prereq—5110, 5120, 5130, 5160)

Applying research, analysis, and management skills to a topic or situation of current interest to industry. Demonstrating the ability to achieve results in a fixed time frame with limited resources.

**EMGT 8333. FTE: Master's.** (1 cr; No grade. Prereq—Master's student, adviser and DGS consent)

**EMGT 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**EMGT 8993. Engineering Management Seminar.** (1 cr [max 2 cr]; S-N only. Prereq—Grad student, %)

Reports on recent developments in engineering management and on research projects in the department.

**EMGT 8994. Directed Research.** (1-8 cr [max 8 cr]; Stdnt Opt. Prereq—MSEM or Grad School student, %)

Directed research or study on an advanced topic.

## English (ENGL)

### College of Liberal Arts

**ENGL 1001. Great American Authors.** (3 cr; A-F or Aud. LE 9)

Introduction to American authors important for their artistic mastery and/or significant role in American literary history.

**ENGL 1101. Literature Appreciation.** (3 cr; A-F or Aud.

=ENGL 1907. Prereq—Primarily for nonmajors but also for potential majors and creative writers LE 9) Developing critical reading skills in fiction, poetry, and drama.

**ENGL 1507. Time and Place.** (4 cr; A-F or Aud. LE 9)

Close reading of selected works about experience of time and place.

**ENGL 1535. King Arthur in History, Literature, and Art.** (4 cr; A-F or Aud. LE 9)

Survey of historical accounts, and literary and artistic treatments of King Arthur in Latin, French, and German sources of the Middle Ages and in selected works in modern Arthurian literature.

**ENGL 1575. 20th-Century Literature.** (4 cr; A-F or Aud. Prereq—Primarily for nonmajors LE 9)

Readings primarily in American, British, and Irish literature.

**ENGL 1582. Introduction to World Literatures.** (3 cr; A-F or Aud. LEIP 09)

Sampling of literary works mainly from Middle East, Africa, Far East, and South America.

**ENGL 1585. Australian and New Zealand Literature and Culture.** (4 cr; A-F or Aud. LEIP 09)

Introduces students to the literature and cultures of Australia and New Zealand, focusing on the formation of national identity, both countries' relationship to Great Britain and the US, conventions like "mateship," and the cultural politics of aboriginal peoples.

**ENGL 1666. Tales of Terror.** (4 cr; A-F or Aud. LE 9)

Gothic masterpieces chiefly from English and American literature, with emphasis on sociological and psychological implications of the genre.

**ENGL 1801. Freshman Seminar: American Gothic.** (4 cr; A-F or Aud. Prereq—Freshman, fewer than 30 cr. LE 9)

Exploration of the Gothic tradition in American literature from colonial days to the present, with special attention to psychological and cultural implications. Some attention, also, to visual arts, film, and theories of terror, horror, the uncanny, and the grotesque.

**ENGL 1802. Freshman Seminar: Asian Culture.** (4 cr; A-F or Aud. Prereq—Freshman, fewer than 30 credits LE 7)

Exploration of Chinese and Japanese cultures with attention to Confucianism, Taoism, Buddhism, Shinto and arts such as calligraphy, painting, poetry, garden design, and music. Some attention also to political history.

**ENGL 1803. Freshman Seminar: Unseen Reality.** (4 cr; A-F or Aud. Prereq—Freshman, fewer than 30 cr. LE 9)

Concepts of "the ideal" and "the real" as developed by writers with differing perspectives, in various literary forms (e.g., fiction, non-fiction, poetry).

**ENGL 1805. Freshman Seminar: Satire and Humor.** (4 cr; A-F or Aud. Prereq—Freshman, fewer than 30 cr LE 9)

Satire and humor in their historical, social, aesthetic, and intellectual contexts.

**ENGL 1907. Introduction to Literature.** (3 cr; A-F or Aud.

=ENGL 1101. Prereq—Primarily for nonmajors LE 9) Literary modes and methods of literary study and interpretation.

**ENGL 2571. Contemporary Literature.** (4 cr; A-F or Aud. LE 9)

Readings in American and British literature since 1945. Emphases, authors, and titles vary.

**ENGL 2581. Women Writers.** (4 cr; A-F or Aud. Prereq—30 cr or # LECD 09)

Feminist reading of selected plays, poetry, prose (including critical works) written by women writers.

**ENGL 2922. Honors Seminar: The Art of the Memoir: Reading and Writing Memoir.** (4 cr; A-F or Aud)

Study of the memoir as a literary genre—its conventions, elements, and its historical importance—and as an art form. Use of critical approaches in the reading of memoirs. Directed practice writing the student's own memoir.

**ENGL 3115. Writing Fiction.** (4 cr [max 8 cr]; A-F or Aud. Prereq—Comp 1120, min 60 cr (6 cr lit) or #)

Writing of original fiction, with emphasis on the short story; structure and techniques learned from critical reading and classroom analysis.

**ENGL 3121. Writing Poetry.** (4 cr; A-F or Aud)

Writing of poetry, with emphasis on techniques learned through critical reading and classroom analysis.

**ENGL 3195. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 16 cr]; A-F or Aud)

Special topics in English.

**ENGL 3223. Shakespeare.** (4 cr; A-F or Aud. LE 9)

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 study of individual plays.

**ENGL 3333. Children's Literature: Texts and Contexts.** (4 cr; A-F or Aud)

Forms of children's literature, from folk and fairy tales to contemporary stories, poems, and novels for children; major historical, literary and critical issues affecting the production and reception of literature for children.

**ENGL 3411. The Modern Short Story.** (4 cr; A-F or Aud. Prereq—Min 60 cr (6 cr lit) or #)

Study of the genre, emphasizing close reading and interpretation of the elements of short fiction in selected works.

**ENGL 3501. British Literature I.** (4 cr; A-F or Aud. Prereq—Engl major or minor or teach comm art/lit major or minor or elem-middle educ comart/lit specialization)

Chronological study of English literature from beginnings to late-18th century, emphasizing major works, authors, and important literary forms, styles, themes, and movements.

**ENGL 3502. British Literature II.** (4 cr; A-F or Aud. Prereq—Engl major and minor)

Chronological study of English literature from late-18th to late-20th century, emphasizing major works, authors, and important literary forms, styles, themes, and movements.

**ENGL 3563. American Literature I.** (4 cr; A-F or Aud)

Historical survey of important authors, movements, conventions, genres, and themes: origins to Civil War.

**ENGL 3564. American Literature II.** (4 cr; A-F or Aud)

Historical survey of important authors, movements, conventions, genres, and themes: Civil War to present.

**ENGL 3906. Methods of Literary Study.** (4 cr; A-F or Aud. Prereq—Comp 1120, Engl major or Tch Comm Art/Lit major or #)

Introduction to interpretive and scholarly methods.

**ENGL 4097. Internship in Publishing.** (1-4 cr [max 8 cr]; S-N or Aud. Prereq—minimum 60 credits, # Credit cannot be applied to Grad School program)

Practical experience in publishing at an approved business or organization.

**ENGL 4292. Literature into Film.** (4 cr; A-F or Aud. Prereq—Min 90 cr (10 cr lit) or #)

Comparative study of novels and their film adaptations.

**ENGL 4375. Drama.** (4 cr; A-F or Aud)

Selected playwrights, plays, types, traditions, or periods; relevant theoretical and critical writings. Authors and topics vary.

**ENGL 4909. Senior Portfolio.** (1 cr; S-N or Aud. Prereq—Engl major, sr)

Required portfolio and research project undertaken for senior seminar.

**ENGL 4931. Practicum in Teaching Literature.** (4 cr; A-F or Aud. Prereq—3906, sr, 4 other upper division literature courses and #; no Grad School cr)

Assisting in teaching a 1-, 2-, or 3-level literature course; experience preparing course materials; advising students in course; learning about the grading process; experience in lecturing and leading discussions; conferences with professor about teaching issues.

**ENGL 5097. Internship in Publishing.** (1-3 cr [max 3 cr]; S-N or Aud. Prereq—8906, #)

Practical experience in publishing at an approved business or organization.

**ENGL 5116. Advanced Writing of Fiction.** (4 cr [max 8 cr]; A-F or Aud. Prereq—#)

Writing of original fiction beyond the beginning stages; some experience required.

**ENGL 5122. Advanced Writing of Poetry.** (4 cr [max 8 cr]; A-F or Aud. Prereq—3121 or #)

Study of poetics and poetry, with emphasis on student poems.

**ENGL 5222. Shakespeare.** (4 cr; A-F or Aud. Prereq—6 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; A-F or Aud. Prereq—6 cr literature)

Introduction to Middle English. Reading and analysis of Chaucer's works, primarily *Canterbury Tales* and *Troilus and Criseyde*.

**ENGL 5331. Milton.** (4 cr; A-F or Aud. Prereq—6 cr literature)

Minor poems, *Areopagitica*, *Paradise Lost*, and *Samson Agonistes*.

**ENGL 5375. Modern Poetry.** (4 cr; A-F or Aud. Prereq—6 cr literature)

Study of modern poetry written in English.

**ENGL 5444. Childhood in Literature, History and Culture.** (4 cr; A-F or Aud. Prereq—Jr or sr or grad student or #)

Examines traditional kinds of children's literary texts, as well as literary and pedagogical theory, advertising, movies, and television to consider childhood as an historical, aesthetic and social construct in Western culture from the eighteenth century to the present.

**ENGL 5471. The Novella.** (4 cr; A-F or Aud. Prereq—Min 90 cr (12 cr lit) or #)

In-depth study of selected masterworks of the form.

**ENGL 5533. Studies in English Literature Before 1800.** (4 cr; A-F or Aud. Prereq—6 cr lit)

Intensive study of a theme, literary school or circle, literary genre in historical and cultural context. Topics vary.

**ENGL 5541. Restoration and 18th-Century Literature.** (4 cr; A-F or Aud. Prereq—6 cr lit)

Study of controversies and cultural change evident in English literature, 1660-1800. Such authors as Dryden, Behn, Pope, Fielding, Johnson

**ENGL 5561. English Romanticism.** (4 cr; A-F or Aud. Prereq—6 cr literature)

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; A-F or Aud. Prereq—6 cr lit)

Cultural and social concerns of Victorian England as reflected in the works of such writers as Tennyson, Arnold, Christina and D. G. Rossetti, Robert and Elizabeth Barrett Browning, and Samuel Butler.

**ENGL 5566. Irish Literary Revival.** (4 cr; A-F or Aud. Prereq—6 cr lit)

Anglo-Irish literature in its socio-historical context. Such authors as Yeats, Synge, Gregory, Joyce, and O'Casey.

**ENGL 5572. American Renaissance.** (4 cr; A-F or Aud. Prereq—6 cr lit)

American Romanticism and the flowering of American literature from early 19th century to the Civil War (authors and topics vary; e.g., Thoreau, Fuller, Hawthorne, Dickinson, Whitman).

**ENGL 5574. Studies in American Literature to 1914.** (4 cr; A-F or Aud. Prereq—6 cr lit)

Study of selected North American authors from the Colonial Era to the end of WWI. Literature studied will vary in relation to what kind of literary or cultural study instructor intends or what kind of critical approach to literature is used.

**ENGL 5575. Studies in American Literature after 1914.** (4 cr; A-F or Aud. Prereq—6 cr lit)

Study of selected North American authors after 1914. Literature studied will vary in relation to what kind of literary or cultural study instructor intends or what kind of critical approach to literature is used.

**ENGL 5577. Major American Authors.** (4 cr [max 8 cr]; A-F or Aud. Prereq—6 cr lit)

Concentrated study in one to three authors, who are announced before course is offered.

**ENGL 5581. American Novel I.** (4 cr; A-F or Aud. Prereq—6 cr lit or #)

The American novel, origins through 1920; cultural, intellectual, and aesthetic contexts. Authors and topics vary.

**ENGL 5582. American Novel II.** (4 cr; A-F or Aud. Prereq—6 cr lit)

The American novel, 1920 to present; cultural, intellectual, and aesthetic contexts. Authors and topics vary.

**ENGL 5583. British Novel.** (4 cr; A-F or Aud. Prereq—6 cr lit)

The British novel in its social, aesthetic, and intellectual contexts.

**ENGL 5591. Independent Study.** (1-5 cr [max 8 cr]; A-F or Aud. Prereq—#, max 6 cr may be applied to Grad School program)

Students choose projects in consultation with their instructor.

**ENGL 5595. Special Topics: (Various Titles to be Assigned).** (1-5 cr [max 10 cr]; A-F or Aud. Prereq—Primarily for majors, minors, grads)

Topics not included in regular English curriculum. Topic and credits announced before course offered.

**ENGL 5661. Publishing the Middle Ages.** (4 cr; A-F or Aud. Prereq—Jr or sr or grad student or #)

Study of the ways in which the middle ages were defined and canonized in print culture. Instruction on the processes of medieval manuscript production and editing, followed by analysis of rhetorical framework within which "medievalism" was constructed in the 19th century.

**ENGL 5662. The Making of a Major Author: The Scholarly Edition in 17th- and 18th-Century England.** (4 cr; A-F or Aud. Prereq—Jr or sr or grad student or #)

Study of the ways in which writers such as Shakespeare and Milton were transformed into "major authors" and "national poets" through the publication of scholarly editions of their works subsequent to their deaths. Textual analysis of the editions is combined with study of their publication histories, including the roles of editors and publishers who produced them.

**ENGL 5663. Readers and the History of Books.** (4 cr; A-F or Aud. Prereq—Jr or sr or grad student or #)

History of reading, primarily in the United States and England. Study of factors affecting literacy in late 18th through early 20th centuries, including technological advances, educational reform and changes in authorship and literature.

**ENGL 5664. Small Presses, Little Magazines, and Modernism.** (4 cr; A-F or Aud. Prereq—Jr or sr or grad student or #)

The founding and promotion of the modernist movement in little magazines and small presses. Publishing careers of significant modernists (e.g. Ford, Pound, Yeats, H. D. Eliot, Joyce).

**ENGL 5811. Introduction to Modern English.** (4 cr; A-F or Aud)

Modern theories of English grammar.

**ENGL 5821. History of the English Language.** (4 cr; A-F or Aud)

History of sounds, word stock, and structures of English language from earliest records to present.

## Course Descriptions

**ENGL 5902. Teaching Language, Cognition, and Writing.** (4 cr; A-F or Aud. Prereq—Teach comm art/lit major or minor or TESOL licensure or elem/middle educ comart/lit specialization or #)  
Theory and practice of teaching composition; for prospective teachers grade five to community college level.

**ENGL 5922. Teaching Literature and Communication.** (5 cr; S-N or Aud. Prereq—5902, teach comm art/lit major or minor or TESOL licensure or #)  
Theory and applications in teaching reading, writing, literature, speaking, listening, and non-print media, grades 5-12.

**ENGL 8171. Seminar in Pre-1800 British Literature.** (4 cr; A-F or Aud. Prereq—Graduate Student)  
Selected topics in the study of British literature written prior to 1800.

**ENGL 8181. Seminar in British Literature, Late 18th - 20th Century.** (4 cr; A-F or Aud)  
Graduate seminar on selected topics in the study of British literature written from the late 18th century through the 20th century.

**ENGL 8191. Seminar: American Literature.** (4 cr; A-F or Aud)  
Intensive study of selected authors and topics announced ahead of time; historical, cultural, and literary contexts; methodology; relevant scholarship and criticism.

**ENGL 8333. FTE: Master's.** (1 cr; No grade. Prereq—Master's student, adviser and DGS consent)

**ENGL 8444. FTE: Doctoral.** (1 cr; No grade. Prereq—doctoral student, adviser and DGS consent)

**ENGL 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq—[max 18 cr per semester or summer]; 24 cr required)

**ENGL 8906. Introduction to Critical Theory.** (4 cr; A-F or Aud. Prereq—Grad Student)  
Core course required for all English M.A. (Plan B) students. Seminar in critical theory and methods of literary research.

**ENGL 8931. Practicum in Teaching Literature.** (4 cr; A-F or Aud. Prereq—8 cr grad-level literature or #)  
Teaching in sophomore literature courses; experience preparing supplementary materials, consulting with students, and assisting instructors in grading student work.

## Environmental Education (ENED)

College of Education and Human Service Professions

**ENED 1000. Introduction to Outdoor Recreation.** (4 cr; A-F or Aud. Prereq—[REC 1000])  
Overview of outdoor education, including outdoor recreation, environmental education and adventure education, will be explored. The structure and role of outdoor education in contemporary society will be considered.

**ENED 3309. Outdoor Leadership.** (1 cr; S-N or Aud. Prereq—Rec 2300, PEP 3507)  
Theories of leadership practices commonly used in outdoor education settings. Includes group development stages and techniques of group management. Concludes with preparation for 9-day field experience (EnEd 3310). This course MUST be taken in conjunction with EnEd 3310.

**ENED 3310. Outdoor Leadership Field Experience.** (2 cr; A-F or Aud. Prereq—3309)  
Practice, theory, and methods involved in leadership development including a detailed analysis of the qualities and roles of leaders in outdoor educational settings. recreation settings. This course will occur as a 9-day field experience.

**ENED 3331. Organization of Environmental Education Centers.** (2 cr; A-F or Aud. Prereq—[Rec 3331], 2300 or #)  
Philosophy and organization of environmental education centers as non-formal education providers. Both residential and non-residential centers including history, philosophy, management, and educational delivery relative to environmental literacy will be studied. Visits to local environmental learning centers are included.

**ENED 3341. Field Interpretive Techniques I.** (3 cr; A-F or Aud. Prereq—[Rec 3341], Rec 2300 or #)  
Techniques and methods used to interpret natural history of autumn and early winter environments. Emphasizes geomorphology, tree identification, and basic raptor ecology. Primarily field based at sites throughout northeastern Minnesota.

**ENED 3342. Field Interpretive Techniques II.** (3 cr; A-F or Aud. Prereq—Rec 2300 or instr consent, =EnEd 3342)  
Techniques and methods used to interpret natural history of winter and spring environments. Ecology of winter, vernal ponds, spring wildflowers, biomes, and migratory birds. Primarily field based at sites throughout northeastern Minnesota.

**ENED 4163. Outdoor Education Methods.** (3 cr; A-F or Aud. Prereq—[Educ 4163], Rec 3342 or #; no Grad School cr)  
Methods and theoretical basis for teaching outdoor education. Emphasis on application at outdoor sites. Weekend experience at a regional nature center required.

**ENED 4315. Operations and Management.** (4 cr; A-F or Aud. Prereq—2300 or #; no Graduate School credit)  
Methods and practice of administrative processes of personnel, fiscal, and facility management. Field study and presentation of a management plan.

**ENED 4410. Ropes Course Management.** (3 cr; A-F or Aud. Prereq—[Rec 4410], Rec 2300 or #, no Grad School cr)  
Management of a ropes course as a part of an outdoor education facility. Includes ropes course elements, instructional techniques, group debriefing skills, site inspection, safety, recommend and equipment maintenance. This course will follow industry standards such as Project Adventure.

**ENED 4555. Foundations of Environmental Education.** (3 cr; A-F or Aud. Prereq—Rec 2300 or #)  
Provides a background of skills and understanding of environmental education delivery in various educational settings, with emphasis on formal classroom audience.

**ENED 4601. Wilderness Philosophy.** (2 cr; Stdnt Opt. Prereq—[Educ 4601], No Grad School cr)  
People and social forces that have influenced land-use related to designated wilderness; philosophical and historical basis for wilderness management.

**ENED 4996. Outdoor Education Internship.** (12 cr; S-N or Aud. Prereq—[Rec 4996], Rec major, #; no Grad School cr)  
Supervised field experience in outdoor education.

**ENED 5163. Outdoor Education Methods.** (3 cr; A-F or Aud. Prereq—MEd candidate or #, no Grad School cr)  
Methods and theoretical basis for teaching outdoor education. Emphasis on application at outdoor sites. Weekend experience at a regional nature center required

**ENED 5164. Environmental Education In-Service Training.** (.5-10 cr [max 10 cr]; A-F or Aud. Prereq—[Educ 5164], #; no Grad School cr)  
Environmental education methods, materials, and curricula for educators wishing to enhance their environmental education training.

**ENED 5165. Theories and Models in Outdoor Education.** (2 cr; A-F or Aud. Prereq—[Educ 5165], #; no Grad School cr)  
Overview of theoretical foundations of outdoor education. Definitions of terms related to outdoor education, historical antecedents, future adventure education, social and psychological benefits of outdoor education.

**ENED 5167. Research and Issues in Outdoor Education.** (2 cr; A-F or Aud. Prereq—[Educ 5167], no Grad School cr)  
Research literature and related issues pertaining to outdoor education, including research design and methods. Application of research to specific issues.

**ENED 5325. Environmental Issues Investigation.** (3 cr; A-F or Aud. Prereq—#, no Grad School cr)  
The study of resolving environmental problems as taught in environmental education. This includes issue identification; building an effective team of investigators; and, study of the issue to the point of making recommendations to resolution of the issue.

**ENED 5343. Advanced Field Interpretive Techniques.** (3 cr; A-F or Aud. Prereq—3341 or 3342 or #, no Grad School cr)  
Techniques and methods used to interpret the natural and cultural history of unique field sites; For example, Isle Royale National Park. Specific, in-depth topics of natural and cultural history will be emphasized. Techniques for field site investigation and field based interpretation as an educational approach will be investigated.

**ENED 5495. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 4 cr]; Stdnt Opt. Prereq—No Grad School cr)  
Treatment of topics not included in regular curriculum or in-depth treatment of topics associated with normal curricular offering.

**ENED 5555. Environmental Education for Practicing Educators.** (2 cr; A-F or Aud. Prereq—[Educ 5555], no Grad School cr)  
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 world environment.

**ENED 5560. Current Research and Issues.** (3 cr; A-F or Aud. Prereq—MEd candidate or #, no Graduate School credit)  
Examines research literature and related issues pertaining to outdoor education including disciplines of science, environmental experiential, and adventure education. Trends in research, teaching, plus research design and methods.

**ENED 5625. Program Development and Evaluation.** (3 cr; A-F or Aud)  
A comprehensive approach to program development will be applied to youth-based environmental education programs. Course is designed for those working in supervisory capacities to gain skills in designing, implementing, and evaluating environmental education programs.

**ENED 5850. Classroom Applications.** (2 cr; A-F or Aud. Prereq—MEd candidate or #, no Graduate School credit)  
Understanding the formal classroom environment: scope and sequence, management, assessment, and standards for applications pertinent to audience and setting in environmental education.

**ENED 5855. Programming for School Systems.** (2 cr; A-F or Aud. Prereq—5850, Educ 5850 or #, no Graduate School credit)  
The relationship between environmental education and the formal school system (P-12) will be examined. Instructional approaches that use the environment as a context for helping students develop essential content and skills in the core academic disciplines will be emphasized.

**ENED 5998. Outdoor Education Seminar.** (1 cr [max 3 cr]; S-N or Aud. Prereq—[Rec 4998], #, no Grad School cr) Facilitated discussions and presentations of contemporary recreation research, curricula, and/or issues.

## Environmental Science (ESCI)

Swenson College of Science and Engineering

**ESCI 2210. Science and Management of Environmental Systems.** (4 cr; A-F or Aud. Prereq—Biol 1011, Chem 1151, Chem 1152, Geol 1110 or #)

Scientific foundations of major environmental issues, water chemistry, atmospheric chemistry, natural resources, global climate, national and international environmental regulation and policy, and environmental economics.

**ESCI 3101. Nonrenewable Resources.** (4 cr; A-F or Aud. Prereq—2210, Chem 1151 or 1161, Phys 2011 or #)

Geology of nonrenewable resources and introduction to extractive industry methods and procedures. Formation and occurrence of natural resources, theory and practice of technologies associated with the production, separation, purification, conversion, consumption, and waste disposal of nonrenewable energy and mineral resources.

**ESCI 3102. Renewable Resources.** (4 cr; A-F or Aud. Prereq—3101 or #, Phys 2012)

Principles of renewable energy, energy conversion, irreversible thermodynamics and thermodynamic engines, thermoelectric generators, turbines, photovoltaic conversion, electrochemical conversion, fuel cells, pumping efficiency, wind energy, conversion of wave energy, heat pumps, ecosystems and biomass energy, and energy transmission and storage.

**ESCI 3291. Independent Study.** (1-3 cr [max 3 cr]; Stdnt Opt. Prereq—#)

Directed, student motivated, study arranged with instructor and ESCI director before registration.

**ESCI 3296. Cooperative Education.** (1 cr; A-F only. Prereq—2210)

Practical work experience with an employer closely associated with student's academic area. Arranged by mutual agreement between student, department, and employer. Formal written report and oral report of work completed must be submitted to department at end of experience.

**ESCI 4101. Pollution and Technology.** (4 cr; A-F or Aud. Prereq—2210, Chem 1151 or 1161, Phys 2011 or #, no Grad School cr)

Sources, distribution, and ultimate fate of air, water and solid/hazardous wastes. Principles of treatment of point and non-point source wastes. Case studies of successful remediation technologies. Models of contaminant movement in the environment. Landfill construction. Application of federal law: National Environmental Policy Act, Clean Air Act, Clean Water Act, Pollution Prevention Act, Resource Conservation and Recovery Act, and Superfund Amendments and Reauthorization Act.

**ESCI 4102. Environmental Assessment.** (4 cr; A-F or Aud. Prereq—3102, 4101 or #; no Grad School cr)

Environmental issues identification and investigation. Review of case studies of environmental investigations and the components of environmental impact statements. Selection of local or regional environmental issues and evaluation of the environmental problems from a multidisciplinary perspective. Preparation of draft Environmental Impact Statement (EIS).

## Environmental Studies (ES)

College of Liberal Arts

**ES 1001. Introductory Seminar.** (2 cr; A-F only)

Introduction to the complexities of multidisciplinary environmental issues through research and literature review with emphasis on development of critical thinking skills.

**ES 2001. Ecosystems I.** (3 cr; A-F only. Prereq—ES major)

Contains a theoretical description of the fundamental physical, chemical and biological components comprising ecosystems, how these components interact to determine ecosystem structure and function, and the response of these components, hence ecosystems, to anthropogenic stress.

**ES 2002. Ecosystems II.** (3 cr; A-F only. Prereq—2001)

Builds upon the theoretical information provided in ES 2001 by providing students a hands-on approach to understanding ecosystem dynamics. Students will learn hypothesis testing, experimental techniques, and methods for analyzing data that indicates ecosystems' response to anthropogenic stress.

**ES 2803. Issues in Global Ecology.** (3 cr; A-F or Aud. Prereq—[Biol 2803] LEIP 05)

Holistic approach to current status and future prospects of Earth's life support systems.

**ES 3500. Ecological Economics.** (3 cr; A-F only. Prereq—[ES major or cand] and [Econ 1022 or Econ 1023] or #)

Examine the basic principles and assumptions of Micro and Macro Economics, and their relevance in our modern global economic system. Examine the environmental/social consequences of deviations from these assumptions, and alternative economic models/analyses and policies consistent with sustainable development.

**ES 4001. Independent Study.** (1-3 cr [max 3 cr]; A-F only. Prereq—60 cr or #; no Grad School credit)

Directed readings and projects for students who wish to do independent advanced study or work on topics not normally covered in other courses.

**ES 5001. Environmental Studies Seminar.** (4 cr; A-F only. Prereq—ES major, 90 cr; no Grad School credit)

Critical discussion, research, and literature review of multidisciplinary environmental issues.

**ES 5040. Environmental Studies Internship Preparation.** (1 cr; S-N only. Prereq—ES major, no Grad School credit)

Various employers and members of environmental organizations in the Duluth region, and in Minnesota will speak to the class each week to describe what they do in their respective fields of environmental studies. Students will research careers in environmental studies, producing reports on prominent fields and directions in environmental sciences. Students will be placed with perspective internship experiences at the end of the semester.

**ES 5050. Environmental Studies Internship.** (3 cr; S-N only. Prereq—5040, ES major, No Grad School cr)

Practical experience in some field of environmental work, under direction of a faculty adviser and a work-site adviser.

## Exercise Science Athletic Training (ESAT)

College of Education and Human Service Professions

**ESAT 2400. Applied Exercise Science.** (3 cr; A-F or Aud. Prereq—[PEP 3035 or CC 3101], Pre pe major or coaching minor)

Physiological and biomechanical principles of physical training and conditioning.

**ESAT 2420. Resistance and Power Training Techniques.** (3 cr; A-F or Aud. Prereq—Exercise science major, min 30 cr)

Resistance and power training techniques consisting of supplemental, complex, core strength and Olympic lifting exercises and polymeric techniques. Active participation and practical exam required. Includes training and evaluation procedures and techniques, as well as safety and spotting requirements. (2 hours lecture, 2 hours lab per week.)

**ESAT 2610. Introduction to Athletic Training.** (3 cr; A-F or Aud. Prereq—[PEP 2610], Pre-athletic training or #)

An overview of the responsibilities of an athletic trainer and the athletic trainer's role as a sports medicine team member; as well as the basic concepts in the prevention, recognition, and care of injuries to the physically active.

**ESAT 2620. Prevention and Care of Athletic Injuries.** (2 cr; A-F or Aud. Prereq—[PEP 2620], Athletic training major)

Principles and techniques of the prevention and care of common athletic injuries. Emphasis is on preparing the student to make appropriate decisions in the prevention, first aid treatments, emergency care, and transportation of the sick and injured in sports.

**ESAT 2697. Clinical Experience in Athletic Training I.** (2 cr; A-F or Aud. Prereq—2610, Athletic Training major)

Athletic training psychomotor skills are enhanced and assessed by an approved clinical instructor during the clinical rotation. Emphasis is on competencies and proficiencies previously instructed in courses. A minimum of 100 hours of clinical experience are required.

**ESAT 2698. Clinical Experience in Athletic Training II.** (2 cr; A-F or Aud. Prereq—2697, Athletic Training major)

Athletic training psychomotor skills are enhanced and assessed by an Approved Clinical Instructor. Emphasis is on competencies and proficiencies previously instructed in courses. A minimum of 100 hours of clinical experience are required.

**ESAT 3200. Motor Learning and Development.** (5 cr; A-F or Aud. Prereq—Athletic training cand or exercise science cand or pe cand or #)

Principles and practices that affect the learning and performing of motor skills; theories of motor learning; professional applications of the motor learning in exercise science, physical therapy, athletic training, and physical education.

**ESAT 3210. Exercise Adherence.** (3 cr; A-F or Aud. Prereq—Exercise science cand or #)

Fundamental concepts of exercise psychology. Physical activity models of involvement; exercise determinates and correlates; exercise interventions.

**ESAT 3300. Human Biomechanics.** (4 cr; A-F or Aud. Prereq—Phys 1001, athletic training cand or exercise science cand or #)

Application of physical laws to human movement. Laws of mechanics and tissue biomechanics concepts are applied to human motor function. (3 hr lect, 1 hr lab)

**ESAT 3400. Exercise Physiology.** (4 cr; A-F or Aud. Prereq—Hlth 2040 or PHSL 3011, athletic training or exercise science cand or #)

Physiological responses and adaptations to acute and chronic exercise. (3 hrs lect, 1.25 hrs lab)

**ESAT 3410. Performance Nutrition and Weight Management.** (4 cr; A-F or Aud. Prereq—Hlth 1470, athletic training cand or exer science cand or #)

A study of the principles of sports nutrition with emphasis on the effects of diet on body composition, metabolic processes, physiological function, and physical performance.

## Course Descriptions

**ESAT 3420. Exercise Testing and Prescription.** (4 cr; A-F or Aud. Prereq=3400, athletic training or exercise science cand or #)

Physical fitness programming for adults; principles of exercise testing and prescription.

**ESAT 3430. Principles of Strength and Conditioning Programs.** (4 cr; A-F or Aud. Prereq=3400, athletic training or exercise science cand or #)

Theory and practice of developing and implementing strength training and conditioning programs; emphasis on technique analysis and instructional methods.

**ESAT 3432. Exercise Leadership.** (3 cr; A-F or Aud. Prereq=Exercise science cand or #)

Principles and practices of group exercise leadership and instruction.

**ESAT 3440. Clinical Exercise Physiology.** (5 cr; A-F or Aud. Prereq=3420, exercise science cand or #)

Examination of the use of physiological principles and relationships in clinical situations where exercise is used for prevention or alleviation of disease.

**ESAT 3450. Management of Fitness Facilities.** (3 cr; A-F or Aud. Prereq=Exercise science cand or #)

Theory and practice of managing sports facilities.

**ESAT 3600. Fundamentals of Athletic Training Evaluation.** (4 cr; A-F or Aud. Prereq=[PEP 3632], 2620, athletic training major)

Fundamental concepts of functional anatomy and biomechanics related to athletic performance and injury. An introduction to injury evaluation, palpation, goniometry, and manual muscle testing will also be presented.

**ESAT 3630. Athletic Injury Evaluation I.** (3 cr; A-F or Aud. Prereq=[PEP 3620], 3600, athletic training major)

Pathology, etiology, palpation, special tests, and neurological tests used by athletic trainers in the evaluation of injuries to the lower extremity, lumbar spine and pelvic structure.

**ESAT 3632. Athletic Injury Evaluation II.** (3 cr; A-F or Aud. Prereq=3630, athletic training major)

Pathology, etiology, palpation, special tests, and neurological tests used by athletic trainers in the evaluation of injuries to the upper extremity, head, neck and torso.

**ESAT 3640. Therapeutic Modalities.** (3 cr; A-F or Aud. Prereq=[PEP 3640], 3600, 3630, 3632, athletic training major.)

Theories and concepts in the appropriate application and utilization of therapeutic modalities in the treatment of athletic injuries. A supervised laboratory experience is included within this course to ensure that students develop the appropriate psychomotor skills in applying and using each modality safely.

**ESAT 3642. Therapeutic Exercise.** (3 cr; A-F or Aud. Prereq=[PEP 3610], 3640, athletic training major)

Theories and concepts in the appropriate application and utilization of therapeutic exercises in the rehabilitation of athletic injuries. A supervised laboratory experience is included within this course to ensure that students develop the appropriate psychomotor skills in applying and using rehabilitation techniques.

**ESAT 3697. Clinical Experiences in Athletic Training III.** (2 cr; A-F or Aud. Prereq=2698, Athletic Training major)

Athletic training psychomotor skills are enhanced and assessed by an approved clinical instructor during the clinical rotation. Emphasis is on previously learned classroom material. 225 hours of clinical experiences are required.

**ESAT 3698. Clinical Experiences in Athletic Training IV.** (2 cr; A-F or Aud. Prereq=3697, Athletic Training major)

Athletic training psychomotor skills are enhanced and assessed by an approved clinical instructor during the clinical rotation. Emphasis is on previously learned classroom material. 225 hours of clinical experiences are required.

**ESAT 4001. Pharmacology in Athletic Training.** (2 cr; A-F or Aud. Prereq=3632, 3642, 3698, Athletic Training major, no Grad School cr)

Pharmacological application of therapeutic medications commonly prescribed for acute and chronic health problems and injuries in athletic populations. Also examined is the use and abuse of drugs, ergogenic aids and supplements frequently used by athletes.

**ESAT 4600. Senior Seminar Athletic Training.** (3 cr; A-F or Aud. Prereq=[PEP 5600], 4001, Athletic Training major, no Grad School cr)

A culminating course that includes the athletic training student portfolio, encompasses the final preparation for the NATABOC examination, and concludes with athletic training research techniques and synthesis.

**ESAT 4646. Medical Aspects of Athletic Training.** (3 cr; A-F or Aud. Prereq=3642, 3698, Athletic Training major, no Grad School cr)

The recognition, evaluation, management, and treatment of non-orthopedic medical conditions that affect the physically active population.

**ESAT 4650. Administrative Aspects of Athletic Training.** (3 cr; A-F or Aud. Prereq=4646, 4001, Athletic Training major, no Grad School credit)

Managerial and organizational strategies for developing and directing athletic training services at the high school, collegiate, and clinical setting. Practical applications and case studies are emphasized.

**ESAT 4697. Clinical Experiences in Athletic Training V.** (2 cr; A-F or Aud. Prereq=3697, Athletic Training major, no Grad School cr)

Athletic training psychomotor skills are enhanced and assessed by an approved clinical instructor during the clinical rotation. Emphasis is on previously learned classroom material. 300 hours of clinical experience are required

**ESAT 4698. Clinical Experiences in Athletic Training VI.** (2 cr; A-F or Aud. Prereq=4697, Athletic Training major, no Grad School credit)

Athletic training psychomotor skills are enhanced and assessed by an approved clinical instructor during the clinical rotation. Emphasis is on previously learned classroom material. 300 hours of clinical experiences are required.

**ESAT 4700. Statistics and Research Methods in Exercise Science.** (4 cr; A-F or Aud. Prereq=12 cr from 3200, 3300, 3400, 3410, athletic training or exercise science candidate, no Grad School cr)

Interpretation of statistical procedures and research design in exercise science. Prepares students to conduct research projects in the exercise physiology, biomechanics, motor learning, and the psychological factors that influence exercise.

**ESAT 4710. Applied and Experimental Exercise Science.** (4 cr; A-F or Aud. Prereq=4700 or #, exercise science cand, no Grad School cr)

Advanced study and research in exercise science; methods of quantifying exercise responses and adaptations; basic research design.

**ESAT 4996. Internship.** (3-12 cr [max 12 cr]; S-N or Aud. Prereq=3420, exercise candidate, #, no Grad School cr)

Supervised field internship experience in hospital, fitness facility, or agency setting.

## Family Medicine (FMED)

### School of Medicine

**FMED 5591. Independent Study.** (1-8 cr [max 12 cr]; Stnt Opt. Prereq=%)

Intensive, independent study project of student's interest in medical research, interdisciplinary fellowship, preceptorship in rural health care delivery, or another medical area approved by Department of Family Medicine.

**FMED 6101. Family Medicine.** (2 cr; P-N or Aud. Prereq=Regis med student)

Lectures and seminars on disease syndromes affecting human organ systems and on disease prevention with reference to health issues in epidemiology, environment, and public health; exposure to community preventive health and alternative medicine programs; provides basic foundation in current computer technology.

**FMED 6121. Preceptorship I.** (1 cr; P-N or Aud. Prereq=Regis med student)

Students spend periods with area physician in family medicine observing problems encountered in this type of practice and methods by which health care is delivered.

**FMED 6122. Preceptorship II.** (4 cr; P-N or Aud. Prereq=Regis med student)

Students spend periods with area physician in family medicine observing problems encountered in this type of practice and methods by which health care is delivered.

**FMED 6441. Clinical Rounds and Clerkship I.** (1 cr; O-N only. Prereq=Regis med student)

Clinical practicum, hospital based, covering core material in family practice, internal medicine, obstetrics, pediatrics, surgery. Patient work-ups with discussion by preceptor.

**FMED 6442. Clinical Rounds and Clerkship II.** (2 cr; O-N only. Prereq=Regis med student)

Clinical practicum, hospital based, covering core material in family practice, internal medicine, obstetrics, pediatrics, surgery. Patient work-ups with discussion by preceptor.

**FMED 6461. Preceptorship III.** (2 cr; P-N or Aud. Prereq=Regis med student)

Students spend periods of time with a physician in family practice in rural/small communities of Minnesota and Wisconsin observing methods by which health care is delivered.

**FMED 6462. Preceptorship IV.** (3 cr; P-N or Aud. Prereq=Regis med student)

Students spend periods of time with a physician in family practice in rural/small communities of Minnesota and Wisconsin observing methods by which health care is delivered.

**FMED 6501. Clinical Pathology Conferences I.** (1 cr; P-N or Aud. Prereq=Regis med student)

Applying knowledge gained in pathology and laboratory medicine to an unknown clinical case in order to work through a differential diagnosis.

**FMED 6502. Clinical Pathology Conferences II.** (1 cr; P-N or Aud. Prereq=Regis med student)

Applying knowledge gained in pathology and laboratory medicine to an unknown clinical case in order to work through a differential diagnosis.

**FMED 6967. The Healer's Art.** (1 cr; P-N or Aud. Prereq=Regis med student, #, no Grad School credit)

Provides a basis for inquiry and discussion between medical students and clinical faculty on topics that are entwined within the practice of medicine. Due to course content, enrollment is limited.

**FMED 6977. Family Connection.** (1 cr; P-N or Aud. Prereq—Preregis med, #, cannot be concurrently registered for 6987)

Introduces the first-year medical student to family health care concepts through contact with an assigned family in conjunction with their local family physician, lectures and small group discussions. Due to course content, enrollment is limited.

**FMED 6987. Obstetrical Longitudinal Course.** (1 cr; P-N or Aud. Prereq—Preregis med, #, cannot be concurrently registered for FMED 6977)

Introduces the first-year medical student to obstetrical care through small group lectures and discussions while following an obstetrical patient on a longitudinal basis in conjunction with a local family practitioner or OB specialist. Due to course content, enrollment is limited. Discussion.

**FMED 6997. Rural Academy of Leadership.** (1 cr; P-N only. Prereq—Preregis med, #)

Learn how to use interests and talents in the community through volunteer service and leadership. Consists of lecture/discussion sessions and training/orientation retreat to prepare for volunteer activities at a local free clinic. Includes a community service project that will culminate in a presentation to others at the end of the course.

**FMED 7100. Clinical Family Medicine.** (13 cr [max 117 cr]; P-N or Aud. Prereq—%; no Grad School credit)

Supervised care of patients of all ages emphasizing continuous, primary, preventive, acute, and chronic care in all general diagnostic categories.

## Finance and Management Information (FMIS)

Labovitz School of Business and Economics

**FMIS 2201. Information Technology in Business.** (3 cr; A-F or Aud. =CS 1011, FMIS 1201, FMIS 3201. Prereq—LSBE student or Computer Information Systems majors, min 15 cr or @)

Introduction to information technology (IT) concepts: computer hardware and software; use of personal productivity tools (spreadsheet, database, and presentation software); system development processes; Web technologies; applications of IT in business processes.

**FMIS 3141. Business Communications.** (3 cr; A-F or Aud. Prereq—LSBE cand or Econ major or @)

Principles of business communication and their application to oral, written, and nonverbal communication.

**FMIS 3220. Database Management and Design.** (3 cr; A-F only. Prereq—2201 or CS 1121 or CS 1511, LSBE cand or @)

Concepts and structures relating to design, implementation, and administration of database management systems. Emphasis on relational databases and development of integrated applications.

**FMIS 3222. Systems Analysis and Design.** (3 cr; A-F or Aud. Prereq—2201, LSBE cand or @)

Analysis phase of systems development life cycle. Emphasizes feasibility study, requirements analysis, and system specification. Detailed study of current physical and logical systems models and specification.

**FMIS 3224. Telecommunications.** (3 cr; A-F or Aud. Prereq—3201 or 2201, CS 1121 or CS 1511, LSBE cand or @)

Management of telecommunications networks from a business problem solving perspective. Survey of telecommunications technologies, network architectures, management issues, and evolving business environments.

**FMIS 3232. Visual Web Programming.** (3 cr; A-F or Aud. Prereq—2201 or 3201, LSBE candidate or @)

Introduces Microsoft .Net technology, which consists of the .Net Platform and the .Net Framework. Focuses on the ASP.Net with VB.Net, which is part of .Net Framework designed for developing Web applications and Web services.

**FMIS 3240. Enterprise System Architectures.** (3 cr; A-F or Aud. Prereq—2201 or CS 1121, LSBE candidate or @)

Combines an accelerated introduction to an object-oriented programming language with an appreciation for developing scalable, flexible and interoperable enterprise-wide application. Focus is on how to select appropriate technologies and combine them in the design of effective enterprise architectures.

**FMIS 3291. Independent Study MIS.** (1-3 cr [max 3 cr]; A-F only. =FMIS 3691. Prereq—%)

Special work in information sciences that extends beyond, or in greater depth than, regular course offerings.

**FMIS 3295. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—LSBE candidate or @)

Exploration of specific MIS problems, issues, and approaches.

**FMIS 3301. Production and Operations Management.** (3 cr; A-F or Aud. Prereq—LSBE cand or approved non-LSBE 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, quality management, and project management. Computer applications of quantitative techniques to support operations decision making.

**FMIS 3397. LSBE Internship.** (3 cr; A-F or Aud. Prereq—Admitted to LSBE candidacy, consent of internship director)

Work-integrated learning program providing practical experiences within students' majors. Students participate in an approved program within cooperating businesses, government agencies, or civic organizations. Requires minimum 200 hours work experience, assigned written reports, and performance evaluations.

**FMIS 3601. Corporation Finance.** (3 cr; A-F or Aud. Prereq—LSBE cand or approved non-LSBE bus adm minor or @)

Fundamental concepts of managerial financial decision making. Time value of money, valuation, risk and return, financial statement analysis, short-run financial management, capital budgeting, cost of capital, long-term financing, and corporate taxation.

**FMIS 3612. Managerial Finance.** (3 cr; A-F or Aud. Prereq—3601, LSBE cand or @)

Intermediate conceptual and analytical applications in capital budgeting, funds flow, cost of capital, debt management, equity financing, mergers and acquisitions, business reorganizations, international financial management.

**FMIS 3619. Analysis of Financial Statements.** (3 cr; A-F or Aud. =ACCT 3619. Prereq—3601, LSBE candidate or #)

Analysis and interpretation of financial statements, presentation of analytical techniques, including trend, comparative, and ratio analysis. Use of computer assisted analysis

**FMIS 3632. Retirement and Employee Benefits Planning.** (3 cr; A-F only. Prereq—3601, LSBE candidate, or @)

Aspects of employee benefits and retirement planning both in theory and as the principles are applied in practice. Typical focus includes employee benefits plans and insurance, retirement needs analysis, social security and medicare, and investment options and considerations.

**FMIS 3644. Investment Fundamentals.** (3 cr; A-F or Aud. Prereq—3601, LSBE cand 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.** (3 cr; A-F or Aud. Prereq—3601, LSBE cand or @)

Analysis of money and capital markets, savings-investment process, and financial institutions. Role of Federal Reserve and Treasury in finance market development; supply and demand for loanable funds; level and structure of interest rates. Asset/liability management.

**FMIS 3649. International Finance.** (3 cr; A-F or Aud. Prereq—3601, LSBE cand or @)

Comprehensive framework and analysis for financial management of international firm. International financial markets, exchange rates and international firms, elements of international investments, financing decisions, and strategy formulation.

**FMIS 3655. Risk Management and Insurance.** (3 cr; A-F or Aud. Prereq—3601, LSBE candidate or #)

Foundations as well as the economic, financial and legal issues surrounding risk management and insurance. Students will discuss and analyze risk management techniques currently used in business and examine different types of insurance policies.

**FMIS 3691. Independent Study Finance.** (1-3 cr [max 3 cr]; A-F only. =FMIS 3291. Prereq—%)

For students wishing to do special work in finance that extends beyond, or in greater depth than, regular course offerings.

**FMIS 3695. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—3601, LSBE cand or @)

Exploration of specific finance problems, issues, and approaches.

**FMIS 4220. Medical Informatics.** (3 cr; A-F or Aud. Prereq—2201 or 3201, LSBE cand or @, no Grad School cr)

Introduction to the convergence of computing, information systems, and healthcare with a focus on managing information and developing systems that leads to more effective decisions and actions in healthcare. Covers the standards, ethics and security of the electronic health record.

**FMIS 4221. Extensible Markup Language and its Applications.** (3 cr; A-F or Aud. Prereq—2201 or 3201, LSBE candidate, or @)

Intermediate course that focuses on the fundamentals of the XML specification of the W3C and its related technologies, including XML Schema, XPath, XQuery, and XSLT. Writing well-formed and valid XML documents, defining DTDs and schemas, exchanging and manipulating XML data via an RDBMS, and integrating XML technologies into Web applications will be covered.

**FMIS 4225. Advanced Applications Development.** (3 cr; A-F only. Prereq—3220, 3222, MIS major or @)

Development of advanced microcomputer-based applications using modern development environments (languages). Emphasis on systems development and integration, interface design, and data access strategies.

**FMIS 4295. MIS Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—2201 or 3201, LSBE cand or @)

Exploration of specific MIS problems, issues, and approaches

## Course Descriptions

**FMIS 4615. Futures and Options.** (3 cr; A-F or Aud. Pre-req-3644, LSBE cand with 60 cr or grad student 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 4616. Security Analysis.** (3 cr; A-F or Aud. Pre-req-3644, Acct 3101 or FMIS 3619; %; no Grad School credit)

Introduction to theory, concepts, and practices of security analysis and investment practices. Common stock, fixed income securities, derivative securities, and mutual funds will be analyzed. Other topics include sector analysis, financial statement analysis, ratio analysis, diversification, and hedging.

**FMIS 4617. Management of Financial Institutions.** (3 cr; A-F or Aud. Pre-req-3647, LSBE cand with 60 cr or grad student or @)

Techniques for managing commercial banks and other financial institutions through asset/liability management.

**FMIS 4620. Portfolio Theory and Analysis.** (3 cr; A-F or Aud. =FMIS 4611. Pre-req-4616, %; no Grad School cr) Portfolio management in a modern portfolio theory (MPT) framework. Risk measurements, risk-return relationships, and portfolio models are developed. Topics include Markowitz portfolio theory, risk-return models, bond portfolio management, evaluating portfolio performance, and outperforming the market.

**FMIS 4624. Applied Portfolio Management.** (3 cr; A-F or Aud. Pre-req-4616, 4620, %; no Grad School credit) Gives students in the financial markets program "hands on" learning experience by analyzing and managing a real-money investment fund. Students will be responsible for managing all aspects of the investment fund.

**FMIS 4644. Portfolio Management.** (3 cr; A-F or Aud. Pre-req-3644, LSBE candidate) Portfolio analysis in the mean-variance framework of Markowitz. Portfolio management strategies. The CAPM, APT, and other capital market theory implications. Portfolio performance evaluation.

**FMIS 4695. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Pre-req-LSBE cand or @; no Grad School credit) Exploration of specific finance problems, issues, and approaches.

## Fine Arts (FA)

### School of Fine Arts

**FA 1102. Creating Art.** (3 cr; A-F or Aud. Pre-req-=[1101] LE 9)

Discussion/direct experience of settings/ways in which art (including aesthetic philosophy and other creative work) arises.

**FA 2595. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; Stdnt Opt) Selected studies with interdisciplinary or multidisciplinary focus.

## Foreign Studies (FORS)

### Academic Administration

**FORS 1xxx-5xxx. Foreign Studies Courses.** (1-20 cr; Stdnt Opt. Pre-req-Admission to an approved study abroad program. Required consent from the International Education Office.)

Undergrad and graduate courses used to designate study abroad courses.

## Foreign Studies (FST)

### Academic Administration

**FST 228. Foreign Studies Preparation.** (0 cr; No grade. Pre-req-#)

Provides tools necessary to prepare for and improve their study abroad experience. On-line instruction allows students to explore the country and culture in which they will study abroad as well as preparing them to develop realistic expectations of themselves and their study abroad experience.

**FST 2929. Orientation to Foreign Studies.** (2 cr; S-N or Aud. Pre-req-Admitted to an approved Study Abroad Program, required consent from the International Education Office)

Study Abroad Course

**FST 4949. Foreign Study Synthesis.** (2 cr; S-N or Aud. Pre-req-Admitted to an approved Study Abroad Program, required consent from the International Education Office. INTL PERSP)

Study Abroad Course, IP theme.

**FST 1xxx-5xxx. Foreign Studies Courses.** (1-20 cr, Pre-req- Admission to an approved study abroad program. Required consent from the International Education Office) Undergrad and graduate courses used to designate study abroad courses.

## French (FR)

### College of Liberal Arts

**FR 1101. Beginning French I.** (4 cr; A-F or Aud. Pre-req-Little or no prior formal study of this language, or # LE 3) Conversation and communicative course for students with little or no previous study of French. Emphasis on oral and aural skills; some grammar. Taught in French and English.

**FR 1102. Beginning French II.** (4 cr; A-F or Aud. Pre-req-1-2 yrs high school Fr or 1101 or # LE 3) Conversation and communicative course for students with limited previous study of French. Emphasis on oral and aural skills; some grammar. Taught in French and English.

**FR 1201. Intermediate French I.** (4 cr; A-F or Aud. Pre-req-3-4 yrs high school Fr or 1102 or # LE 3) Consolidation and enrichment of previously acquired abilities speaking and understanding French, set within introduction to written French and survey of contemporary culture of French-speaking societies. Emphasis on oral, aural, and reading skills; vocabulary building; some writing. Taught in French.

**FR 1202. Intermediate French II.** (4 cr; A-F or Aud. Pre-req-4 yrs high school Fr or 1201 or # LEIP 03) Consolidation and enrichment of previously acquired abilities speaking and understanding French, set within introduction to written French and survey of contemporary culture of French-speaking societies. Emphasis on oral, aural, and reading skills; vocabulary building; some writing. Taught in French.

**FR 2301. Advanced French.** (4 cr; A-F or Aud. Pre-req-5 yrs high school Fr or 1202 or # LEIP 03) Development of French literacy within a culturally authentic contemporary context. Emphasis on practical writing and formal oral and aural communication skills; vocabulary building; enhancement of reading skills; review of key grammar. Taught in French.

**FR 2315. French Cinema.** (4 cr; A-F or Aud. LEIP 09) Images of human diversity in French cinema. Films with English subtitles; class discussion in English.

**FR 3031. French Language Study Abroad I.** (1-5 cr [max 10 cr]; Stdnt Opt. Pre-req-#)

For students pursuing formal study of French, beyond the beginning and intermediate levels, in a French-speaking country, under the auspices of another college or university or by individual agreement.

**FR 3032. French Language Study Abroad II.** (1-5 cr [max 10 cr]; Stdnt Opt. Pre-req-#)

For students pursuing formal study of French, beyond the beginning and intermediate levels, in a French-speaking country, under the auspices of another college or university or by individual agreement.

**FR 3045. French Culture and Civilization Study Abroad I.** (1-5 cr [max 10 cr]; Stdnt Opt. Pre-req-#)

For students pursuing formal study of French culture and civilization, beyond the beginning and intermediate levels, in a French-speaking country, under the auspices of another college or university or by individual agreement.

**FR 3046. French Culture and Civilization Study Abroad II.** (1-5 cr [max 10 cr]; Stdnt Opt. Pre-req-#)

For students pursuing formal study of French culture and civilization, beyond the beginning and intermediate levels, in a French-speaking country, under the auspices of another college or university or by individual agreement.

**FR 3047. French Culture and Civilization Abroad III.** (1-5 cr [max 10 cr]; Stdnt Opt. Pre-req-#)

For students pursuing formal study of French culture and civilization, beyond the beginning and intermediate levels, in a French-speaking country, under the auspices of another college or university or by individual agreement.

**FR 3048. French Culture and Civilization Study Abroad IV.** (1-5 cr [max 10 cr]; Stdnt Opt. Pre-req-#)

For students pursuing formal study of French culture and civilization, beyond the beginning and intermediate levels, in a French-speaking country, under the auspices of another college or university or by individual agreement.

**FR 3302. Advanced French Composition and Conversation.** (4 cr; A-F or Aud. Pre-req-2301 with grade of C or higher)

Refines students' skills in oral and written expression after they have completed the French language sequence. Individualized work on points of syntax and semantics, set in a contemporary context, using a variety of texts and resources.

**FR 3310. Survey: Essays, Short Stories, Poetry in the French Language.** (4 cr; A-F or Aud. Pre-req-2301 with C or higher or #)

Selected works in three genres, written in the French language from the 15th Century to the present: essays, short stories, poetry.

**FR 3591. Independent Study.** (1-4 cr [max 8 cr]; A-F or Aud. Pre-req-2301 with C or better, #) Students develop and carry out reading and research programs in consultation with the instructor.

**FR 4412. Contemporary French Culture and Society.** (4 cr; A-F or Aud. Pre-req-2301 with grade of C or higher or #; no Grad School credit)

Study of contemporary social, cultural, and political issues in France and other Francophone regions. Conducted in French.

**FR 4422. 20th-Century Novel.** (4 cr; A-F or Aud. Pre-req-2301 or equiv with C or better or #; no Grad School credit)

Study of representative novels.

**FR 4472. French Classical Literature.** (4 cr; A-F or Aud. Pre-req-2301 or equiv with C or better or #; no Grad School credit)

Representative works of 17th-century French prose, poetry, and theatre.

**FR 4482. Voltaire and Rousseau in English.** (4 cr; A-F or Aud. Prereq–2301 or equiv with C or better or #; no Grad School credit)

Representative works.

**FR 4492. 19th-Century Novel.** (4 cr; A-F or Aud. Prereq–2301 with C or better or #; no Grad School credit) Study of several novels by major 19th-century writers: Hugo, Balzac, Stendhal, Flaubert, Zola, Maupassant).

## Geography (GEOG)

College of Liberal Arts

**GEOG 1202. World Regional Geography.** (3 cr; A-F only. LEIP 08)

Geography of human groups in diverse settings. Emphasis on cultural diversity, regional development, and human and environmental forces shaping regional patterns and processes. Geographic analysis of selected regions and countries.

**GEOG 1304. Human Geography.** (3 cr; A-F only. LECD 06) 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 1414. Physical Geography.** (4 cr; A-F only. LE 4) Earth-sun relations, maps and globes, and major factors of the natural environment, including water resources, landforms, weather and climate, natural vegetation, and soils. (3 hrs lect, 2 hrs lab)

**GEOG 2306. Environmental Conservation.** (3 cr; A-F only. LE 8)

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 2313. Economic Geography.** (3 cr; A-F only. LE 6) 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 2405. Geography of Cultural Diversity.** (3 cr; A-F only)

Culture is ubiquitous as it is ambiguous in social science research. Cultural geography overlaps into all other sub disciplines, along with current approaches, issues and debates in contemporary research. It defies any clear, satisfying definition. Consequently, the numerous philosophical, theoretical, methodological and ethical issues pertaining to the investigation and representation of culture in academia will be the focus.

**GEOG 2552. Introduction to Maps and Cartographic Methods.** (3 cr; A-F only. LE 2)

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 3334. Urban Geography .** (3 cr; A-F only. Prereq–Min 30 or incl 3 cr Geog or #)

As the world becomes more urbanized there seems to be less distinction between global problems and urban problems. Analysis of the relationship between urbanization and other aspects of our modern world such as economic globalization, increased levels of international migration, and warfare. Examine how global dilemmas can be

seen in the national and international issues. Pay particular attention to the everyday struggles that occur in the households and neighborhoods of cities as people attempt to care for themselves and their families in this rapidly changing world.

**GEOG 3335. Urban Planning.** (3 cr; A-F only. Prereq–Min 30 or incl 3 cr Geog)

Urban planning explores the purpose, practice, and theories of modern community planning for the promotion of social and economic well-being. The causes of urban problems, and the tools planners can use to solve them will be investigated. Special focus will be paid to citizen participation and how the voices of community members can be heard in the planning process.

**GEOG 3350. Geography of Population, Gender, and Migration.** (3 cr; A-F only)

Explores issues and themes related to the special distribution of the world's population. Various factors are involved in population change including fertility, mortality, migration, immigration, food, health, and environment. Population geographers have begun to recognize the importance of gender in the spatial patterns and social dimensions of human activities. Focuses on the critical population theories; examines social constructions and geographical variations based on masculinity and femininity; and relates to the complex relations between gender and population in diverse historical and geographic settings.

**GEOG 3370. Geographies of Development.** (3 cr; A-F only. Prereq–Min 30 cr)

Focuses on the theories of development, development in practice, and the spaces of development. Specifically considers theories of development and their interpretations, strategies of development and developing nations, and interconnections and globalization and development.

**GEOG 3401. Weather and Climate.** (3 cr; A-F only. Prereq–1414, 25 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 3422. Natural Hazards.** (4 cr; A-F only. Prereq–1414, min 30 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 3461. Geography of Global Resources.** (3 cr; A-F only. Prereq–Min 30 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 3481. Urban Ecology.** (3 cr; A-F only)

Introduction to theoretical, practical and policy aspects of urban ecology. Discusses methods of sustainable cities and ecologically responsible planning. Includes study of relevant field techniques and policy issues, including public participation in planning process and development of sustainable growth strategies.

**GEOG 3532. Map Design and Graphic Methods.** (4 cr; A-F only. Prereq–2552 or #; Stat 1411 recommended)

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. (2 hrs lect, 4 hrs lab)

**GEOG 3702. Geography of the United States and Canada.** (3 cr; A-F only. Prereq–Min 30 or incl 6 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 3722. Geography of South Asia.** (3 cr; A-F only. Prereq–Min 30 or incl 6 cr Geog or #)

Looks back in the histories of South Asia to carefully examine the sociocultural economic and political dilemmas posed by colonialism considering the successes, failures, and ramifications of the post colonial project of reconciling diversity and change with the demand for unified and stable identities.

**GEOG 3762. Geography of Europe.** (3 cr; A-F only. Prereq–Min 30 cr incl 6 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 3991. Independent Study in Geography.** (1–4 cr [max 6 cr]; A-F only. Prereq–#)

For students interested in doing advanced work in selected fields of geography.

**GEOG 3995. Special Topics: (Various Titles to be Assigned).** (1–4 cr [max 8 cr]; A-F only. Prereq–#)

Topics in geography of current and special interest to students that are not offered in regular department curriculum. Topics may involve specialties of staff or visiting faculty.

**GEOG 3997. Internship in Geography.** (1–6 cr [max 8 cr]; Stnt Opt. Prereq–Geog major, 60 cr or #)

Scheduled assignments with direct supervision in public agencies or relevant private firms.

**GEOG 4393. Political Geography.** (4 cr; A-F only. Prereq–Min 75 cr inc 6 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 4394. Gender, Space and Culture.** (4 cr; A-F only. Prereq–Min 75 cr inc 6 cr geog or #)

Gender differences in experiences of space and place; relationship between gender politics and geographies of cities, regions, nation-states, and other social institutions; gender differences in “making place” and interacting with environments; emphasis on possibility of feminist alternatives.

**GEOG 4451. The Geography of Soils.** (4 cr; A-F only. Prereq–1414 or Geol 1110 or Chem 1113 or Chem 1151 or grad student or #)

Examines soil formation and processes in varied environments, with emphasis on soil as a dynamic system, integral to all terrestrial ecosystems. Human impact and use of soils is examined with regard to land degradation and soil erosion.

**GEOG 4563. Introduction to Geographic Information Science.** (3 cr; A-F only. Prereq–3532, &4564, 60 cr incl 16 cr geog or #)

Theory of design, operation, and application of geographic information science (GIS); theoretical application of GIS to environmental, physical, and socioeconomic problems; from data gathering and coding through spatial analysis and interpretation.

**GEOG 4564. Laboratory in Geographic Information Science.** (2 cr; A-F only. Prereq—Min 60 cr, &4563 or #) Application of geographic information science (GIS) to environmental, physical, and socioeconomic problems; from planning and creating a spatial database to spatial analysis of database to explore contemporary spatial problems.

**GEOG 4580. Introduction to Remote Sensing and Image Interpretation.** (4 cr; A-F only. Prereq—2552, 4563, 4564; course in computer programming, introductory statistics recommended) Introduces basic concepts of remote sensing of the environment. Intended to provide the background information necessary to successfully use remotely sensed imagery in conjunction with GIS technology to answer questions about the world in which we live.

**GEOG 5446. Water Processes and Management.** (4 cr; A-F only. Prereq—1414 or grad student) Introduction to the components of surface water processes and water resources management, including precipitation, runoff generation, channel processes, spatial and temporal variations in water distribution, aspects of water quantity and quality, and basin management problems.

**GEOG 5541. Environmental Application of GIS.** (4 cr; A-F only. Prereq—4563 or #) Introduction to ArcView GIS and its applications to the environmental issues such as natural hazards, forest management, contaminated sites, soil erosion, habitat assessment, and regional planning.

**GEOG 5543. Advanced Cartographic Methods.** (4 cr; A-F only. Prereq—3532, Stat 1411, 60 cr incl 12 cr geog or grad student or #) Alternative map representations, such as multimedia representations, map animations, and maps for physically challenged individuals. Focuses on cognitive issues concerning map design, such as color perception and symbolization, that enhance map reading and understanding. (2 hrs lect, 4hrs lab)

**GEOG 5612. Field Techniques.** (4 cr; A-F only. Prereq—Min 60 cr incl 12 cr geog or grad student 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 5803. Geographic Thought.** (3 cr; A-F only. Prereq—30 cr incl 12 cr geog or grad student or #) Development and significance of geographic concepts and thought. History and intellectual roots of contemporary geography, geographers, and geographic institutions.

**GEOG 5991. Independent Study in Geography.** (1-4 cr [max 6 cr]; A-F only. Prereq—Max 4 cr can be applied to Graduate School program; #) Independent problems for postbaccalaureate students interested in doing additional work in selected fields in geography.

**GEOG 5995. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 6 cr]; A-F only. Prereq—Grad student or #; max 8 cr to Grad School program) Topics of current and special interest to students that are not offered in regular curriculum. Topics may involve specialties of staff or visiting faculty.

**GEOG 5999. Senior Project in Geography.** (3-4 cr [max 4 cr]; A-F only. Prereq—#; Max 3 cr can be applied to Grad School program) Student-initiated field, lab, and/or library research topic. Formal written and oral presentation.

## Geology (GEOL)

Swenson College of Science and Engineering

**GEOL 1040. Freshman Seminar: Topics: (Various Titles to be Assigned).** (3 cr; A-F or Aud. Prereq—Freshman, fewer than 30 cr. LE 5)

Topics of general interest in the geosciences. Topic announced before course is offered.

**GEOL 1041. Freshman Seminar: Minerals and Life: All That Glitters is Not Gold.** (3 cr; A-F or Aud. Prereq—Freshman, fewer than 30 cr. LE 5)

Civilizations have been built by the exploitation of rock and mineral resources. This class chronicles mineral use from ancient civilization to the present. Topics covered include mineral composition, use exploitation through time as well as the identification of common useful minerals. Field Trip Required.

**GEOL 1042. Freshman Seminar: Natural Disasters and Civilization.** (3 cr; A-F or Aud. =GEOL 1047, GEOL 1052. Prereq—Freshman, fewer than 30 cr LE 5)

Natural disasters examined first from a geological perspective, and then in terms of their effects on civilizations and/or species.

**GEOL 1043. Freshman Seminar: Science and Societal Issues: Whom to Believe?.** (3 cr; A-F or Aud. Prereq—Freshman, fewer than 30 cr. LE 5)

Reading current topics in society dealing with scientific issues: e.g., global warming, water reserves, U.S. energy independence, evolutionary science vs. creationism. How do we read about these issues critically to form an opinion? Seminar class primarily for non-science majors.

**GEOL 1045. Freshman Seminar: Minnesota's Geologic History.** (3 cr; A-F or Aud. Prereq—Freshman, fewer than 30 cr. LE 4)

From volcanoes to oceans to Ice Ages, take a journey through 3.6 billion years of Minnesota's geologic history. The journey starts with volcanoes rising from the sea and takes students through episodes of mountain building, marine invasions, and Ice Ages. (Course fees assessed.)

**GEOL 1047. Freshman Seminar: People and Volcanoes.** (3 cr; A-F or Aud. =GEOL 1042, GEOL 1052. Prereq—Freshman, fewer than 30 cr LE 5)

From 3.7 million year old footprints in volcanic ash through world changing eruptions like Tambora and Santorini to robots investigating volcanic craters, this course explores the fascinating and dangerous relationship of humans and human civilizations with volcanoes.

**GEOL 1048. Freshman Seminar: Human Dimension of Global Environmental Change.** (3 cr; A-F or Aud. =GEOL 1058. Prereq—Freshman, fewer than 30 cr LEIP 05)

Study of environmental change on Earth, past and present. Integration of natural systems with human activity, including natural cycles in Earth systems, human population, resources, sustainability, global atmospheric change, and environmental ethics.

**GEOL 1110. Geology and Earth Systems.** (4 cr; A-F or Aud. LE 4)

Comprehensive survey of Earth's composition, structure, and dynamics to develop an understanding of internal processes, plate tectonics, and surface processes as a framework for geological history and development of life.

**GEOL 1120. Life and Death of the Dinosaurs.** (3 cr; A-F or Aud. LE 5)

Survey of dinosaurs, who dominated large-animal life on Earth for 150 million years; theories of dinosaur origins and extinction; habitat of dinosaurs on worldwide Mesozoic coastal plains; dinosaur fossilization and modern excavation.

**GEOL 1130. Introduction to Environmental Science.**

(4 cr; A-F or Aud. LEIP 04) Earth's physical and biological systems and human interaction with the environment. Climate, rocks, soils, ecosystems, human population, land use, energy use and its consequences, environmental policy, air and water pollution, and conservation issues.

**GEOL 1140. Climate Change and Human History.** (3 cr; A-F only. LEIP 05)

Examination of why Earth's climate has changed in the past and how these changes have affected humans. Topics will include theories of effects of climate on human evolution, the effects of climate on the rise and fall of civilizations. This provides a basis for discussion of potential effects of future climate change.

**GEOL 1610. Oceanography.** (3 cr; A-F or Aud. Prereq—[2610] LE 5)

Origin and history of ocean basins, sea floor morphology, chemistry of sea water, currents, waves, tides, life in the sea, primary productivity, nutrient dynamics, human impact.

**GEOL 2110. Earth History.** (3 cr; A-F only. Prereq—1110 or 1130 or 2610 or Ast 1040 or Geog 1414 or #)

The historical development of the science of geology, nature of the geologic record, fossils, the geologic time scale, and tectonic evolution of continents and ocean basins. Concepts presented are developed within the framework of the theory of plate tectonics.

**GEOL 2111. Earth History Laboratory.** (1 cr; A-F only. Prereq—1110 or 1130 or 2610 or Ast 1040 or Geog 1414 or #) Laboratory companion to GEOL 2110, the historical development of the science of geology. Geological science majors and minor are required to take this 1 (one) 2-hour lab each week.

**GEOL 2120. The Earth's Dynamic Interior.** (3 cr; A-F or Aud. Prereq—1110 or 1130 or 2110 or 1610 or Geog 1414)

Treatment of the origin, structure and internal composition of the Earth, synthesizing geological, chemical and physical knowledge bearing on the Earth's inaccessible interior. Emphasis is placed on dynamic processes at all depths in the Earth.

**GEOL 2311. Mineralogy.** (4 cr; A-F or Aud. =GEOL 2300. Prereq—1110 or 2110, 1 sem coll chem or #)

Systematic study of minerals and their relationship to rocks. Emphasis will be placed on introductory crystal chemistry, crystallography and physical properties; optical mineralogy, and identification of minerals in hand specimen, thin section, and by x-ray diffraction. (Course fee assessed.)

**GEOL 2312. Petrology.** (5 cr; A-F or Aud. Prereq—2311)

Petrology of igneous, sedimentary and metamorphic rocks, including their occurrence, petrogenesis and tectonic setting. Emphasis on the relationships between mineral assemblages, rock textures, geochemistry, origins, and rock-forming processes. Course fees assessed.

**GEOL 2350. Earth's Resources.** (3 cr; A-F or Aud. Prereq—Min 25 cr or # LEIP 05)

Distribution of Earth's resources through space and time, including metals, minerals, fossil fuels, building materials, water, and soil. Relationships between population growth and Earth's finite resources. (field trip)

**GEOL 3000. Geologic Maps.** (3 cr; A-F or Aud. Prereq—1110 or 1130 or Geog 1414)

Principles of reading and interpreting geological maps. Emphasis will be placed on interpreting and visualizing published geologic maps, constructing geologic histories, and an introduction to the basic methods of making geologic maps in the field.

**GEOL 3091. Independent Study.** (1-2 cr [max 4 cr]; Stnt Opt. Prereq—#)

Directed readings and projects on topics not normally covered in other courses.

**GEOL 3100. Earth's Climate and Environment: Past and Future.** (3 cr; A-F or Aud. Prereq—1110 or 1130 or 1610, Chem 1151)

Exploration of the processes that control Earth's climate and affect the environment on timescales of 100's of millions to 10's of years. Discussions will include how and why the dinosaurs environment was different from today's and concerns about future global warming.

**GEOL 3180. Teaching Assistant Experience I.** (1-2 cr [max 6 cr]; S-N only. Prereq—2110, 2120, 2311, 2312, geological sciences major, # (Max 2 cr can be applied toward geological sciences major.))

Participation in teaching Geological Sciences lecture and lab courses, including preparation of material, instruction, and student interaction.

**GEOL 3210. Geomorphology.** (4 cr; A-F or Aud. =GEOL 2210. Prereq—1110 or 2110, Math 1250 or #)

Study of Earth surface processes emphasizing the origin and evolution of landforms; response of the physical environment to climatic change and tectonic events, and application of physical, chemical, and mathematical principles to the study and interpretation of landforms.

**GEOL 3420. Sedimentology and Stratigraphy.** (4 cr; A-F or Aud. Prereq—2110, 2311 or #)

Introduction to the concepts, methods, and application of sedimentology and stratigraphy, including the description and interpretation of sediments and sedimentary rocks, their provenance, stratal packaging, and tectonostratigraphic setting. (Course fee assessed.)

**GEOL 3710. Introduction to Geochemistry.** (3 cr; A-F or Aud. Prereq—Math 1296 or equiv, Chem 1152 or #)

Understanding chemical reactions occurring in geological processes on scales ranging from atomic to global. Geochemistry of the Earth; chemical reactions and stability of minerals; applications of geochemistry to understanding global processes and environmental problems. (3 hrs lect)

**GEOL 4091. Geologic Problems and Research.** (1-2 cr [max 4 cr]; A-F or Aud. Prereq—#, no Grad School cr) Individual research in lab or field problems.

**GEOL 4110. Advanced Earth Science for Teachers.** (2 cr; A-F or Aud. Prereq—1110, teaching science majors or grad student or #)

Investigative approach to secondary school teaching of modern earth science curricula, including aspects of astronomy, meteorology, oceanography, and geology, the latter with an emphasis on plate tectonics. (2 hrs lect)

**GEOL 4180. Teaching Assistant Experience II.** (1-2 cr [max 4 cr]; S-N only. Prereq—Geol core, geological sciences major, #; max 2 cr can be applied toward geological sciences major; cr cannot be applied to a Grad School program)

Participation in teaching Geological Sciences lecture and lab courses, including preparation of material, instruction, and student interaction.

**GEOL 4210. Glacial and Quaternary Geology.** (4 cr; A-F or Aud. Prereq—[5210], 3210 or grad student or #,)

Physics of glacier flow, processes of erosion and deposition, survey of glacial landforms, history and chronology of glaciation. Survey of geological and biological responses to changing environment resulting from climatic fluctuations during last three million years of Earth history. Field studies on the glacial deposits of Minnesota. (2 hrs lect, 2 hrs field lab)

**GEOL 4240. Physical Hydrogeology.** (4 cr; A-F or Aud. Prereq—[5240], 2110, Phys 2011, Math 1296 or Math 1290 or grad student or #)

Introduction to concepts of fluid movement in Earth's crust and the interaction of rocks and water. Introduction to the hydrologic cycle, theory of flow through porous media, crustal-scale flow systems, role of fluids in the plate tectonic cycle.

**GEOL 4250. Environmental Hydrogeology.** (4 cr; A-F or Aud. Prereq—[5250], Math 1296 or Math 1290 and Phys 2011 or grad student or #)

A quantitative introduction to hydrogeology and aquifer mechanics with emphasis on environmental applications, including, unsaturated flow, interaction between surface water and groundwater, wellhead protection, well hydraulics, inverse methods, and solute transport. Offered alternate years.

**GEOL 4320. Precambrian Geology.** (3 cr; A-F or Aud. Prereq—[5320], 4450 or grad student or #)

Nature, distribution, origin, correlation, and special problems of the Precambrian, emphasizing Lake Superior region. Term paper. 3 hrs. lect, field trips; offered alternate years.

**GEOL 4335. Physical Volcanology.** (3 cr; A-F or Aud. Prereq—[5335], 2312 or grad student or #)

Morphology and development of volcanic formations and deposits, and 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. Offered alternate years.

**GEOL 4350. Economic Geology.** (4 cr; A-F or Aud. Prereq—[5350], 2312 or grad student or #)

Geologic description, distribution, and genesis of economic mineral deposits; processes leading to their formation; relationship to plate tectonics; exploration techniques and criteria for finding new deposits. Course fees assessed.

**GEOL 4450. Structural Geology.** (5 cr; A-F or Aud. Prereq—[3520], 2312 or #)

Introduction to brittle and ductile deformation, including joints, faults, shear zones, and folds; elementary stress and strain theory; deformation mechanisms; introduction to plate tectonics. Labs emphasize geologic map interpretation and structural analysis. (Two hrs lec, 4 hrs lab, field trip - course fee assessed.)

**GEOL 4480. Tectonics.** (3 cr; A-F or Aud. Prereq—[5500], 2120, 4450, or grad student or #)

Ancient and active plate-tectonic processes. Topics include tectonic theory, plate motions, evolution of divergent, convergent and transform margins, anatomy of orogenic belts, and neotectonics. Examines tectonic phenomena in the context of geological, geophysical and surficial processes. Offered alternate years.

**GEOL 4500. Field Geology.** (6 cr; A-F or Aud. Prereq—4450, #)

Geological mapping of sedimentary, igneous, and metamorphic terranes and of Quaternary deposits and landforms; topographic maps and aerial photographs, including preparation of geologic maps and cross sections, and map unit descriptions.

**GEOL 4805. Environmental Geophysics.** (4 cr; A-F or Aud. Prereq—[5810], 1110, Math 1297 or grad student or #)

Review of principle geophysical techniques used in the environmental and exploration industries. Emphasizes the application of these techniques for solving near-surface problems. Includes review of case histories and group projects.

**GEOL 4820. Global Geophysics.** (3 cr; A-F or Aud. Prereq—[5820], 2120, Math 1290 or 1296 or grad student, #)

Build upon material presented in 2120, exploring the contribution of geophysics to our understanding of the Earth and the processes that control its appearance and behavior. Offered alternate years.

**GEOL 5091. Geologic Problems.** (1-2 cr [max 4 cr]; Stndt Opt. Prereq—Graduate Student or #)

Individual research in lab or field problems.

**GEOL 5095. Special Topics: (Various Titles to be Assigned).** (1-2.5 cr [max 10 cr]; A-F or Aud. Prereq—#) Topics not covered in regular curriculum. Topic announced before course offered.

**GEOL 5100. Seminar.** (1-2 cr [max 4 cr]; Stndt Opt. Prereq—#)

Oral and written presentation on topics of current significance to geoscientists. Participation by department staff.

**GEOL 5200. Geological Field Studies.** (2-3 cr [max 6 cr]; Stndt Opt. Prereq—[2110 or 2120] or grad student or #)

Project-oriented field class in classical geological localities. Trips may be 1 or 2 weeks long, normally run during semester breaks or summer sessions. Examples of trips include Barbados, Hawaii, desert Southwest, California, and Big Bend area of Texas. Travel fee assessed for each location.

**GEOL 5215. Glaciology.** (3 cr; A-F or Aud. Prereq—8 or geol, Math 1290 or Math 1296, Phys 2011 or grad student of #)

Theory of glacier flow. Anatomy of glaciers and ice sheets, mechanics and thermodynamics of glacier flow. Reconstruction of physical characteristics of past ice sheets from glacial sediments and landforms. Glacier response to climate change. Offered alternate years

**GEOL 5220. Global Climate Change.** (3 cr; A-F or Aud. Prereq—#)

Analysis of past global change from climate proxy records in glacial ice, tree rings, ocean and lake sediments, ocean corals. Impact of ocean and atmospheric circulation on global climate; climate cycles; El Niño; human impact on global climate. Offered alternate years.

**GEOL 5251. Well Hydraulics.** (3 cr; A-F or Aud. Prereq—2312, Phys 2011, [Math 1296 or Math 1290], or grad student or #)

Hydraulics of groundwater flow to wells; equations of flow; analysis of steady and non-steady radial flow; aquifer response to stress; analysis of monitoring well networks, pumping tests, and single-point aquifer performance tests.

**GEOL 5260. Fluvial Geomorphology.** (4 cr; A-F or Aud. Prereq—3210 or 3420, Math 1296, Phys 2011 or Grad School student status or #)

Focuses on the physical processes operating in stream channels and watersheds including watershed-scale hydrology and topography in GIS; reach-scale fluid mechanics and sediment transport; and channel patterns, forms, and classification systems. Other topics included will be river history, human alterations to rivers, and river restoration efforts.

**GEOL 5310. Advanced Petrology.** (3 cr; A-F or Aud. Prereq—2312 or grad student)

Physico-chemical principles applied to origin of igneous and metamorphic rocks. Phase equilibria in important mineral systems. Lab study and interpretation of igneous and metamorphic rocks using petrographic microscope. (2 hrs lect, 2 hrs lab)

**GEOL 5321. Theory, Practice of Scanning Electron Microscopy and X-Ray Microanalysis in Lectures.** (3 cr; A-F or Aud. Prereq—Min 75 cr, Chem 1152, Phys 2012, or Grad student or #)

Presents the basic physics of scanning electron microscopy, including electron beam generation, image formation, signal detection, and beam-sample interactions. Basic sample preparation methods for scanning electron microscopy will be presented and demonstrated in laboratory sessions. How characteristic x-rays are produced in a sample and how they are measured and quantified will also be presented. Use of the SEM to collect data and instruction on how to organize collected data in a logical manner.

## Course Descriptions

**GEOL 5430. Stratigraphy and Basin Analysis.** (3 cr; A-F or Aud. Prereq–2110, Math 1296 or grad student or #)  
An integrated study of sedimentary basins as dynamical systems. Analysis of how tectonic and climatic processes drive sedimentation in basins, how these processes are preserved in the basin fill, and how stratigraphers interpret the rock record. Offered alternate years.

**GEOL 5450. Advanced Structure.** (3 cr; A-F or Aud. Prereq–2120, 4450, or grad student or #)  
Modern structural analysis: strain (paths, partitioning, history), tectology, displacement, deformation processes, (mesoscopic, grainscale, microstructures), and fabric evolution. Application of structural techniques to integrative problems (e.g., tectonics, hydrogeology, and planetary, sedimentary and economic geology). Offered alternate years. Course fee assessed.

**GEOL 5710. Aqueous Geochemistry/Chemical Hydrogeology.** (3 cr; A-F or Aud. Prereq–Math 1290 or Math 1297 and Chem 1152 or grad student or #.)  
Principles of solution chemistry, with application to chemical weathering, acid deposition, rivers, lakes, and oceans. Use of chemical equilibrium software to examine complex real world problems.

**GEOL 5730. Geochronology.** (3 cr; A-F or Aud. Prereq–2311, one year of college chemistry or grad student)  
Covers both radiometric and non-radiometric methods of dating primarily Earth but also solar-system materials (meteorites). The chronometers discussed will cover a range of timescales, from early solar-system history to recent human-influenced history. Offered alternate years.

**GEOL 5839. Coral Reef Geology.** (3 cr; A-F or Aud. =BIOL 5839. Prereq–Jr or sr or grad student in Geol or related field)  
Physical, chemical and sedimentary processes in coral reef environments, reef morphology, stratigraphic framework of modern and ancient reefs, reef type and dependence on basin morphology and tectonic setting, coral reefs and Quaternary sea-level change. Includes field study of reef systems.

**GEOL 8094. Geologic Research.** (1-6 cr [max 6 cr]; A-F or Aud. Prereq–#)  
Individual research.

**GEOL 8100. Seminar.** (1-2 cr [max 6 cr]; S-N or Aud. Prereq–Grad geol major or #)  
Oral and written presentations on topics of current significance to geoscientists.

**GEOL 8200. Professional Issues in Earth and Environmental Science.** (1 cr; S-N or Aud. Prereq–Graduate student or #)  
Introduces the incoming graduate student in geological sciences to professional practice, standards and ethics, including peer review, proposal writing, ethical problems, the purpose of a university.

**GEOL 8333. FTE: Master's.** (1 cr; No grade. Prereq–Master s student, adviser and DGS consent)

**GEOL 8444. FTE: Doctoral.** (1 cr; No grade. Prereq–prereq doctoral student, adviser and DGS consent)

**GEOL 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. Prereq–Max 6 cr per semester or summer; doctoral student who has not passed prelim oral; no required consent for the first two registrations up to 12 cr; departmental consent for the third and fourth registrations up to an additional 12 cr, or 24 cr total (for doctoral students admitted summer 2007 and beyond; doctoral students admitted prior to summer 2007 may register up to 4 times totaling 60 cr)

**GEOL 8777. Thesis Credit: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**GEOL 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq–[max 18 cr per semester or summer]; 24 cr required)

## German (GER)

### College of Liberal Arts

**GER 1101. Beginning German I.** (4 cr; A-F or Aud. Prereq–Little or no prior formal study of this language, or # LE 3)  
Conversation and communicative course for students with little or no previous study of German. Emphasis on oral and aural skills; some grammar. Taught in German and English.

**GER 1102. Beginning German II.** (4 cr; A-F or Aud. Prereq–1-2 yrs high school Ger or 1101 or # LE 3)  
Conversation and communicative course for students with limited previous study of German. Emphasis on oral and aural skills; some grammar. Taught in German and English.

**GER 1201. Intermediate German I.** (4 cr; A-F or Aud. Prereq–3-4 yrs high school Ger or 1102 or # LE 3)  
Consolidation and enrichment of previously acquired abilities speaking and understanding German, set within introduction to written German and survey of contemporary culture of German-speaking societies. Emphasis on oral, aural, and reading skills; vocabulary building; some writing. Taught in German.

**GER 1202. Intermediate German II.** (4 cr; A-F or Aud. Prereq–4 yrs high school Ger or 1201 or # LEIP 03)  
Consolidation and enrichment of previously acquired abilities speaking and understanding German, set within introduction to written German and survey of contemporary culture of German-speaking societies. Emphasis on oral, aural, and reading skills; vocabulary building; some writing. Taught in German.

**GER 2040. Berlin: Myth, Legend and Reality.** (3 cr; A-F or Aud. LEIP 08)  
Analysis of Berlin the metropolis from the turn of the 20th century to today, through films, music, texts and essays, to determine where myth, legend, and reality merge and separate, and to comprehend the importance of Berlin in German and European historical, political and social developments.

**GER 2301. Advanced German.** (4 cr; A-F or Aud. Prereq–5 yrs high school Ger or 1202 or # LEIP 03)  
Development of German literacy within a culturally authentic contemporary context. Emphasis on practical writing and formal oral and aural communication skills; vocabulary building; enhancement of reading skills; review of key grammar. Taught in German.

**GER 2402. Germany Today.** (3 cr; A-F or Aud. Prereq–Cr will not count toward Ger major or minor LEIP 08)  
Survey of culture, politics, and society of Germany and German-speaking countries, beginning with post World War II era and emphasizing the European Union's emergence and Germany's role in contemporary Eastern Europe.

**GER 3031. German Language Study Abroad I.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq–%)  
For students pursuing formal study of German, beyond the beginning and intermediate levels, in a German-speaking country, under the auspices of another college or university or by individual agreement.

**GER 3032. German Language Study Abroad II.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq–%)  
For students pursuing formal study of German, beyond the beginning and intermediate levels, in a German-speaking country, under the auspices of another college or university or by individual agreement.

**GER 3040. Culture of Germany Studied in Germany.** (4 cr; A-F or Aud. Prereq–1202 or #)  
Study of German culture, both contemporary and past as it informs the present, on site in Germany. Conducted entirely in German, and all language skills will be inculcated and improved. Format will include seminar, discussions, field trips, and small group projects

**GER 3045. German Culture and Civilization Study Abroad I.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq–%)  
For students pursuing formal study of German culture and civilization, beyond the beginning and intermediate levels, in a German-speaking country, under the auspices of another college or university or by individual agreement.

**GER 3046. German Culture and Civilization Study Abroad II.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq–%)  
For students pursuing formal study of German culture and civilization, beyond the beginning and intermediate levels, in a German-speaking country, under the auspices of another college or university or by individual agreement.

**GER 3047. German Culture and Civilization Study Abroad III.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq–%)  
For students pursuing formal study of German culture and civilization, beyond the beginning and intermediate levels, in a German-speaking country, under the auspices of another college or university or by individual agreement.

**GER 3048. German Culture and Civilization Study Abroad IV.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq–%)  
For students pursuing formal study of German culture and civilization, beyond the beginning and intermediate levels, in a German-speaking country, under the auspices of another college or university or by individual agreement.

**GER 3302. Advanced Composition and Conversation.** (4 cr; A-F or Aud. Prereq–2301)  
Refines students' skills in oral and written expression after they have completed the German language sequence. Individualized work on points of syntax and semantics, set in a contemporary context, using a variety of texts and resources.

**GER 3401. Introduction to Literary Studies.** (4 cr; A-F or Aud. Prereq–2301 or #2301 or #)  
Techniques and tools for understanding and writing about German poetry, fiction, and drama both as literary texts and as cultural testimony. Emphasis on class discussion and writing critical essays in German.

**GER 3403. Page and Stage: German Theater and Performance.** (4 cr; A-F or Aud. Prereq–2301 with a grade of C or higher or #)  
Introduction to basic theories of drama and performance, survey of major German dramatists and current stage practices in Germany. Emphasis on class discussion and interpretive reading in German, with critical essays in German.

**GER 3405. German Literature until 1832.** (4 cr; A-F or Aud. Prereq–2301 (concurrent registration permitted with #.))

A survey of German literature from the Lay of Hildebrand until the death of Goethe, including introduction to critical reading. Readings in German (primary texts) and English (commentaries); discussion and writing in German.

**GER 3406. German Literature from the Romantics (1800) until the End of the Modern Era (1965).** (4 cr; A-F or Aud. Prereq–2301 with a grade of C or higher or #, 3405 is recommended preparation)

A survey of German literature from the Romantic era (1800) until the beginning of the student movement in about 1965. Readings in German (primary texts) and English (commentaries), and an introduction to critical reading (with guides in German and English).

**GER 3591. Independent Study.** (1–4 cr [max 8 cr]; A-F or Aud. Prereq–2301 with a grade of C or higher or equiv or #)

Students develop and carry out reading and research programs in consultation with the instructor.

**GER 4095. Special Topics: (Various Titles to Be Assigned).** (1–4 cr [max 8 cr]; A-F or Aud. Prereq–2301 with a grade of C or higher or #)

Various topics in the language history and structure, literature, and culture of the German-speaking countries.

**GER 4202. The German Novelle.** (4 cr; A-F or Aud. Prereq–2301 with a grade of C or higher or equiv or #; no Grad School credit)

Reading and analysis of short fiction created in German-speaking countries from late 1700s to modern era, with emphasis on texts as social commentary. Class discussion and term paper in German.

**GER 4302. German Women Writers and Filmmakers.** (4 cr; A-F or Aud. Prereq–2301 or #; no Grad School credit) Analysis of German written and visual texts and exploration of women's oppression within repressive political systems as well as Western democracies; women's exploration of their selves; and the question of whether there is a "female writing". Conducted in German.

**GER 4305. German Cinema.** (4 cr; A-F or Aud. Prereq–2301 with a grade of C or higher or instructor's consent; no Grad School credit)

An introduction to the history of German cinema and to film analysis with a focus on the relationship among German film, history, literature, culture, and politics. The course will examine representative works from various cinematic periods. Taught in German.

**GER 4404. Contemporary Germany.** (4 cr; A-F or Aud. Prereq–2301 with a grade of C or higher or equiv or #; no Grad School credit)

Civilization, culture, and politics of Germany and German-speaking countries since 1945. Research term paper in German.

**GER 4502. German Modernisms: From Vienna to Berlin.** (4 cr; A-F only. Prereq–2301 with a grade of C or higher or #, no Grad School cr)

Focuses on the literature and culture of the two major centers in German modernisms: fin de siècle Vienna and Weimar Berlin. Both cities were the site of intellectual and aesthetic upheavals that challenged traditional notions of the subject, representation, class, gender, and technology. Examines major thinkers, writers, artists, and movements in German speaking areas between 1890 and 1933. Taught in German.

## Graduate School (GRAD)

### Academic Administration

**GRAD 999. Graduate School Active Status.** (0 cr; No grade. Prereq–Grad School Students Only)

A zero-credit registration mechanism for Grad School students who must register solely to meet the Grad School's registration requirement. Registration requirements established by departments and agencies within or outside the University (which include, but are not restricted to registration required to hold an assistantship, athletic eligibility, maintain legal visa status or defer loans) are NOT met by Grad 0999.

## Health (HLTH)

### College of Education and Human Service Professions

**HLTH 1100. Health and Wellness Strategies for Life.** (3 cr; A-F or Aud. =HLTH 1000. LE 8)

A lecture series introducing students to health and wellness encompassing nutritional, physical, emotional and spiritual aspects of health and well-being with emphasis on behavioral, environmental and social influences on developing a satisfying and productive lifestyle in our society.

**HLTH 1104. Health Science Terminology.** (1–3 cr [max 3 cr]; A-F or Aud)

Terms commonly used in health sciences and medical professions; emphasis on word structure.

**HLTH 1470. Human Nutrition.** (3 cr; A-F or Aud. LE 5)

Emphasis on chemical nature of dietary nutrients, physiological and metabolic aspects of human nutrition, effects of diet on human health, and global issues in health and nutrition.

**HLTH 1600. Basic First Aid and CPR.** (2 cr; A-F or Aud)

Basic skills and knowledge to respond correctly in first aid emergencies. Leads to American Red Cross Certification basic first aid and CPR certification.

**HLTH 1650. CPR/AED for the Professional Rescuer.** (1 cr; A-F or Aud)

Techniques of cardiopulmonary resuscitation involving one and two rescuers. Leads to American Red Cross certification for infant/child/adult CPR and AED.

**HLTH 1700. First Responder.** (3 cr; A-F or Aud)

Principles of emergency response and accident prevention in the home and community. Leads to Red Cross first emergency responder certification.

**HLTH 2030. Applied Human Anatomy.** (4 cr; A-F or Aud. Prereq–Athletic training, hlth ed or pe or exer sci or rec major or cand, [Biol 1001 or Biol 1011] and [Chem 1102 or Chem 1113]; =Biol 1761)

Introduction to human gross anatomy. Skeletal, muscular, nervous, circulatory, respiratory, and excretory systems. Applications in health and physical education. Demonstrations with predissected specimens.

**HLTH 2040. Principles of Human Physiology.** (4 cr; A-F or Aud. Prereq–Athletic training or hlth ed or pe or rec or exer sci majors or cand or hlth ed minor, 1 sem each of college Biol, Chem, Anat recommended)

Physiological mechanisms of cells, organs, and organ systems; function, control, and coordination of body systems.

**HLTH 3101. Community Health.** (3 cr; A-F or Aud)

Health promotion and disease prevention at local, state, and national levels. Comparison between health problems of individuals and those of groups. Analysis of functions and roles of voluntary and official agencies. Exploration of community-based programs.

**HLTH 3115. Consumer Health Education.** (3 cr; A-F or Aud. Prereq–Min 30 credits)

Overview of concepts of marketing, analysis, selection, and decision making regarding health care, products, services, and providers.

**HLTH 3116. Principles of Epidemiology and Human Disease.** (3 cr; A-F or Aud)

Discussion of diseases and distribution among people. Topics include epidemiological concepts of how diseases are transmitted, surveillance and outbreak investigations, and prevention to eliminate diseases in the community. Vital statistics and methods of tabular-graphical data will be explored.

**HLTH 3117. Principles of Sex Education.** (3 cr; A-F or Aud. Prereq–hlth ed cand or #)

Planning and implementing comprehensive sex education programs in various settings. Sexual physiology, sociocultural aspects of sexuality, birth control, prevention of STDs/HIV, teen pregnancy, and other current topics. How community and family values affect sex education.

**HLTH 3118. Women's Health Issues.** (3 cr; A-F or Aud)

Survey of American women's health issues. Role of women as patients and as health care providers. Language, politics, and economics of women's health care. Comparison of American women's health status to that of women around the world.

**HLTH 3161. School Health Programs: Early Childhood through Middle School.** (2 cr; A-F or Aud. Prereq–EIEd 1010 and completion of 45 cr, el/middle school educ, hlth ed or ECh cand or pre el/middle school educ majors)

Survey of school health programs 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 3202. Drug Education.** (2 cr; A-F or Aud. Prereq–45 cr, for students seeking and admitted to the STEP (Secondary Teaching Education program), cand in health education, physical education, exercise science and communication sciences and disorders or #)

Physiological and psychological effects of alcohol, tobacco, and other drugs. Survey of societal causes and effects of drug use and abuse. Reasons and pressures for drug use by students. Appraisal and assessment of teacher's role in education, intervention, and treatment of drug abuse.

**HLTH 3301. Foundations of Health Education and Promotion.** (3 cr; A-F or Aud. Prereq–1100, hlth ed cand or #)

Health, philosophy, and theories of health education and promotion; introduction to the profession, professional organizations and literature. Responsibilities and competencies of health educators in various settings. Ethical issues, current and future trends in health education and promotion.

**HLTH 3302. School Health Education Methods and Materials.** (3 cr; A-F or Aud. Prereq–3301, hlth ed cand or #)

Coordinated school health programming with a focus on comprehensive school health education for grades 5–12. Methods, strategies, and materials for effective teaching. Determining students needs and interest, selecting content, planning curriculum, stating objective, developing learning opportunities, and evaluating student learning.

**HLTH 3303. Health Education and Promotion Program.** (3 cr; A-F or Aud. =HLTH 3450. Prereq–Concurrent registration is required (or allowed) in 3301, hlth ed cand or #)

Introduction to planning models used in health education/promotion programming. Provides knowledge and skills necessary to assess, plan, and implement health education/promotion programs for multi-age populations. Includes needs assessment, community analysis and organization, program design, and implementation.

## Course Descriptions

**HLTH 3305. Community Health Methods and Strategies.** (3 cr; A-F or Aud. Prereq–3301, 3303, hlth ed cand or #) Theory, methods and practice of community health education. Includes identification and prioritization of community health problems with emphasis on development and implementation of strategies to address these problems. Students will test these strategies within community and school settings.

**HLTH 3307. Conducting and Managing Worksite Health Promotion Programs.** (3 cr; A-F or Aud. Prereq–3303 or 3303 or exercise science major or #) How to design, implement, and evaluate worksite and employee health promotion programs. Exploration of current theories and practical application. Focus on employee needs assessment and risk appraisal, worksite health culture development, effective intervention planning, program evaluation and financial cost and benefits.

**HLTH 3400. Facilitating Healthy Lifestyle Change.** (3 cr; A-F or Aud. Prereq–3301, health ed/promo minor or #) Facilitate health behavior change for individuals and small groups. Emphasis on theories and principles of behavior change, health counseling ethics, interpersonal skills, and records management. Includes assessing, planning, implementing, and evaluating behavior change processes.

**HLTH 3500. Environmental Health.** (3 cr; A-F or Aud. Prereq–hlth ed cand or #) Biological, ecological, and physiological aspects of the environment; concurrent effects on health of the community; and possible solutions to environmental problems.

**HLTH 3991. Independent Study.** (1-6 cr [max 6 cr]; A-F or Aud. Prereq–#) Opportunity for upper-division students to undertake an independent project that would serve to further their knowledge base and/or professional competencies.

**HLTH 3992. Readings in Health.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq–#) Special complementary work and investigation in undergraduate student's field of interest; survey of literature and resources available to health educators.

**HLTH 4000. Professional Issues for Health Educators.** (4 cr; A-F or Aud. Prereq–3305, hlth ed candidate or #; no Grad School cr) Application of advanced skills/competencies. Identifying controversial issues, developing life/work balance and job seeking skills with electronic portfolio, professional networking, beginning grant writing, and preparing for Certified Health Education Specialist (CHES) exam. Students will spend 40 hour minimum in community.

**HLTH 4996. Internship in Health Education.** (1-15 cr [max 15 cr]; S-N or Aud. Prereq–hlth ed major, #; no Grad School credit) Supervised entry-level health education practical experience in hospital, worksite, voluntary, or official agencies. Number of settings is limited to two.

**HLTH 5341. Death Education.** (3 cr; A-F or Aud. Prereq–No Grad School credit) Grief, loss, death, dying, and bereavement in our society as understood by children, adolescents, and adults. Review of research and current literature; education program planning strategies for individuals associated with schools, agencies, organizations, or worksites.

**HLTH 5990. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq–#) Opportunity for upper-division and graduate students to explore current issues. Various health-related problem areas; emphasis on facilitating positive attitudinal and behavioral changes within students/clients.

**HLTH 5991. Independent Study.** (1-6 cr [max 6 cr]; A-F or Aud. Prereq–#, non-degree seeking or grad student; maximum of 6 cr can be applied toward degree) Directed independent study, readings, research, or projects in a particular area of interest. Degree program plan and project proposal should be approved before course is taken by graduate students.

**HLTH 5992. Readings in Health.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq–#) Special complementary readings and discussion in advanced or graduate student's field of interest in health and health education.

## Health Care Management (HCM)

Labovitz School of Business and Economics

**HCM 4510. Medical Sociology.** (3 cr; A-F only. Prereq–LSBE candidate or @, no Grad School cr) Introduction to common theoretical and empirical approaches used by sociologists to study health and illness. Social inequalities in health and illness and the social processes that shape these experiences are the themes of the course.

**HCM 4520. Health Care Organization and Management.** (3 cr; A-F only. Prereq–LSBE candidate or @, MgtS 3401 preferred but not required, no Grad School cr) Studies the organizational structures, types of governance and management issues of the American health care system.

**HCM 4530. Legal Aspects of and Ethics in Health Care.** (3 cr; A-F only. Prereq–LSBE candidate or @, no Grad School cr) Introduction to the legal and ethical environment of health services administration and offers a current and historical overview of legal regulation of the health care industry.

**HCM 4550. Health Care Finance.** (3 cr; A-F only. Prereq–4520, FMIS 3601, LSBE cand or @, no Grad School cr) Covers finance issues related to healthcare organizations. Topics include: reimbursement analysis, understanding the nature of costs, uncertainty, forecasting, service line profitability analysis, and preparation of operating and capital budgets.

**HCM 4560. International Comparisons of Health Care Systems.** (3 cr; A-F only. Prereq–LSBE candidate or @, no Grad School cr) Explores various health care systems offered around the world by evaluating their characteristics, issues and reforms.

**HCM 4570. Health Care Quality Management.** (3 cr; A-F only. Prereq–4520, LSBE cand or @; no Grad School cr) Covers basic principles of quality and patient safety measurement and improvement in health care. Methods for measuring health outcomes and satisfaction as well as regulatory and accreditation requirements affecting quality of care in hospitals, nursing homes, and other areas of healthcare will be discussed.

**HCM 4591. Independent Study.** (1-3 cr [max 3 cr]; A-F only. Prereq–LSBE candidate, #, no Grad School cr) Special work in health care management that extends beyond or in greater depth than regular course offerings.

**HCM 4595. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; A-F only. Prereq–LSBE candidate or @, 4520 or #, no Grad School cr) Specific health care management problems, issues, and approaches.

**HCM 4597. Internship.** (3 cr; A-F only. Prereq–LSBE candidate, consent of program director or internship director, no Grad School cr) Work-integrated learning program providing practical experiences within the health services industry. Students participate in approved program within cooperating businesses, governmental agencies, or civic organizations. Requires a minimum of 200 hours of work experience, assigned written reports, and performance evaluations.

## Health, Physical Education and Recreation (HPER)

College of Education and Human Service Professions

**HPER 3000. Organization and Administration of Health, Physical Education, and Recreation.** (3 cr; A-F or Aud. Prereq–hlth ed or pe or exer sci or rec cand or #) Theoretical and practical basis of administrative process and organizational structure of HPER programs.

**HPER 3100. Risk Management.** (2 cr; A-F or Aud. Prereq–exer sci or rec cand or #) Proactive approach to managing risks associated with conducting health, physical education, and recreation programs. Emphasis on planning for a safe environment.

**HPER 3200. Research and Evaluation in Health Science.** (3 cr; A-F or Aud. Prereq–Min 60 cr, Health ed major or minor or rec cand or #) Exploration of the principles of investigation and evaluation in the health and human service professions with emphasis on methods, data analysis and presentation, and evaluation reports. Basic background information for scientific inquiry and use of evaluative data in health and human service programs.

## History (HIST)

College of Liberal Arts

**HIST 1027. Introduction to Islam.** (3 cr; A-F or Aud. LEIP 07) Introduction to Islamic religion, covering the life of the prophet Muhammad; origins of the Qur'an and Qur'anic Traditions; sectarian intellectual and social developments in Islam; Islamic institutions and practices as well as Islam's encounter with other religions.

**HIST 1095. Freshman Seminar Special Topics: (Various Titles to be Assigned).** (3-4 cr [max 8 cr]; A-F or Aud. Prereq–Freshman, fewer than 30 cr LE 7) Treatment of historical subjects within the Freshman Seminar Program not included in the regular curriculum.

**HIST 1207. Dawn of Modern Europe.** (3 cr; A-F or Aud. LE 7) Early history of the modern era: Renaissance, Reformation, Age of Reason, French Revolution and its impact, Napoleonic era.

**HIST 1208. Europe in the Modern Age.** (3 cr; A-F or Aud. LE 7) Making of modern Europe; analysis of economic and technological revolution, collision of ideologies, imperialist expansion, revolutions, and wars.

**HIST 1304. US History Part I: 1607-1877.** (3 cr; A-F or Aud. LE 7)  
Evolution of the United States from colonial origins into a modern nation. 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. US History Part II: 1865-Present.** (3 cr; A-F or Aud. LE 7)  
Historical roots of 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.

**HIST 1603. Modern Latin America.** (3 cr; A-F or Aud. Prereq—[3603])  
Thematic survey of Latin American history in the nineteenth and twentieth centuries.

**HIST 2244. The History of Science: Ancients to Newton.** (3 cr; A-F or Aud)  
The intellectual and cultural history of science from the Greeks (6th C. B.C.) to the work of Isaac Newton (17th C.).

**HIST 2245. Science and Society: 1500 to Present.** (3 cr; A-F or Aud. LE 7)  
Explores a series of creative moments in development of science and scientific methods within their broader social and cultural contexts.

**HIST 2265. Russia in the 20th Century.** (3 cr; A-F or Aud. LEIP 07)  
Revolutions of 1917, the Soviet period, collapse of the Soviet Union and evolution of Soviet successor states; 1900 to present.

**HIST 2353. American Youth Culture.** (3 cr; A-F or Aud)  
Traces the emergence of youth culture through historical analysis of the experience of youth in the twentieth century and will examine what unified an encompassing “American youth culture,” and what fragmented, divided, and reformulated it over time.

**HIST 2355. United States Military History.** (3 cr; A-F or Aud. LE 7)  
Explore the history of the United States military from the colonial era to the present in the context of broader patterns of American history.

**HIST 2357. Women in American History.** (3 cr; A-F or Aud. LECD 07)  
Roles and contributions of women in American life from colonial period to present.

**HIST 2515. Precolonial Africa.** (3 cr; A-F or Aud. LECD 07)  
Political, cultural, and socioeconomic developments in precolonial Africa to 1800. Emphasis on slave trade, Islamic revolution, and European commercial penetration.

**HIST 2525. Islamic Societies.** (3 cr; A-F or Aud. LEIP 07)  
An introduction to the cultural and religious base of Islamic Societies. Covers history from Qur’anic origins and career of Muhammad down to beliefs, observances, and socio-political and religious issues of the present day.

**HIST 2605. Honors: World War I History and Literature.** (3 cr; A-F only. Prereq—Honors student)  
Examines the history and literature of World War I. Discussion of representative works of fiction along with historiographic questions of the war.

**HIST 3007. The World of Late Antiquity.** (3 cr; A-F or Aud. Prereq—[HmCl 3007])  
Historical transformation from ancient to medieval society in the eastern and western Mediterranean in the second to eighth centuries A.D. including the Germanic states in the West and Byzantium and the Islamic states in the Near East

**HIST 3021. The Age of the Heroes: Homer and his World.** (3 cr; A-F or Aud. Prereq—[HmCl 3021 or CST 3021], Min 30 cr)  
Organization and development of the Greek world from the fourth millennium B.C. to 700 B.C. Descriptive study of Minoan and Mycenaean worlds emphasizing critical evaluation of archaeological, mythological, and artistic significance of Homer.

**HIST 3031. The Roman Republic.** (3 cr; A-F or Aud. Prereq—[HmCl 3031])  
Republican Rome from origins through collapse in 44 B.C., with emphasis on cultural and political attributes, leading figures, and causes of its demise.

**HIST 3041. The Roman Empire.** (3 cr; A-F or Aud. Prereq—[HmCl 3041])  
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.

**HIST 3055. The Ancient Near East.** (3 cr; A-F or Aud. Prereq—[HmCl 3055 or CST 3055], Min 30 cr)  
History of 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.

**HIST 3091. Directed Readings in History.** (1-4 cr [max 16 cr]; A-F or Aud. Prereq—#)  
By arrangement in the department: individual study of material below the research level or formal study of history at an accredited institution abroad.

**HIST 3095. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 4 cr]; A-F or Aud)  
Special topics in history.

**HIST 3097. Internship in History.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—60 cr, #)  
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 3099. Practicum in Teaching History.** (3 cr [max 6 cr]; A-F or Aud. Prereq—History major, completion of 20 cr of 2xxx and above history courses with GPS of 3.3, completion of 90 credits, #)  
Assisting in teaching a 1xxx- or 2xxx-level history course; experience preparing course materials, advising students in learning about the grading process; experience in lecturing and leading discussions, conferences with professor about teaching issues.

**HIST 3151. Ancient Egyptian Culture.** (3 cr; A-F or Aud. Prereq—[HmCl 3151 or CST 3151], Min 30 cr)  
History, culture, and arts of ancient Egypt as known through the archaeological record.

**HIST 3235. History and Soccer: The Rise of the World's Game.** (3 cr; A-F or Aud. Prereq—#)  
Over the past two centuries “soccer” has developed from an informal and regionally variable pastime into the single most popular sport on earth. This phenomenon is incomprehensible without the specific social, cultural, and geographic considerations of nineteenth and twentieth century Britain and its colonies. The sport will be used as a lens through which to examine the social and cultural aspects of the Industrial Revolution and the British Empire, focusing on the central question: “How did historical forces facilitate the rise and spread of the ‘World’s Game?’” Covers the techniques of historical methodology and source analysis, and the general narrative of the Industrial Revolution and British Empire (including colonial perspectives), as well as the internal history of the game itself.

**HIST 3238. History of Christianity: Origins to 1054.** (3 cr; A-F only)  
Examination of the historical (social, cultural, intellectual, and political) development of the Christian religion from the first century to the schism of 1054, with particular consideration of Eastern Christianity.

**HIST 3239. Europe in the Age of Renaissance and Reformation: 1348-1648.** (3 cr; A-F or Aud)  
Social, economic, political, and cultural development of Europe from the Black Death to the Thirty Years’ War. Central themes include Renaissance humanism and art, Columbus and European expansion, the Protestant and Catholic Reformations, and the era of religious wars.

**HIST 3240. Early Modern England: 1485-1689.** (3 cr; A-F or Aud. =HIST 3245)  
Early Modern English society and culture from the 15th to the 17th centuries.

**HIST 3243. Europe in Crisis in the 20th Century.** (3 cr; A-F or Aud)  
Causes, conduct, and consequences of World Wars I and II from European perspective. Offered during day school and in Individualized Learning Program.

**HIST 3244. History of Holocaust.** (3 cr; A-F or Aud)  
Anti-Semitic and extermination policies of the Hitler regime. Origins of that regime and its policies. European anti-Semitism and the Jewish experience in Europe. Conduct of perpetrators, victims, onlookers, resisters. Theological responses and Holocaust representations. Historiographic controversies.

**HIST 3246. History of Hollywood.** (3 cr; A-F or Aud)  
Study of American cinema in terms of how Hollywood functioned, what kind of films it produced, and why. Through the lens of Hollywood, the core issues of American life in the twentieth century will be examined.

**HIST 3257. Modern France.** (3 cr; A-F or Aud)  
History of France from 1789 to present.

**HIST 3264. Imperial Russia.** (3 cr; A-F or Aud)  
Peter I to end of reign of Alexander III.

**HIST 3316. US Social History, 1800-1916.** (3 cr; A-F or Aud)  
Explores the social history of the United States during the long nineteenth century, focusing on the development of specific regional communities within the larger nation as examples of the richness and complexity of the American experience.

**HIST 3317. American Expansion, 1800-1900.** (3 cr; A-F or Aud)  
Follows the geographic and economic development of the United States from a rural strip bordering the Atlantic Ocean, through civil war to emerge as an industrialized, continent-spanning global power.

**HIST 3320. American Popular Culture, 1940 to the Present.** (3 cr; A-F or Aud)  
Examines the intersection of the American popular arts—especially film, music, the visual arts, and literature—with national and international politics and American public life from World War II to the present.

**HIST 3333. From Homer to Alexander: Archaic and Classical Greece.** (3 cr; A-F or Aud. Prereq—[HmCl 3333])  
Early history of Greek world from Heroic Age to death of Alexander the Great, 850-323 B.C.

## Course Descriptions

**HIST 3335. From Alexander to Muhammad.** (3 cr; A-F or Aud. Prereq—[HmCl 3335])  
Social and cultural analysis of the impact Alexander the Great had on eastern Mediterranean development between 323 B.C. and 631 A.D. Alexander and his world, the formation of its three great religions, and the Alexandrian legacy of his achievement.

**HIST 3361. The American City.** (3 cr; A-F or Aud)  
American urbanization from colonial town to modern metropolis, emphasizing social and cultural problems peculiar to cities and impact of the city on American civilization.

**HIST 3365. American Culture and Globalization.** (3 cr; A-F or Aud)  
The U.S. as an importer and exporter of cultural and social trends from the colonial period to the present. Global relationships among reform movements, migration, business and labor, intellectual ideas, and popular culture. Analysis of the American character.

**HIST 3386. The United States and the World since 1898.** (3 cr; A-F or Aud. Prereq—[3384 and 3385], students will receive credit if 3384 (only) or 3385 (only) were taken)  
Examines United States foreign relations—political, economic, social, and cultural—since 1898.

**HIST 3396. The Vietnam War.** (3 cr; A-F only)  
Examines the Vietnam war as a transformative event in both the United States and Vietnam. It will cover the decades-long history of the conflict, and will address its legacies in U.S. foreign relations, domestic politics and culture, and Vietnamese life.

**HIST 3462. History of Modern Japan.** (3 cr; A-F or Aud)  
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.** (3 cr; A-F or Aud)  
China's history from the Opium War to the Great Proletarian Cultural Revolution and Deng Xiaoping's capitalist reform.

**HIST 3465. Twentieth Century China Politics.** (3 cr; A-F or Aud)  
Examines Chinese history from the late Qing to the present with a particular attention on the Chinese political, legal, social, and diplomatic history. Teaches the various factors that gradually influenced the historical course of China, the important roles that the West and Japan played in shaping modern China, the causes and consequences of the numerous political movements in the early stage of the People's Republic of China, and China's recent massive reform efforts to prosperity.

**HIST 3505. Colloquium for Majors.** (1-2 cr [max 2 cr]; S-N or Aud. Prereq—Hist or teaching soc studies major/minor; attendance at 5 dept-approved lectures/discussions over 1-yr period; regis only during semester of 5th lect; (1 cr for attendance; 2 cr for attendance, presentation))  
Lecture and discussion groups on a variety of topics.

**HIST 3515. Modern Africa.** (3 cr; A-F or Aud)  
Africa, 1800 to present. Colonial conquest and domination, African resistance, nationalism, and problems of independence.

**HIST 3516. Society and Culture in 20th-Century Africa.** (3 cr; A-F or Aud)  
Generational, class, and gender conflicts in the wake of European occupation, impact of colonial and neocolonial domination, and African responses to that occupation and to the world economy in the 20th century; selected films and literary sources.

**HIST 3725. Islamic History from Muhammad to the Ottomans.** (3 cr; A-F or Aud. Prereq—1027 or 2525 or #)  
History and development of Islamic society from seventh to sixteenth century.

**HIST 3726. Modern Middle East: 18th Century–Present.** (3 cr; A-F or Aud)  
Survey from Ottoman to present times concentrating on themes, such as colonialism and the anti-colonialist struggle, the rise of state power, gender relations, the rise of new socio-economic groups, new expressions of identity, and western perceptions of the region.

**HIST 4527. Middle Eastern History Through Film.** (4 cr; A-F only. Prereq—no Grad School or LEIP 07)  
Explores topics in Middle Eastern history—religious, political, social, and cultural—from the rise of Islam to the present through film.

**HIST 5094. Directed Research.** (4 cr [max 12 cr]; A-F or Aud. Prereq—#, max 4 cr may be applied to Grad School program)  
Directed Research

**HIST 5095. Special Topics: (Various Titles to be Assigned).** (.5–4 cr [max 12 cr]; A-F or Aud. Prereq—#)  
To treat historical subjects not included in the regular curriculum.

**HIST 5905. History Seminar.** (4 cr [max 8 cr]; A-F or Aud. Prereq—#)  
Advanced study and individual research on a selected historical topic or theme; senior capstone course for history majors. (2.5 hrs lect, 1 hr student/faculty consultation)

## Honors (HON)

### Academic Administration

**HON 400. Honors Capstone Seminar.** (0 cr; S-N only. Prereq—Honors student)  
Provides guidance for completion of Capstone projects required of all UMD Honors students, and provides a forum for the presentation of completed projects. Students will present their research, and will attend the presentations of fellow-students. Seminar participants will also mentor an incoming Honors student, and be provided with assistance in preparing graduate school applications and resumes.

## Industrial Engineering (IE)

### Swenson College of Science and Engineering

**IE 1225. Introduction to Design and Manufacturing Engineering.** (4 cr; A-F or Aud. =ENGR 1210, IE 2222. Prereq—Mech engr student or ind engr student and Math 1296 or 1596 or #)

Introduction to methods used to design and manufacture high quality products. Through the use of a CAD system the student will learn design techniques relative to a product. Students, working in teams, will produce their design using appropriate manufacturing methods.

**IE 3115. Operations Research.** (4 cr; A-F or Aud. Prereq—Math 3280, Stat 3411, BSIE candidate or #)  
Optimization. Linear programming, network analysis, Markov chains, and queuing theory.

**IE 3122. Materials Engineering Laboratory.** (2 cr; A-F only. Prereq—1225, &3130)  
ASTM standards for testing metals, polymer, ceramic, and composite materials. Measurement of material properties including: yield strength, tensile strength, stiffness, hardness, toughness, and hardenability. Traditional methods of processing materials including: punching, plastic injection molding, thermoforming, sand casting, sheet metal forming, extrusion, welding, polymer matrix

composites vacuum bagging. Heat treatment and metallographic study of metals. Estimation of the effects processing techniques have on material properties using both analytical and empirical techniques. Use of Design of Experiments approach for estimation of process control factor effects and modeling of process quality characteristics. Detailed lab report writing and oral presentation of results.

**IE 3125. Engineering Economic Analysis.** (3 cr; A-F or Aud. Prereq—&Stat 3411, BSIE or BSME cand or #)  
Data analysis and methods for engineering decision making under risk; using time and value of money concepts; using expectation principles for project selection; and using forecasts.

**IE 3130. Materials Processing Engineering.** (3 cr; A-F only. Prereq—Engr 2110, Engr 2016, &Stat 3411)  
An introduction to common materials processes and material responses, including thermal and mechanical processing of metals, polymers and composite materials.

**IE 3140. Human Factors and Ergonomic Design.** (3 cr; A-F only. =IE 3105. Prereq—B.S.I.E. candidate or #)  
Through the study of perception, cognition, and motor performance, explores human abilities and limitations as well as the external factors impacting them. To improve performance of a human-machine system, learn about tools for analyzing products, identifying design elements to augment abilities, and recognizing limitations.

**IE 3222. Occupational Systems Laboratory.** (2 cr; A-F only. Prereq—[3105, 3265], 3140, &4020 or #)  
Using principles of human factors and production management, introduces methods for assessing and optimizing performance of occupational systems (i.e., workers, workplaces and tasks, and tools and equipment). These methods are applied in laboratory exercises to evaluate effects of workplace factors on various performance measures.

**IE 4010. Six Sigma Quality Control.** (3 cr; A-F only. =IE 3255. Prereq—Stat 3411, B.S.I.E. or B.S.M.E. candidate, no Grad School cr)  
Statistical quality control in manufacturing; modeling, process quality, control charts, process capability, acceptance sampling methods, Six Sigma, Design of Experiments, and Lean Enterprise.

**IE 4020. Lean Enterprises Management.** (3 cr; A-F only. =CE 3026, IE 3265. Prereq—1225, 3125 or #, no Grad School cr)  
Develops management systems using lean methods: JIT, CMS, ERP, SCM, TQM, SMED, and Kaizen Techniques. Forecasting, aggregate planning, inventory management, and other facilities improvement techniques, including efficient scheduling of manufacturing and service systems.

**IE 4115. Facility Planning and Simulation.** (4 cr; A-F or Aud. Prereq—4010, 4020, BSIE candidate)  
Facility and process design and analysis using flow rates, design relationships, graphical aids, and computer simulation.

**IE 4196. Cooperative Education.** (1 cr [max 2 cr]; A-F or Aud. =ME 4196. Prereq—BSIE candidate, no Grad School cr)  
Practical work experience with employer closely associated with student's academic area; arranged by mutual agreement among student, department, and employer. Biweekly status reports and final written report must be submitted to department.

**IE 4222. Systems Integration Laboratory.** (2 cr; A-F only. =IE 4235. Prereq—&4230 or %, no Grad School cr)  
Design, programming, and implementation of part or all of an automated and integrated manufacturing, testing, packaging, or distribution system.

**IE 4230. Systems Integration.** (3 cr; A-F only. Prereq-4020 or ME 3140, ECE 2006, CS 1121 or CS 1131 or CS 1511 or CS 2121, BSIE cand or #)

Study of the hardware and software aspects of many devices, subsystems, and computers used in modern automation, and their integration into automated manufacturing, packaging, and distribution systems.

**IE 4255. Multidisciplinary Senior Design.** (4 cr; A-F or Aud. =ME 4255. Prereq-4115, EMgt 4110, BSIE cand, or #, no Grad School cr)

Capstone design course in industrial engineering. Project Management, problem definition, root cause analysis, baseline analysis, alternative solutions, analysis, reporting. Societal, economic, ethical, environmental, political considerations. Oral and written reports. Work is in teams focused on industrial or competition-based projects.

**IE 4491. Independent Study.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq-BSIE or BSME cand, #)  
Directed individual study arranged with instructor and department head before registration.

**IE 4495. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 8 cr]; Stdnt Opt. Prereq-BSIE candidate or #)  
Topics not available in regular department curriculum. May involve specialties of department or visiting faculty.

**IE 4801. International Engineering Report.** (1 cr [max 2 cr]; S-N or Aud. Prereq-BSIE or BSME cand, %, no Grad School credit)

Directed self-examination of engineering study abroad in Sweden. Required for each semester abroad

**IE 4993. Industrial Engineering Seminar.** (1 cr [max 2 cr]; S-N or Aud. Prereq-BSIE or BSChE or BSECE or BSME or MEHS cand or #; no Grad School credit)  
Reports on recent developments in engineering and on research projects in the department.

**IE 5305. Supply Chain Management.** (3 cr; A-F or Aud. Prereq-4020, BSIE cand or MSEM student or #)  
Concepts essential to understanding supply chain management, including strategy and design, as well as operational, managerial, technological, and implementation issues. It provides an integrated perspective of the supply chain, including purchasing, production, transportation, distribution and information systems.

**IE 5315. Organizational Control Methods.** (3 cr; A-F or Aud. Prereq-BSIE or MSEM cand or #)  
Roles of the engineer in managing organizational resources. Budgeting, cost-volume relationships, product costing, annual reports, audits. Project estimating and reporting.

**IE 5325. Advanced Engineering Economics.** (3 cr; A-F or Aud. Prereq-3125, BSIE or MSEM cand or #)  
Fundamentals of engineering economics: decision trees, time value of money, analysis of alternatives for project investments, taxes, inflation. Applications to engineering services and manufacturing.

**IE 5335. Engineered Products and Services.** (3 cr; Stdnt Opt. Prereq-BSIE or MSEM candidate, #)  
Development, production, and distribution of engineered products and services. Strategies for positioning engineered products and services to successfully compete in a global market. Sales, purchasing, qualification, and service. Standards, regulations.

**IE 5991. Independent Study in Industrial Engineering.** (1-4 cr [max 6 cr]; Stdnt Opt. Prereq-MSEM cand, #)  
Directed study of special interest topics not available in standard curriculum. Must be arranged with instructor before registration. May include readings, research and/or special projects.

## Integrated Biosciences (IBS)

Swenson College of Science and Engineering

**IBS 5101. Biochemistry and Molecular Biology.** (3 cr; A-F only. Prereq-Chem 4341 or equiv)

A thorough review of the structure and properties of biomolecules including a complete understanding of the components and macromolecules that comprise nucleic acids, proteins, carbohydrates, and lipids.

**IBS 8011. Integrated Biological Systems.** (2 cr; A-F only. Prereq-IBS Graduate Student)

Introduction to integrated biosciences by way of a systems approach, including feedbacks between system components, stoichiometry, and energetics as integrating principles at all levels from molecular and cellular systems to physiological systems, population dynamics, and ecosystems. Required for all IBS students.

**IBS 8012. Integrated Evolutionary Processes.** (2 cr; A-F or Aud. Prereq-8011, IBS Grad student)

Review of advanced topics in evolutionary biology, including coevolution, evolution of disease organisms, ecosystem consequences of evolution, evolutionary stable strategies, and game theory. Required for all IBS students.

**IBS 8020. Integrated Biosciences Colloquia.** (1 cr [max 4 cr]; S-N only. Prereq-IBS Graduate Student)

Presentations by Integrated Biosciences Graduate Faculty on their research and how it is integrated with various other research programs in Duluth and worldwide.

**IBS 8030. IBS Research Club.** (1 cr [max 5 cr]; S-N or Aud. Prereq-IBS Graduate Student)

Readings and discussion of current literature integrating the areas of Cell, Molecular and Physiological Biology with Ecology, Organismal, and Population Biology. Current literature emphasizing the application of novel techniques to biological problems at several levels of organization will be presented. Students will lead a discussion on at least one paper. Required for IBS students both semesters of their first two years.

**IBS 8094. Rotations.** (3 cr; S-N only. Prereq-IBS Graduate Student)

Rotations through laboratories of faculty members of the Integrated Biosciences Program. During the rotations students will be exposed to molecular, cellular, physiological, and ecological problems and techniques.

**IBS 8099. The Biological Practitioner.** (1 cr; S-N or Aud. Prereq-IBS Graduate Student)

A course designed to introduce the incoming graduate student in biological sciences to professional practice, standards and ethics, including peer review, proposal writing, ethical problems, the purpose of a university, and other problems. Required for all IBS students.

**IBS 8102. Cell, Molecular and Developmental Biology.** (3 cr; A-F only. Prereq-5101, Chem 4342 or equivalent, IBS Grad School student)

Comprehensive review of contemporary topics in modern molecular biology. This will include systemic examples from cell and developmental systems. Required for CMP emphasis.

**IBS 8103. Comparative Animal Physiology.** (3 cr; A-F only. Prereq-One year of college biol, two years of college chem; 8011, IBS Grad School student)

In depth review of selected topics in animal physiology. Lecture presentation of fundamental concepts of cardiovascular, neural, respiratory, renal, and endocrine physiology. In-depth

discussion and student presentation of selected topics with particular emphasis on current advances.

**IBS 8201. Ecological Processes.** (2 cr; A-F or Aud. Prereq-8011, IBS Grad School student)

In depth survey of advanced topics in ecological processes, including allometry and scaling, animal behavior, food webs, and energy and material flows through organisms and ecosystems. Required for EOP Track.

**IBS 8333. FTE: Master's.** (1 cr; No grade. Prereq-Master's student, adviser and DGS consent)

**IBS 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

## Inter-Institutional Cross-Registration (IICR)

Continuing Education

**IICR 1001. Inter-Institutional Cross Registration.** (1-9 cr [max 36 cr]; Stdnt Opt. Prereq-#)

Inter-institutional cross registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of Saint Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 1002. Inter-Institutional Cross Registration.** (1-9 cr [max 36 cr]; Stdnt Opt)

Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 1003. Inter-Institutional Cross Registration.** (1-9 cr [max 9 cr]; Stdnt Opt)

Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 1004. Inter-Institutional Cross Registration.** (1-9 cr [max 9 cr]; Stdnt Opt)

Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross-registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 2001. Inter-Institutional Cross Registration.** (1-9 cr [max 36 cr]; Stdnt Opt. Prereq-#)

Inter-institutional cross registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 2002. Inter-Institutional Cross Registration.** (1-9 cr [max 36 cr]; Stdnt Opt)

Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

## Course Descriptions

**IICR 2003. Inter-Institutional Cross Registration.** (1-9 cr [max 9 cr]; Stdnt Opt)  
Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 3001. Inter-Institutional Cross Registration.** (1-9 cr [max 36 cr]; Stdnt Opt. Prereq-#)  
Inter-institutional cross registration reflecting the credit hour load of University of Minnesota Duluth, students enrolling under the inter-institutional cross registration agreement with the College of Saint Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 3002. Inter-Institutional Cross Registration.** (1-9 cr [max 36 cr]; Stdnt Opt)  
Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 3003. Inter-Institutional Cross Registration.** (1-9 cr [max 9 cr]; Stdnt Opt)  
Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 4001. Inter-Institutional Cross Registration.** (1-9 cr [max 36 cr]; Stdnt Opt. Prereq-No Grad School credit; #)  
Inter-institutional cross registration reflecting the credit hour load of University of Minnesota Duluth, students enrolling under the inter-institutional cross registration agreement with the College of Saint Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 4002. Inter-Institutional Cross Registration.** (1-9 cr [max 36 cr]; Stdnt Opt)  
Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 4003. Inter-Institutional Cross Registration.** (1-9 cr [max 9 cr]; Stdnt Opt. Prereq-No Grad School cr)  
Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 5001. Inter-Institutional Cross Registration.** (1-9 cr [max 36 cr]; Stdnt Opt. Prereq-no grad credit; #)  
Inter-institutional cross registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of Saint Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists; no grad credit

**IICR 5002. Inter-Institutional Cross Registration.** (1-9 cr [max 36 cr]; Stdnt Opt)  
Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of

St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

**IICR 5003. Inter-Institutional Cross Registration.** (1-9 cr [max 9 cr]; Stdnt Opt. Prereq-No Grad School cr)  
Inter-institutional cross-registration reflecting the credit hour load of University of Minnesota Duluth students enrolling under the inter-institutional cross registration agreement with the College of St. Scholastica and the University of Wisconsin Superior and any other institution with whom such an agreement exists.

## Interdisciplinary Studies (IS)

College of Liberal Arts

**IS 3099. Senior Project.** (1-10 cr [max 10 cr]; A-F or Aud. Prereq-#)

An agreement that specifies nature of the project, amount of work, and number of credits must be approved by two advisers and filed with director of interdisciplinary studies.

**IS 5001. Construction and Deconstruction of Nation: Reflections of 20th Century Hispanic History.** (2 cr; A-F only. Prereq-Min 90 cr)

Introduction to 20th Spanish cinema, literature, and culture: the historical, social aesthetic, and theoretical factors that brought about Spain's Civil War, Francoism, exile and deportation to Nazi camps, Basque separatism, ETA terrorism, and Spain's membership in the European Union. Spain, along with so many other countries in our increasingly "globalized world," is currently undergoing an "identity crisis." The concept of "Spanishness" will be addressed.

**IS 5002. Exodus and Exile in Contemporary Cinema.** (4 cr; A-F only. Prereq-Min 90 cr)

Cross-border and internal population movements have assumed dimensions beyond the response capacity of any single governmental and international body. A socio-historical understanding of uprooted social groups and individuals who voluntarily or involuntarily leave their country and culture. Effects and implications of displacement and examines how European exilic and diasporic filmmakers signify exile and diaspora by expressing, allegorizing, commenting upon and critiquing home, host societies and cultures. Analyses of film texts whose narrative strategies undermine conventional cinema, in particular cinematic realism.

**IS 8001. Introduction to Liberal Studies.** (1-4 cr [max 8 cr]; S-N or Aud. Prereq-MLS candidate or %)

Introduction to methods of interdisciplinary liberal studies. Minimum of 4 credits required of M.L.S. candidates.

**IS 8501. Seminar: Ethics and the Human Condition.** (4 cr; A-F or Aud. Prereq-MLS candidate or %)

Explores applications of values and ethical considerations from humanistic study to problems of modern world.

**IS 8591. Directed Study.** (1-8 cr [max 8 cr]; A-F or Aud. Prereq-MLS candidate or %)

Individualized study under supervision of the director of the liberal studies program.

## International Business (INTB)

Labovitz School of Business and Economics

**INTB 3201. International Business.** (3 cr; A-F only. Prereq-SBE cand or @)

Identification of position of United States in world trade; impact of international trade on national businesses and policies; business and employment opportunities in international business.

**INTB 4495. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; A-F only. Prereq-#)

Special, focused, and timely topics in globalization and international business.

## International Studies (INTS)

College of Liberal Arts

**INTS 1070. An Introduction to Scandinavia.** (3 cr; A-F or Aud. LEIP 08)

Interdisciplinary survey of Scandinavia and its people: major historical, social, political, and cultural features of region.

**INTS 1191. International Study.** (1-5 cr [max 15 cr]; A-F or Aud. Prereq-%)

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 4100. Seminar in International Studies.** (4 cr; A-F or Aud. Prereq-Pol 1050, 60 cr incl 8 upper div cr approved IntS courses and #)

Analysis of and supervised research and writing on selected topics.

## Italian (ITAL)

College of Liberal Arts

**ITAL 1101. Beginning Italian.** (3 cr; A-F or Aud. Prereq-Little or no prior formal study of this language, or # LEIP 03)

Conversation and communicative course for students with little or no previous study of Italian. Emphasis on oral and aural skills, and vocabulary and idioms useful in daily life. Taught in Italian and English.

**ITAL 1102. Beginning Italian II.** (3 cr; A-F or Aud. Prereq-1101 or # LEIP 03)

Conversation and communicative course for students with lone semester's previous study of Italian. Emphasis on oral and aural skills, and vocabulary and idioms useful in daily life, building on the content of Italian 1101: Beginning Italian. Taught in Italian and English.

## Journalism (JOUR)

College of Liberal Arts

**JOUR 2001. Reporting and Writing I.** (3 cr; A-F or Aud. Prereq-WRIT 1120)

Skill-based course in reporting and writing that introduces the fundamentals used by all journalists; information gathering; writing basic news stories; professional news style; structure and readability; and interviewing techniques. Examples of professional journalism will be read and discussed.

**JOUR 2101. Editing I: Copy Editing and Layout.** (3 cr; A-F or Aud. Prereq—[3101], 2001, WRIT 1120)

Develops the essential skills for editing print and online publications, including copy and picture editing, selecting stories, exercising sound news judgment, developing the writer-reporter relationship, writing headlines, designing and laying out basic pages, using graphics, and understanding fundamental legal and ethical issues that affect publications.

**JOUR 2300. News Photography.** (3 cr; A-F or Aud. Prereq—[3300])

How to take the types of photographs commonly used by professional news operations, ranging from features and photo essays to spot news and sports. Work produced may be used in the student newspaper if the student editor accepts it. Develops an understanding of the ethical and theoretical aspects of news photography, and learn a vocabulary for discussing and critiquing visual images.

**JOUR 2400. Community and Journalism.** (3 cr; A-F or Aud. Prereq—[3400], 2001)

Examines the role of journalism in defining communities. Exposure to various concepts of community and the role journalism has in defining these communities on both a local and global scale. Analyze a specific case study of one community journalism entity, and explore the ramifications of technology on the transformation of community.

**JOUR 2501. History of American Journalism.** (3 cr; A-F or Aud)

Explores the social and cultural history of journalism in the United States. Read pieces of journalism and critiques of journalism from various time periods and study key moments in journalism history. Examines the practice of journalism, its core values, and how these have changed over time. Explores how technological, social and economic change shape journalism.

**JOUR 3001. Reporting and Writing II.** (3 cr; A-F or Aud. Prereq—2001, Comp 1120)

Skills-based that builds on JOUR 2001. Write publishable news stories based on field work and interviews. Emphasis on fully-developed, multi-source news stories that are fair and complete. Expand interview and research skills, and become familiar with the wide range of information available in public documents.

**JOUR 3401. Digital Storytelling.** (3 cr; A-F or Aud. Prereq—2001, Writ 1120)

Report and write various forms of electronic news stories commonly produced for television, radio and the Internet. Learn the stylistic differences between writing electronic news scripts and writing for print. Learn basic field recording techniques and production skills for audio and video.

**JOUR 3700. Media Law and Ethics.** (3 cr; A-F or Aud. Prereq—Writ 1120)

Examines laws, regulations and major court decisions that affect journalists and news organizations. Topics include First Amendment principles of press freedom, libel, invasion of privacy, prior restraint, access to information, and the regulation of electronic media content.

**JOUR 3991. Independent Study in Journalism.** (1-5 cr [max 5 cr]; A-F or Aud. Prereq—2001, #)

Directed reading and research in journalism.

**JOUR 4001. Specialized Reporting and Writing.** (3 cr; A-F or Aud. Prereq—2001, 3001, Writ 1120; no Grad School cr)

Delves into a specific area of journalism such as science reporting, outdoor writing, investigative reporting or writing about government. Read and critique examples and produce work in the given area of specialization.

**JOUR 4102. Editing II: Newsroom Practicum.** (3 cr; A-F or Aud. Prereq—[5102], 2001, 3101 or Grad Student)

Experience in a working newsroom. Apply skills from other journalism classes to plan, produce and manage an online news publication. Basic principles as well as practical skills with advanced computer programs. Includes editing, managing and reporting, as well as the discussion of both journalism and leadership issues. Advance theory and practice in news selection, preparation, and display for newspaper, magazine, broadcast and photojournalism media. Emphasis on the ethical and professional responsibility of the journalist.

**JOUR 4197. Journalism Internship.** (1-3 cr [max 3 cr]; S-N only. Prereq—2001, 3700, min 60 cr, #, no Grad School cr)

Supervised professional experience as a working staff member with a newspaper, magazine, broadcast station or other communications organization.

**JOUR 4500. Special Topics: (Various Titles to be Assigned).** (3 cr [max 6 cr]; A-F or Aud. Prereq—2001, 3101, Comp 1120; no Grad School cr)

Selected topics and issues in journalism, such as staff organization, policies, finance, law, photography, design, and the role of the student press.

**JOUR 5197. Journalism Internship.** (1-3 cr [max 3 cr]; S-N only. Prereq—Coll Grad or Grad School student, #)

Supervised professional experience as a working staff member with a newspaper, magazine, broadcast station or other communications organization.

## Labovitz School of Business and Economics (LSBE)

Labovitz School of Business and Economics

**LSBE 1101. The Business Environment.** (3 cr; A-F or Aud. LE 8)

Introduction to context, environment, and operation of business and organizations. Study of foundations and functional areas of business and entrepreneurship. Analysis of technological, ethical, diversity, and global issues from business and organizational perspectives.

## Language (LANG)

College of Liberal Arts

**LANG 1101. Beginning Foreign Language I.** (4 cr; A-F or Aud. Prereq—#, % LE 3)

For students studying beginning language where that language is spoken, under the auspices of another college or university or by individual arrangement with prior approval by the Department of Foreign Languages and Literatures; or students studying a less frequently taught language at UMD.

**LANG 1102. Beginning Foreign Language II.** (4 cr; A-F or Aud. Prereq—1101 or # LE 3)

For students studying beginning language where that language is spoken, under the auspices of another college or university or by individual arrangement with prior approval by the Department of Foreign Languages and Literatures; or students studying a less frequently taught language at UMD.

**LANG 1201. Intermediate Foreign Language I.** (4 cr; Stnt Opt. Prereq—1102 or # LE 3)

For students studying intermediate language under the auspices of another college or university or by individual arrangement with prior approval by the Department of Foreign Languages and Literatures; or students studying a less frequently taught language at UMD.

**LANG 1202. Intermediate Foreign Language II.** (4 cr; A-F or Aud. Prereq—1201 or # LEIP 03)

For students studying intermediate language under the auspices of another college or university or by individual arrangement with prior approval by the Department of Foreign Languages and Literatures; or students studying a less frequently taught language at UMD.

**LANG 1301. ESL: English for Academic Writing and Speaking.** (3 cr [max 6 cr]; A-F or Aud)

Integrated study of reading, listening, writing, and speaking skills for students who are not native speakers, with an emphasis on academic and scholarly American English. Content is individualized to each student's needs.

**LANG 3091. Directed Study.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—#, %)

Directed Study

**LANG 3095. Special Topics: (Various titles to be Assigned).** (1-4 cr [max 8 cr]; Stnt Opt)

Selected topics, not currently offered, that deal with genres, periods, specific authors, or cultural movements of Germanic, Hispanic, Francophone, or other foreign worlds.

**LANG 4044. Language Teaching Methods.** (4 cr; A-F or Aud. Prereq—Fr 2301 or Ger 2301 or Span 2301 or equiv)

Theory and practice of teaching a second language. Survey and application of current methods used to teach skills and cultural concepts of world languages.

**LANG 5198. Language Workshop.** (1-4 cr [max 8 cr]; A-F or Aud. Prereq—Tchg credentials in a second lang or #)

Service course for prospective and in-service teachers provides postgraduate study of any matters related to teaching of a foreign language.

## Limnology (LIM)

Swenson College of Science and Engineering

**LIM 5004. Field Limnology.** (2 cr; A-F or Aud. Prereq—Graduate student or #)

Field measurements on local lakes, streams; research cruise aboard R/V Blue Heron on Lake Superior; laboratory exercises in biological, chemical, geological and physical limnology.

**LIM 5101. Physical Limnology.** (3 cr; A-F or Aud. =LIM 5001. Prereq—Math 1297, Phys 2012, or grad student)

Physical description of lake dynamics including: lake morphometry, water budget, light distribution, circulation, fronts, waves and mixing. Descriptive, mathematical, numerical and data-analysis techniques are used to investigate the various topics.

**LIM 5102. Chemical Limnology.** (3 cr; A-F or Aud. Prereq—[5001], Math 1296, Phys 1002 or 1202, Chem 1152 or 1162, or grad student)

Organic and inorganic chemistry of natural waters, major and minor ions, pH-Eh relationships, carbon and nutrient cycles, pore water chemistry, sediment chemistry, microbial geochemistry. Offered alternate years.

**LIM 5103. Geological Limnology.** (3 cr; A-F or Aud. =LIM 5002. Prereq–Math 1296, Phys 1002 or 1202, Chem 1152 or 1162, or grad student)

Geological aspects of freshwater systems: origins, tectonic and climatic settings of lakes, geophysical mapping, physical sedimentary processes, sedimentary geochemistry, geochronology and paleolimnology. Offered alternate years

## Linguistics (LING)

College of Liberal Arts

**LING 1811. Introduction to Language.** (3 cr; A-F or Aud. LE 2)

Provides an introduction to a theoretical study of the nature of natural language, using examples primarily from present-day English. Students are expected to learn analytical skills to understand how human languages (and the human mind) work and how the sub-components (sounds, words, sentences and meaning) of natural languages are systematically organized.

**LING 2506. Language and Writing.** (3 cr; A-F or Aud. Prereq–WRIT 1120)

Different from a traditional linguistic approach, language and its system will be examined with emphasis on writing, as opposed to speech. Based on the formal theoretical foundations of language and linguistics, three main topics are discussed in detail. First, world's major writing systems and a short history of writing are introduced. Second, the English sentence structures are studied from a contemporary theoretical and historical linguistic perspective. Third, language use in writing is discussed in various genres.

**LING 3101. Introduction to Phonology.** (3 cr; A-F or Aud. Prereq–1811 or #)

Phonology is a grammar of sound for a language. The phonological component of a language is the system of rules, representations and principles that govern the patterning of sounds. To understand the general patterns of sounds, students are expected to analyze data across the language families pre-theoretically. This pre-theoretical analysis will be scientifically explained within modern phonological theories.

**LING 3102. Introduction to Syntax.** (3 cr; A-F or Aud. Prereq–1811 or #)

Deals with how sentences are structured. After discussing lexical categories (parts of speech) and phrasal structures from a scientific perspective, several different theories are introduced under the blanket name Generative Grammar. Based on Generative Grammar, students learn how to analyze English sentence structures to understand universal properties of natural language.

**LING 3591. Independent Study in Linguistics.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq–1811 or #, %) Directed reading and/or research.

**LING 4103. Morphology: Word Structures and Rules.** (3 cr; A-F or Aud. Prereq–1811, no Grad School cr)

An introductory survey course on linguistic morphology that examines key concepts used to describe and explain the internal structures of words, and also deals with the central word formation processes across the typologically different languages. This theoretical knowledge acquired is then applied to the analysis of word formation in various discourse domains in present-day English and non-Indo-European languages.

**LING 4195. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 4 cr]; A-F or Aud. Prereq–Min 60 cr, no Grad School cr)

Subdisciplines such as pragmatics, semantics, regional and social language variation, childhood language acquisition, second language learning, language change and linguistic reconstructions, cognitive linguistics, and history of linguistic inquiry.

**LING 4400. Sociolinguistics.** (3 cr; A-F only. =LING 5400. Prereq–LING 1811 with a grade of C or #, no Grad School cr)

The study of the uses and varieties of language as it is used in society by various groups. Among the topics to be examined are regional, social, and ethnic dialects.

**LING 4802. Applied Linguistics.** (4 cr; A-F or Aud. Prereq–No Grad School cr)

Application of linguistic theory to reading and writing instruction, with emphasis on preparation of secondary school teachers in English and communication.

**LING 4852. Practicum in Teaching Linguistics.** (1-3 cr [max 3 cr]; A-F or Aud. Prereq–1811, 3101, 3102 or #, no Grad School cr)

Supervised teaching in introductory linguistics courses. Experience in preparation for and in conduct of classes, in consultations with students, and in testing.

**LING 5103. Morphology: Word Structures and Rules.** (3 cr; A-F or Aud. Prereq–1811, Coll Grad or Grad School students)

An introductory survey course on linguistic morphology that examines key concepts used to describe and explain the internal structures of words, and also deals with the central word formation processes across the typologically different languages. This theoretical knowledge acquired is then applied to the analysis of word formation in various discourse domains in present-day English and non-Indo-European languages.

**LING 5195. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 4 cr]; A-F or Aud. Prereq–Coll Grad or Grad School student)

Subdisciplines such as pragmatics, semantics, regional and social language variation, sociolinguistics, childhood language acquisition, second language learning, language change and linguistic reconstructions, and history of linguistic inquiry.

**LING 5400. Sociolinguistics.** (3 cr; A-F only. =LING 4400. Prereq–Graduate school standing or collegiate graduate students)

The study of the uses and varieties of language as it is used in society by various groups. Among the topics to be examined are regional, social, and ethnic dialects. (Field project)

**LING 5802. Applied Linguistics.** (4 cr; A-F or Aud. Prereq–Coll Grad or Grad School student)

Application of linguistic theory to reading and writing instruction, with emphasis on preparation of secondary school teachers in English and communication.

**LING 5852. Practicum in Teaching Linguistics.** (3 cr; A-F or Aud. Prereq–Coll Grad or Grad School student)

Supervised teaching in introductory linguistics courses. Experience in preparation for and in conduct of classes, in consultations with students, and in testing.

**LING 8591. Independent Study in Linguistics.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq–%)

Directed reading and/or research.

## Management Studies (MGTS)

Labovitz School of Business and Economics

**MGTS 3401. Organizational Behavior and Management.** (3 cr; A-F only. Prereq–LSBE cand or bus adm minor or @)

Introduction to organizations, management processes, and understanding human behavior at work. Covers the effects of the external environment, organizational structure, job design, teams, and leadership on employees attitudes, motivation, and behavior.

**MGTS 3491. Independent Study.** (1-3 cr [max 3 cr]; A-F only. Prereq–%)

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 3497. Organizational Management Internship.** (3 cr; A-F only. Prereq–LSBE cand, consent of internship director)

Work-integrated learning program providing practical experiences within students' major. Students participate in approved program within cooperating businesses, governmental agencies, or civic organizations. Requires minimum of 200 hours work experience, assigned written reports, and performance evaluations.

**MGTS 3801. Human Resource Management.** (3 cr; A-F only. Prereq–LSBE cand or approved non-LSBE bus adm 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 3897. Human Resources Internship.** (3 cr; A-F only. Prereq–LSBE cand, consent of internship director)

Work-integrated learning program providing practical experiences within students' major field. Students participate in approved program with businesses, governmental agencies, or civic organizations. Requires minimum of 200 hours work experience, assigned reports, and performance evaluations.

**MGTS 3997. Management of Community Projects.** (1-3 cr [max 3 cr]; A-F only. Prereq–3401, 3801, LSBE cand, #) Requires design and administration of community-related project involving volunteers. Interns identify project, contact appropriate persons, obtain approval, and submit written proposal. Requires completion of minimum of 100-300 hours, maintenance of weekly journal, oral presentation, and written analysis.

**MGTS 4411. Organizational Studies.** (3 cr; A-F only. Prereq–3401, LSBE cand or @)

Survey of organization theories and their application to organizational structuring, coordination, control, job design, organizational decision making, leadership, and organizational development.

**MGTS 4421. Managing Change.** (3 cr; A-F only. Prereq–3401, 3801 or equiv, LSBE cand or grad student or @) Causes, goals, programs, and results of organizational change and employee responses to it. Assumptions, values, contingency factors, ethical considerations, models, and intervention strategies for organizational development. Role of managers as change agents.

**MGTS 4431. Leadership.** (3 cr; A-F only. Prereq—3401, LSBE cand or @)

A survey of the leadership literature aimed at the development of an understanding of leaders and the leadership process. An exploration of such questions as: Who as a person is the leader? How do people come to the position of a leader? What is the nature of leadership as a process? How do leaders influence others? What is participative leadership? What is charismatic and transformational leadership?

**MGTS 4443. Building and Leading Teams in Organizations.** (3 cr; A-F only. Prereq—LSBE candidate, 3401 or #) Examines effective design and management of a variety of groups in organizations, including work groups, task forces, self-managed teams and coalitions. Covers group composition, goals, processes, and effectiveness; includes leadership, managing external relationships, and performance measurement.

**MGTS 4451. Management Inquiry.** (3 cr; A-F only. Prereq—3401, 3801, approved LSBE cand or @) Methods employed by organizational specialists in conducting applied inquiry (research) to assist organizational decision making, coupled with an examination of a contemporary management issue. Preparation and written/oral presentation of research findings from student-conducted field, laboratory, or library research projects focused on contemporary management issues.

**MGTS 4461. Business and Society.** (3 cr; A-F only. Prereq—3401, 3801, LSBE cand 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 4472. Entrepreneurship.** (3 cr; A-F only. Prereq—LSBE cand or @) Seminar on the fundamentals of entrepreneurship, the characteristics of entrepreneurs, and the life cycle of a new venture: creating and starting a new venture; financing the new venture; managing, growing, and ending the new venture.

**MGTS 4473. Management of Innovation and Technology.** (3 cr; A-F only. Prereq—3401, LSBE cand or @) Issues related to achieving maximum leverage from innovation competencies, skills, and resources. Factors distinguishing high-innovation companies, strategies for innovation, internal and external conditions, and market consequences of innovation. Integration of technology within the strategic management process.

**MGTS 4474. International Management.** (3 cr; A-F only. Prereq—3401, LSBE candidate or @) Differences in culture, history, resources, etc. are explored in the context of managing global businesses and workforce. Students will reflect on their own managerial skills, and develop skills to become a global manager.

**MGTS 4475. Negotiations, Bargaining and Conflict Resolution.** (3 cr; A-F only. Prereq—LSBE candidate, 3401 or #) Combines analytical material on the negotiation process, with a series of negotiating experiences, to develop your understanding of, and skills in, negotiating and resolving conflicts in business. Covers topics and strategies appropriate for use between people, departments, organizations and countries, across a variety of industries.

**MGTS 4481. Strategic Management.** (3 cr; A-F only. Prereq—3401, 3701, FMIS 3301, FMIS 3601, 90 cr, LSBE cand or @; no Grad School credit) Integration of basic functions of marketing, finance, production, and behavioral sciences. Emphasis on organizational environments and development and implementation of competitive strategies that respond to social, political, and economic conditions from perspective of top management.

**MGTS 4483. Cooperative Strategy and Strategic Alliances.** (3 cr; A-F only. Prereq—LSBE candidate, 3401, 4481 preferred or #) Introduces the concept that firms are engaged in cooperative as well as competitive relationships. Creates understanding for the nature of strategic alliances-forming, negotiating, operating, evaluating-in an international context.

**MGTS 4495. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; A-F only. Prereq—LSBE cand, 3401 or @) Enables students, working closely with the instructional faculty, to explore one or more contemporary organization management issues in substantial depth.

**MGTS 4821. Staffing Work Organizations.** (3 cr; A-F only. Prereq—3801, LSBE cand or @) Theory and practice of staffing work organizations. Emphasis on design and implementation of staffing systems, legal requirements, and career planning.

**MGTS 4831. Compensation Systems.** (3 cr; A-F only. Prereq—3801, LSBE cand or @) Theory, design, and practice of employee compensation systems. Impacts of compensation, economic and institutional forces influencing employer compensation policies and practices, supplemental forms of compensation and administrative practices.

**MGTS 4841. Training and Development.** (3 cr; A-F only. Prereq—3801, LSBE cand or @) Elements of training and development program planning and delivery: learning theories and approaches, needs assessment, training objectives, design, training methods, transfer-of-training strategies, and evaluation. Assess, design, and evaluate human resource development systems. Develop training skills and techniques.

**MGTS 4851. Unions and Collective Bargaining.** (3 cr; A-F only. Prereq—3801, LSBE cand or @) Nature of and basis for contractual relationships between employers and unions. Emphasis on background of labor movement, union organizing, bargaining relationships, labor law, and contemporary trends in private and public sector labor relations.

**MGTS 4861. International Human Resource Management.** (3 cr; A-F only. Prereq—3801, LSBE candidate or #) Course combines theories of culture with HRM applications to develop students' awareness cultural issues as they apply in the workplace.

**MGTS 4881. Human Resource Issues and Trends.** (3 cr; A-F only. Prereq—3801, LSBE cand or @) Integrative, problem-solving approaches to contemporary human resource challenges, with emphasis on employment law.

**MGTS 4895. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; A-F only. Prereq—LSBE cand, 3801 or @) Enables students, working closely with the instructional faculty, to explore one or more contemporary human resource management issues in substantial depth.

## Marketing (MKTG)

Labovitz School of Business and Economics

**MKTG 3701. Principles of Marketing.** (3 cr; A-F only. Prereq—[MgtS 3701], LSBE cand or approved non-LSBE bus adm minor or @) Marketing as a 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.

**MKTG 3711. Marketing Research.** (3 cr; A-F only. Prereq—[MgtS 3711], MgtS 3701 or Mktg 3701, LSBE cand or @) Emphasis on improving skills of conducting secondary research, designing a primary research study, and analyzing and reporting results of a research study.

**MKTG 3741. Fundamentals of Selling.** (3 cr; A-F only. Prereq—[MgtS 3741], MgtS 3701 or Mktg 3701, LSBE cand 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.

**MKTG 3781. International Marketing.** (3 cr; A-F only. Prereq—[MgtS 3781], MGTS 3701 or MKTG 3701, LSBE cand or @) Marketing across national boundaries; effects of foreign economic, legal/political, and sociocultural environments on multinational marketing strategies.

**MKTG 3791. Independent Study.** (1-3 cr [max 3 cr]; A-F only. Prereq—%) For students wishing to do special work in marketing that extends beyond, or in greater depth than, regular course offerings.

**MKTG 3797. Marketing Internship.** (3 cr; A-F or Aud. Prereq—[MgtS 3797], LSBE cand, consent of internship director) Work-integrated learning program providing practical experiences within students' major. Students participate in approved program within cooperating businesses, governmental agencies, or civic organizations. Requires minimum of 200 hours work experience, assigned written reports, and performance evaluations.

**MKTG 4711. Business-to-Business Marketing.** (3 cr; A-F only. Prereq—[MgtS 4711], MgtS 3701 or Mktg 3701, LSBE cand 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.

**MKTG 4721. Advertising and Marketing Communications.** (3 cr; A-F only. Prereq—[MgtS 4721], MgtS 3701 or Mktg 3701, LSBE cand 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.

**MKTG 4731. Consumer Behavior.** (3 cr; A-F only. Prereq—[MgtS 4731], MgtS 3701 or Mktg 3701, LSBE cand 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.

## Course Descriptions

**MKTG 4741. Developing and Marketing New Products.** (3 cr; A-F only. Prereq—[MgtS 4741], MGTS 3701 or MKTG 3701, LSBE cand or @)

A marketing-oriented new products management course that explores the new product development process with a focus on marketing strategies for the planning, development and launch of new products and services.

**MKTG 4751. Retailing.** (3 cr; A-F only. Prereq—3701, LSBE candidate or @, no Grad School cr)

Principles of establishing and operating a retail business. Topics include retail market analysis and research, store layout, retail accounting, merchandise selection and financing, pricing, selling, advertising, budgets and current trends. Emphasis on retail management from a strategic perspective.

**MKTG 4781. Marketing Management and Strategy.** (3 cr; A-F only. Prereq—[MgtS 4781], MgtS 3701 or Mktg 3701, MgtS 3711 or Mktg 3711, 1 other Mktg course, 90 cr, LSBE cand or grad 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.

**MKTG 4795. Special Topics (Various Topics to be Assigned).** (1-3 cr [max 9 cr]; A-F only. Prereq—LSBE cand, MGTS 3701 or MKTG 3701 or @, no Grad School cr) Enables students, working closely with the instructional faculty, to explore one or more contemporary marketing issues in substantial depth.

## Master in Advocacy and Political Leadership (MAPL)

College of Liberal Arts

**MAPL 5110. Ethics in Politics: Developing a Shared Ethical Code for Involvement in MN Advocacy, Political Life.** (3 cr; A-F only. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Develop a shared, rudimentary ethical code for participation in Minnesota advocacy and political life. The exercise in developing the code will be informed by reading a few of the major political/ethical theorists, by dialogue with various political/advocacy figures, and by case studies.

**MAPL 5111. Labor Organizing.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Historical overview of the evolution of modern labor movement, examine the state of organized labor and labor organizing today, and analyze two emerging models of union leadership—social movement leadership and institutional leadership.

**MAPL 5113. Labor and Political Economy.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Overview of political economy and labor, examine different economic theories, changing economic policies and their impact on workers and labor, and examine specific case studies of political economy: the New Deal/Great Society policies, deindustrialization, monetary policy, globalization, welfare reform and taxation.

**MAPL 5116. Rural Politics and Community Advocacy.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Applications to assess operative power structures in rural and small communities, the sources of community cohesion and conflict, and the designing and implementing of effective economic and civic improvement projects and policies.

**MAPL 5117. Urban Policy and Community Organizing.** (3 cr; A-F only. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Focuses on policy issues such as housing, transportation, youth programs, poverty, and economic development, and models and practices for community organizing at the neighborhood level and in urban communities. Students will learn to do research with local community organizations.

**MAPL 5119. Techniques for Nonprofit Advocacy: Nonprofits as Agents of Democracy.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Teaches on the nonprofit sector's composition, power, and positioning and its - both positive and oppositional - governmental relationships. Students learn about the creation of alternative power structures and advancement of programs, issues, and social change agendas through nonprofits.

**MAPL 5200. Nonprofits and Civic Engagement.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

History, theory and current practice of nonprofits in educating and activating citizens to participate in the public dialogue. Special attention is given to the role of nonprofits as resources to elected and appointed policy makers.

**MAPL 5202. Nonprofits and Government: The Public and Private Partnership.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

An in-depth look at the intersection between non-profits and government. Addresses the origin, growth and future of the relationship between non-profit organizations and the government sector, and current and historical partnerships will be reviewed. Through readings, case studies, and guest lecturers, students will be exposed to the challenges of these partnerships as well as success stories. Students will be exposed to the State and Federal programs related to economic development, housing, and social services. Students will also discuss the devolution of government functions to third parties and private organizations, as well as the associated funding implications.

**MAPL 5301. Campaigns and Elections.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Overview of campaigns and elections, to include both the party nomination process and general elections, at the national, state, and local levels.

**MAPL 5302. Policy and the Media.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Examination of the way policy makers use the media and ways media affects policy. Traditional and new media and media methods regarding current debates framing political issues, media consolidation and role in shaping rather than reporting news are offered.

**MAPL 5303. Lobbying and Intergovernmental Relations.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

What and why public policy is being set in Minnesota and Wisconsin, at the statewide, major local and regional levels.

**MAPL 5306. Gender and Advocacy.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Explores the politics of gender and public policy in the U.S. and is designed to provide students with a historical and theoretical background on policy formation, and a set of analytical tools applied to policy case studies.

**MAPL 5307. Political and Advocacy Leadership.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Help advocates strengthen abilities to lead wisely, ethically and effectively in political settings. Provides an interdisciplinary framework to explore the principles of power and leadership, and features effective political leaders from Minnesota and Wisconsin who discuss their principles of leadership.

**MAPL 5308. The Impact of Art on Social Change.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Analysis and understanding of how art works influence public perception, political will, social policy. Topics include environmental protection, labor movement, attitudes toward war, civil rights, and gay and lesbian rights. Art forms examined include drama, literature, film, music, photography, painting.

**MAPL 5309. Legal System and Public Policy.** (3 cr; A-F only. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Prepares advocates to understand the extent to which courts or more precisely the issues confronting our legal system drive policy and social change. Students will develop practical skills to seek legal remedies for their constituencies, and strategies for knowing when to choose the courts instead of the legislative process.

**MAPL 5310. Advocacy Strategies in Theory and Practice.** (3 cr; A-F only. Prereq—MAPL, or Collegiate Grad Student or Grad School Student of #, no Grad School cr)

Prepares advocates to work powerfully and persuasively in public, political contexts. Students will learn how to analyze political situations and to develop issue-, context- and culture-specific messages while gaining practical experience in reacting in impromptu fashion to evolving circumstances, constructing a strategic campaign plan, negotiation and bargaining, and working to advance their cause on a personal and cultural level. Current advocacy and political leaders from Minnesota and Wisconsin will be featured.

**MAPL 5311. Advocacy in the Public Sector: Service in the Elected Branch.** (3 cr; A-F or Aud. Prereq—No Grad School cr)

First of two required segments of the concentration, advocacy in the public sector. Prepares for current or future careers in the elected branches of government, at the local, regional, state or national level as members of councils, boards, the Legislature or Congress, or as staff to those elected. Familiarizes students with three essential skills for persons interested in such careers, instruction on understanding and using public opinion measurement, instruction on best practices for those operating as staff to elected or appointed officials, and instruction on media relations in a political setting; all three skills-oriented segments will be taught by guest lecturers with outstanding credentials; the first and last three-hour periods of the class will discuss the ethical dimensions of working in the political realm.

**MAPL 5312. Advocacy in the Public Sector: Service in the Executive Branch.** (3 cr; A-F or Aud. Prereq—MAPL or Collegiate Grad student or #, no Grad School cr)

This is the second of two required segments of the MAPL concentration, Advocacy in the Public Sector, designed for use by students wishing to work in government. Prepares students who have or will have careers in the executive branches of government, at the local, regional, state or national levels as elected officials, as political staff to these various elected officials, or as members of the

bureaucracy. Students will become familiarized with how to find and use the best administrative practices as they related to personnel, resource and information management, with special emphasis on finding innovative solutions to management problems.

**MAPL 5395. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; A-F or Aud. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Opportunity to explore diverse topics in advocacy, to take advantage of new developments in the field and to explore current issues or events related to advocacy.

**MAPL 6001. Political Process and Public Policy.** (3 cr; Stdnt Opt. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Offers familiarity with the concepts of agenda setting and policy development and with the variable meanings used in the political arena to define core concepts like equitable and efficient. After reading and reporting on a leading book from the public affairs literature, students focus primarily on a policy they wish to see enacted or changed, then prepare background papers and oral presentations arguing for that enactment or change.

**MAPL 6002. Policy Evaluation.** (3 cr; Stdnt Opt. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Prepares students to understand and, in some cases, to perform, formal evaluations of policy proposals, including cost benefit analysis and other efficacy-based measures. Students will learn that neither public policy nor politics are or can be ethically neutral.

**MAPL 6003. Civic Engagement and Political Cultures.** (3 cr; Stdnt Opt. Prereq—MAPL or Collegiate Grad student status or Grad School student status or #)

Identification of at least four major issues currently facing the policy makers in Minnesota and/or the nation. Using historical analysis, students will ascertain how these issues came to be what they currently are and attempt to analyze where they might go, given the political culture in the state and nation. Students will quickly survey and critique the philosophical foundations of American politics, from Jefferson and Madison to Rawls and Martin Luther King.

**MAPL 6004. Political Organizing and Communication.** (3 cr; Stdnt Opt. Prereq—MAPL or Grad School or Collegiate Grad student or #)

Designed to give students an understanding of the sociological, intra-personal nature of political and advocacy communication as well as familiarity with successful advocacy writing and with modern organizing strategies.

**MAPL 6008. Advocacy Internship I.** (3 cr; S-N or Aud. Prereq—MAPL student or #, no Grad School cr) Internship experiences will be offered in the advocacy and political leadership program. Students will have supervised direct experience with an individual or organizational sponsor in advocacy.

**MAPL 6009. Advocacy Internship.** (2 cr [max 4 cr]; S-N or Aud. Prereq—MAPL or #, no Grad School cr) Internship experiences will be offered in the advocacy and political leadership program. Students will have supervised direct experience with an individual or organizational sponsor in advocacy.

## Master of Business Administration (MBA)

Labovitz School of Business and Economics

**MBA 8111. Business, Government, and Society.** (2 cr; A-F or Aud. Prereq—MBA student or @)

How cultural, political, global, legal, and economic factors impact business activities. Issues of business ethics and social responsibility.

**MBA 8211. Data Analysis and Statistics for Managers.** (2 cr; A-F or Aud. Prereq—Econ 2020 or equiv, MBA student or @)

Concepts/principles of business statistics, data analysis, and presentation of results. Research process and design, secondary and primary data collection, measurement concepts, sampling design, use and interpretation of statistical techniques, research ethics, reporting, and evaluating research findings.

**MBA 8311. Operations Management.** (3 cr; A-F or Aud. Prereq—FMIS 3301 or equiv, MBA student or @)

Operations management strategies for the organization. Computer-implemented decision support models introduced in contexts such as project management, resource allocation, forecasting, quality management, inventory management, and simulation.

**MBA 8333. FTE: Master's.** (1 cr; No grade. Prereq—Master's student, adviser and DGS consent)

**MBA 8411. Policy Formulation and Implementation.** (3 cr; A-F or Aud. Prereq—8311, 8611, 8711, 8811, MBA student or @)

Formulation and implementation of organizational strategy and policy that results in a sustainable competitive advantage. Develop skills in integrating all functional areas of business as well as identifying industry and competitive trends to determine organizational strategy.

**MBA 8501. Management Accounting.** (3 cr; A-F or Aud. Prereq—Acct 2005 or equiv, MBA student or @)

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 product mix, cost-volume-profit analysis, and other profit planning and control areas.

**MBA 8512. Managerial Economics.** (2 cr; A-F or Aud. Prereq—Econ 1022, Econ 1023 or equiv, MBA student or @)

Application of economic theory and economic methodology to managerial decision making. Supply and demand, production, consumer behavior, business and economic forecasting, pricing and marketing strategies under differing competitive conditions, government's role, and the global market.

**MBA 8611. Financial Management.** (3 cr; A-F or Aud. Prereq—FMIS 3601 or equiv, MBA student or @)

Overview of fundamental concepts and principles of financial management and how these analyses are implemented by financial managers in making strategic financial decisions in a corporate setting. Topics include developments in capital market theory, capital budgeting analysis in terms of the NPV and real options approaches, costs of capital, long term financing, capital structure analysis and international financial strategies.

**MBA 8711. Marketing Management.** (3 cr; A-F or Aud. Prereq—Mktg 3701 or equiv, MBA student or @)

Planning, implementation, evaluation, and control of organizational marketing activities. This process includes environmental market analysis in order to achieve competitive advantage and effective resource allocation.

**MBA 8811. Human Resource Challenges.** (3 cr; A-F or Aud. Prereq—MgtS 3801 or equiv, MBA student or @) Overview of contemporary human resource issues, human resource systems, procedures, and decisions that guide effective, efficient, and equitable management of people in organizations.

**MBA 8991. Independent Study.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—@)

Provides opportunity for special study in areas useful to individual programs and objectives in accounting, economics, finance, information systems, management, human resource management, marketing, and other areas of business administration that extend beyond, or in greater depth than, regular courses.

**MBA 8994. Directed Research.** (1-6 cr [max 6 cr]; A-F or Aud. Prereq—MBA student, @)

Directed research.

**MBA 8995. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 8 cr]; A-F or Aud. Prereq—MBA student or @)

Special topics on or integrative, interdisciplinary study of problems in accounting, economics, and business administration.

**MBA 8999. Projects in Business.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—MBA student, @)

Community or campus-based projects involving analysis of an issue or problem in an organization and proposal of a solution. Provides an opportunity for integrative, interdisciplinary study of problems in accounting, economics, and business administration.

## Mathematics (MATH)

Swenson College of Science and Engineering

**MATH 102. Euclidean Geometry.** (0 cr; A-F or Aud. Prereq—High school algebra; the preparatory course fee is equal to 3 credits of resident tuition)

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 1005. College Algebra.** (5 cr; A-F or Aud. Prereq—Math ACT 18 or higher or SSP 0103 or %)

Basic concepts of solving equations and inequalities. Introduction to function concept and graphing. Polynomial, rational, logarithmic, and exponential functions.

**MATH 1007. Algebra Review.** (1 cr; S-N or Aud. Prereq—81160 or 1250 or 1290 or 1296 or 1596)

College-level algebra: solving equations and inequalities. Designed for students who need to review high-school algebra topics and/or supplement previous courses, such as College Algebra.

**MATH 1024. Introduction to Contemporary Mathematics.** (3 cr; A-F or Aud. Prereq—Math ACT 22 or higher or a grade of at least C- in Math 1005 or % LE 2)

Increases awareness and appreciation of uses, richness, and power of mathematics. Sample topics: graph theory for management science, scheduling, linear programming, statistical sampling and inference, coding information, decision making, voting theory, game theory, geometric growth, symmetry, and patterns.

**MATH 1141. Mathematics for Elementary Education.** (4 cr; A-F or Aud. Prereq—Pre-elem educ major and math ACT 22 or higher or a grade of at least C- in MATH 1005 or %)

Subject matter for effective elementary school teaching. Problem solving, structure of number systems, and properties of geometric figures. Use of microcomputers in mathematics.

## Course Descriptions

**MATH 1160. Finite Mathematics and Introduction to Calculus.** (5 cr; A-F or Aud. Prereq—Math ACT 23 or higher or a grade of at least C- in Math 1005 or %; if you have received credit for 1290 or 1296 or 1596, you will not receive credit for Math 1160. LE 2)

Elementary functions, matrices, graphical and algebraic methods for solving systems of linear equations and inequalities, introduction to linear programming, and abbreviated treatment of calculus with emphasis on business and social science applications.

**MATH 1234. Freshman Seminar: Topics (Various Titles to be Assigned).** (3 cr; A-F or Aud. Prereq—Freshman, fewer than 30 cr. LE 2)

Concepts from mathematics/statistics and their areas of use. See Class Schedule for topics.

**MATH 1250. Precalculus Analysis.** (4 cr; A-F or Aud. Prereq—Math ACT 22 or higher or a grade of at least C- in Math 1005 or % LE 2)

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 1290. Calculus for the Natural Sciences.** (5 cr; A-F or Aud. =MATH 1296, MATH 1596. Prereq—Math ACT 25 or higher or a grade of at least C- in Math 1250 or % LE 2)

Differential and integral calculus needed for modeling in earth and life sciences. Computational software. Not intended for students in mathematics, engineering, or physical sciences.

**MATH 1296. Calculus I.** (5 cr; A-F or Aud. =MATH 1290, MATH 1596. Prereq—Math ACT 25 or higher or a grade of at least C- in Math 1250 or % LE 2)

First part of a standard introduction to calculus of functions of a single variable. Limits, continuity, derivatives, integrals, and their applications.

**MATH 1297. Calculus II.** (5 cr; A-F or Aud. =MATH 1597. Prereq—A grade of at least C- in 1290 or 1296 or 1596)

Second part of a standard introduction to calculus. Vectors, applications of integrals, transcendental functions, series, and multivariable functions and partial derivatives.

**MATH 1596. Honors: Calculus I.** (5 cr; A-F or Aud. =MATH 1290, MATH 1296. Prereq—1250 or 3 1/2 years high school mathematics including trigonometry, % LE 2)

First part of standard introduction to calculus of functions of single variable. Limits, continuity, derivatives, integrals, and their applications, indeterminate forms. Same as Math 1296, but with more depth, rigor, more challenging assignments. For high-ability students with excellent preparation.

**MATH 1597. Honors: Calculus II.** (5 cr; A-F or Aud. =MATH 1297. Prereq—1596 or a grade of A in 1290 or 1296, %)

Same as Math 1297, but with more depth, rigor, and challenging assignments. Techniques of integration, transcendental functions, exponentials and logarithms, infinite sequences and series, vectors, partial differentiation, and applications. Intended for high-ability students with excellent preparation.

**MATH 2326. Introduction to Linear Algebra and Mathematical Reasoning.** (3 cr; A-F or Aud. Prereq—1290 or 1296 or 1596)

Mathematical reasoning, including direct proofs, indirect proofs, proofs by contradiction, and counterexamples. Systems of linear equations; matrix algebra; determinants; an introduction to vector spaces, subspaces, linear independence, span, basis; change of coordinates, matrix transformations, eigenvalues, eigenvectors, and orthogonal projections.

**MATH 3091. Independent Study.** (1-3 cr [max 8 cr]; A-F or Aud. Prereq—%)

Directed reading and/or research in mathematics. Must be arranged with instructor and department head before registration.

**MATH 3097. Internship.** (1-3 cr [max 3 cr]; S-N or Aud. Prereq—Math major, %)

Practical, independent project in commercial, government, or industrial setting. Department approval required before beginning project.

**MATH 3110. Foundations of Mathematics and Geometry.** (4 cr; A-F or Aud. Prereq—1297 or 1597, teaching math major)

Introduction to foundations of mathematics. Non-Euclidean geometries, postulational systems, and models. History of mathematics. Importance and use of mathematics in modern society.

**MATH 3120. Mathematics Tutorial Project.** (1-2 cr [max 4 cr]; S-N or Aud. Prereq—1290 or 1296 or 1596, SSP 3003, #)

Primarily for tutoring 1xxx mathematics courses, under supervision of mathematics department member.

**MATH 3280. Differential Equations with Linear Algebra.** (4 cr; A-F or Aud. Prereq—A grade of at least C- in 1297 or 1597)

First, second, and higher order equations; series methods; Laplace transforms; systems; software; modeling applications; introduction to vectors; matrix algebra, eigenvalues.

**MATH 3298. Calculus III.** (4 cr; A-F or Aud. Prereq—A grade of at least C- in 1297 or 1597)

Third part of a standard introduction to calculus. Conic sections, vectors and vector-valued functions, partial derivatives and multiple integrals, vector fields, Green's and Stokes' theorems.

**MATH 3355. Discrete Mathematics.** (4 cr; A-F or Aud. Prereq—1297 or 1597 or #)

Introduction to mathematical logic, predicates and quantifiers, sets, proof techniques, recursion and mathematical induction, recursive algorithms, analysis of algorithms, assertions and loop invariants, complexity measures of algorithms, combinatorial counting techniques, relations, graph theory.

**MATH 3941. Undergraduate Colloquium.** (1 cr; S-N or Aud. Prereq—Math major or minor, %; must regis during sem of 16th point)

Exposure to UMD mathematics-related colloquia. Sixteen points required: one for attending a colloquium; one for writing an acceptable report on a colloquium (at least four must be earned through writing); up to eight for giving a colloquium.

**MATH 4201. Elementary Real Analysis.** (4 cr; A-F or Aud. Prereq—[3299], 3280, 3355, no Grad School cr)

In-depth study of concepts fundamental to the theory of single-variable calculus, including topology of the real numbers, convergence of sequences and series, function continuity, the derivative, and the Riemann integral.

**MATH 4230. Applied Mathematics: Complex Variables.** (3 cr; A-F or Aud. Prereq—3280)

Complex numbers and analytic functions; complex integration; complex power series, Taylor series, and Laurent series; theory of residues; conformal mapping.

**MATH 4240. Applied Mathematics: Operational Methods.** (3 cr; A-F or Aud. Prereq—3280)

Laplace transform; Fourier series, integrals, and transforms; Sturm-Liouville operator- and boundary-value problems; orthogonal functions; operator solutions of partial differential equations.

**MATH 4326. Linear Algebra.** (3 cr; A-F or Aud. Prereq—A grade of at least C- in 3280, 3355, no Grad School cr)

Systems of linear equations, matrix algebra, determinants, vector spaces, subspaces, linear independence, span, basis, coordinates, linear transformations, matrix representations of linear transformations, eigenvalues and eigenvectors, diagonalization, Gram-Schmidt orthogonalization, orthogonal projection and least squares.

**MATH 4371. Introduction to Abstract Algebra.** (3 cr; A-F or Aud. Prereq—3355, 4326 or 3280, teaching math major, cannot be used for math major elective; no Grad School cr) Introduction to groups and rings appropriate for students majoring in teaching mathematics.

**MATH 5110. Foundations of Secondary-level Mathematics: Algebra.** (3 cr; A-F or Aud. Prereq—4326 or mathematics teaching license or #)

Advanced pre-service and in-service secondary mathematics teachers. Secondary mathematics from a higher perspective: definitions, history, and machinery of functions; concept of and solving equations; algebraic structures; congruence transformation; symmetry; similar figures; distances within figures; relationship among area, volume, and dimension.

**MATH 5120. Foundations of Secondary-level Mathematics: Analysis.** (3 cr; A-F or Aud. Prereq—4326 or mathematics teaching license or #)

Real and complex numbers; natural numbers, induction, and recursion; divisibility properties of the integers and polynomials; systems of modular arithmetic; number fields; angle measure and the trigonometric ratios; trigonometric functions and their connections; cartesian model for Euclidean Geometry.

**MATH 5201. Real Variables.** (4 cr; A-F or Aud. Prereq—4201)

Limits, sequence and series of real numbers, tests for convergence, rearrangements, summability, and the class L-SQUARED. Metric spaces; continuous functions, connectedness, completeness, compactness. Banach fixed-point theorem and Picard existence theorem for differential equations.

**MATH 5233. Mathematical Foundations of Bioinformatics.** (3 cr; A-F or Aud. Prereq—Any two of the following: Biol 5233, Math 3355, CS 1511, Stat 3611 or #)

Mathematical, algorithmic, and computational foundations of common tools used in genomics and proteomics. Topics include: sequence alignment algorithms and implementations (Needleman-Wunsch, Smith-Waterman, BLAST, Clustal), scoring matrices (PAM, BLOSUM), statistics of DNA sequences (SNPs, CpG islands, isochores, satellites), and phylogenetic tree methods (UPGMA, parsimony, maximum likelihood). Other topics will be covered as time permits: RNA and protein structure prediction, microarray analysis, post-translational modification prediction, gene regulatory dynamics, and whole-genome sequencing techniques.

**MATH 5260. Dynamical Systems.** (3 cr; Stndt Opt. Prereq—3280)

Fundamentals of differential equations (existence, uniqueness, continuation of solutions); linear systems, autonomous systems, and Poincare-Bendixon theory; periodic systems; discrete dynamical systems; bifurcation theory; chaos.

**MATH 5270. Modeling with Dynamical Systems.** (3 cr; Stndt Opt. Prereq—3280)

Application and analysis of continuous and discrete dynamical systems. Model construction, simulation, and interpretation.

**MATH 5280. Partial Differential Equations.** (3 cr; A-F or Aud. Prereq—A grade of at least C- in 3280 or grad standing)

Introduction, emphasizing use of Fourier series, Green's functions, and other classical techniques.

**MATH 5327. Advanced Linear Algebra.** (3 cr; A-F or Aud. Prereq—Graduate student or #)  
Vector spaces over fields, subspaces, linear transformations, matrix representations, change of basis, inner-product spaces, singular value decomposition, eigenspaces, diagonalizability, annihilating polynomials, Jordan form.

**MATH 5330. Theory of Numbers.** (3 cr; A-F or Aud. Prereq—3355 or #)  
Properties of integers, primes, divisibility, congruences, and quadratic reciprocity. Computational aspects include factoring algorithms and RSA cryptosystem.

**MATH 5365. Graph Theory.** (3 cr; A-F or Aud. Prereq—3355 or #)  
Finite graphs, including trees, connectivity, traversability, planarity, colorability, labeling, and matchings.

**MATH 5366. Enumerative Combinatorics.** (3 cr; A-F or Aud. Prereq—3355)  
Permutations, combinations, binomial coefficients, inclusion-exclusion, recurrence relations, ordinary and exponential generating functions, Catalan numbers, selected topics from designs, finite geometries, Polya's enumeration formula.

**MATH 5371. Abstract Algebra I.** (3 cr; A-F or Aud. Prereq—3355 or 4326 or grad standing or #)  
Introduction to groups and rings and their applications.

**MATH 5372. Abstract Algebra II.** (3 cr; A-F or Aud. Prereq—5371 or #)  
Polynomial rings, divisibility in integral domains, field extensions, finite fields, special topic, and applications.

**MATH 5384. Algebraic Coding Theory.** (3 cr; A-F or Aud. Prereq—3355 or #)  
Introduction to linear error-correcting codes using binary vector spaces and finite fields. Hamming codes, Golay codes, linear codes in general, cyclic codes, BCH codes, and their encoding/decoding.

**MATH 5810. Linear Programming.** (3 cr; A-F or Aud. Prereq—3280 or 4326)  
Motivation problems, modeling, theory of simplex method, duality and sensitivity analysis, large-scale problems, complexity, and Karmarkar algorithm.

**MATH 5830. Numerical Analysis: Approximation and Quadrature.** (4 cr; Stdnt Opt. Prereq—3280 or 4326, proficiency in FORTRAN or C or C++)  
Error analysis, interpolation and approximation, numerical integration, solution of nonlinear systems.

**MATH 5840. Numerical Analysis: Systems and Optimization.** (4 cr; Stdnt Opt. Prereq—3280 or 4326, proficiency in FORTRAN or C or C++)  
Solution of systems of linear equations; elimination and factorization methods; iterative methods; error analysis; eigenvalue/eigenvector approximation; unconstrained optimization; nonlinear least squares.

**MATH 5850. Numerical Differential Equations.** (4 cr; A-F or Aud. Prereq—3280, proficiency in FORTRAN or C or C++)  
Computational differencing techniques as applied to initial- and boundary-value problems. Introduction to variational formulations of differential equations and general technique of weighed residuals.

**MATH 5991. Independent Study.** (1-4 cr [max 8 cr]; A-F or Aud. Prereq—%; Max 6 cr to a Grad School program)  
Directed individual reading and/or research in mathematics; must be arranged with instructor and department head before registration.

**MATH 5995. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—%)  
Topics not available in standard curriculum.

**MATH 8201. Real Analysis.** (3 cr; A-F or Aud. Prereq—5201)  
Rigorous development of abstract measure spaces, measurable functions, and corresponding theory of integration. Lebesgue measure and Lebesgue integral developed as a particular model. (offered alt yrs)

**MATH 8333. FTE: Master's.** (1 cr; No grade. Prereq—Master's student, adviser and DGS consent)

**MATH 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**MATH 8811. Mathematics Seminar.** (3 cr; S-N or Aud. Prereq—8980)  
Applications of mathematical and computational modeling methods; high-performance computation, visualization, and modeling techniques. Case-study analyses of models from areas such as the sciences, medicine, engineering, and industry.

**MATH 8980. Graduate Seminar.** (1 cr; A-F or Aud. Prereq—#)  
Survey of applications of discrete, continuous, and stochastic modeling techniques. For first-year graduate students in applied and computational mathematics.

**MATH 8994. Directed Research.** (1-4 cr [max 12 cr]; A-F or Aud. Prereq—#)

## Mechanical Engineering (ME)

### Swenson College of Science and Engineering

**ME 3111. Fluid Mechanics.** (3 cr; A-F or Aud. Prereq—Engr 2026, BSME or BSChE cand or #; =ChE 3111)  
Mass and energy balances, Bernoulli's Equation, momentum balance, laminar and turbulent flow, boundary layer theory, flow through porous media.

**ME 3140. System Dynamics and Control.** (3 cr; A-F or Aud. Prereq—CS 1121 or 1131 or 1211 or 1511 or 2121, ECE 2006, Math 3280, BSME cand or #)  
Mathematical modeling of mechanical, electrical, thermal, fluid, and hybrid systems. System response using numerical integration and Laplace transforms. Fourier transform and convolution. Transfer functions and frequency response. Classical control theory.

**ME 3211. Thermodynamics.** (3 cr; A-F or Aud. Prereq—Phys 2012, ME 3111, BSME cand or #)  
Thermodynamics, thermodynamic properties of liquids and gases, 1st and 2nd laws of thermodynamics, irreversibility and entropy. Carnot systems, work producing systems, combustion engine cycles, work absorbing systems, refrigeration cycles, psychrometrics.

**ME 3222. Controls and Kinematics Laboratory.** (2 cr; A-F only. Prereq—3140 with a grade of C- or better, &3230; =IE 4135 and/or ME 4135)  
Perform computer simulations and hands on laboratory exercises to explore effective control systems design. Robotic programming exercises using industrial robots will be performed. Design and construction of mechatronic devices will be completed.

**ME 3230. Kinematics and Mechatronics.** (3 cr; A-F only. =IE 4135, ME 4135. Prereq—3140, Math 3298)  
Classical closed and open form kinematics modeling will be developed. Use of Denavit Hartenberg structural analysis will be explored. Kinetic models of structures will be developed. Explores the design and use of mechatronic devices.

**ME 4112. Heat and Mass Transfer.** (3 cr; A-F or Aud. =CHE 3112. Prereq—3211, Math 3298, BSME or BSChE cand or #)  
Theory and practice of heat and mass transfer. Fundamentals of diffusion, conduction, convection, and radiation with application to the design of heat and mass transfer equipment and systems.

**ME 4122. Heat Transfer, Thermodynamics and Fluid Mechanics Laboratory.** (2 cr; A-F or Aud. Prereq—&4112 or ChE 3112 or #, BSME cand)  
Heat transfer and Thermo-Fluids lab, experimental evaluation of conductive, convective and radiation heat transfer, and analysis of performance of various energy systems such as compressors, turbines, fans, refrigerators and combustion engines.

**ME 4135. Robotics and Controls.** (4 cr; A-F or Aud. =IE 4135, ME 3230. Prereq—CS 1121 or CS 1511 or CS 1211 or CS 2121, ECE 2006, Math 3298, Engr 2026, BSME or BSIE candidate or #)  
Exploration of Forward and Inverse Kinematics models for individual robots. Study of robot motion trajectories at the micro- and macroscopic level. Study of PE, PD and PID controllers for robots. Exploration of efficient methods for developing stable controllers for various geometric configurations. Laboratory exercises and final group project to demonstrate mastery of the subject matter.

**ME 4145. CAD/CAM.** (4 cr; A-F or Aud. Prereq—[IE 4145], Engr 2016, BSIE International Engineering, or BSME cand, or #)  
Description of hardware for CAD/CAM, principles of solid modeling, data structures, visualization, calculation of mass properties, surface modeling. Introduction to FEM usage, lab use of CAD/CAM system for solid modeling, cutter path generation, and FEM problems in vibration, stress analysis.

**ME 4175. Machine Design.** (3 cr; A-F or Aud. Prereq—[IE 4175], Engr 2016, Engr 2110, BSME cand or #)  
Analysis of mechanical components as used in mechanical devices. Theories of material failures, lubrication, and corrosion. Design of machinery considering performance, safety, packaging, wear, and recycling.

**ME 4196. Cooperative Education.** (1 cr; A-F or Aud. =IE 4196. Prereq—BSME cand, #, no Grad School cr)  
Practical work experience with employer closely associated with student's academic area; arranged by mutual agreement among student, department, and employer. Biweekly status reports and final written report must be submitted to department.

**ME 4245. Machining and Machine Tools.** (4 cr; A-F or Aud. Prereq—[IE 3245], IE 1225, Engr 2016, BSIE or BSME cand)  
Metal cutting theory, aspects of tool design, fastener and power screw threads, machine tool design: mechanical and electrical, digital control theory for machine tools. Lab experiments in metal cutting, laser metrology, and manual programming of CNC machine tools.

**ME 4255. Multidisciplinary Senior Design.** (4 cr; A-F or Aud. =IE 4255. Prereq—4112, 4175, EMgt 4110, BSME cand, or #, no Grad School cr)  
Capstone design course in mechanical engineering. Project Management, problem definition, root cause analysis, baseline analysis, alternative solutions, analysis, reporting. Societal, economic, ethical, environmental, political considerations. Oral and written reports. Work is in teams focused on industrial or competition-based projects.

**ME 4491. Independent Study in Mechanical Engineering.** (1-4 cr [max 4 cr]; Stndt Opt. Prereq—Sr standing in engineering discipline, #)

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

**ME 4495. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 12 cr]; A-F or Aud. Prereq—BSME cand or #, no Grad School cr)

Topics not available in regular department curriculum. May involve specialties of department or visiting faculty.

**ME 5305. Computational Fluid Dynamics.** (3 cr; A-F only. Prereq—&4112 or ChE 3112, BSChE, or BSME or BSIE candidate or %)

Finite-difference methods for steady and transient diffusion and convection-diffusion problems. Finite-volume technique for the solution of multi-dimensional fluid flow, and heat and mass transfer problems. Utilize CFD software to solve complex problems.

**ME 5315. Nondestructive Evaluation of Engineering Materials.** (3 cr; A-F only. Prereq—3140)

Fundamentals of Ultrasonic and Acoustic Emission NDE are considered including wave propagation, experimental measurement systems, flaw detection and characterization, and material characterization. Labs are used to support the study of ultrasonic and acoustic emission NDE. Other NDE techniques including magnetics, penetrants, eddy currents, thermography, are surveyed.

**ME 5325. Sustainable Energy System.** (3 cr; A-F only. Prereq—3211, BSChE or BSECE or BSIE or BSME candidate, or %)

A comparison of different energy systems will be made in terms of economic, environmental and political implications. Specific energy alternatives will include coal, oil, geothermal, bioenergy, solar, wind, fission, fusion, hydrogen, fuel cell.

**ME 5335. Introduction to Finite Element Analysis.** (3 cr; A-F only. Prereq—Engr 2016, BSME or BSIE or MSEM candidate or %)

An introduction to finite element analysis, including theoretical and applied components in mechanical and thermal systems.

**ME 5991. Independent Study in Mechanical Engineering.** (1-4 cr [max 6 cr]; Stndt Opt. Prereq—MSEM can, %)

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

## Medical and Molecular Physiology (PHSL)

School of Medicine

**PHSL 3011. General Physiology.** (4 cr; A-F or Aud. Prereq—Biol 1761 or Chem 1102 or #)

Lectures and demonstrations illustrate key aspects of function and mechanisms of action of major organ systems. Primarily for students preparing for nursing, dental hygiene, pre-professional programs, communication disorders, life science teaching, majors in natural sciences.

**PHSL 5211. Literature Seminar.** (1-2 cr [max 2 cr]; S-N or Aud)

Oral presentation of written literature review and research data reflecting student's research interests and thesis research results.

**PHSL 5292. Readings in Physiology.** (1-3 cr [max 3 cr]; Stndt Opt. Prereq—#)

Topics in physiology selected for each student; written reviews prepared and discussed.

**PHSL 5294. Research in Physiology.** (1-15 cr [max 15 cr]; Stndt Opt. Prereq—#)

Introduction and use of lab techniques and equipment used for research in various subspecialties of physiology, including neurophysiology, cardiovascular physiology, endocrinology, respiratory and transport process, electrophysiology, and renal physiology.

**PHSL 5601. Physiology of Organ Systems I.** (4 cr; A-F or Aud. Prereq—Biol 2101 or Biol 2201 or Chem 3322 or 4341 or #)

Survey of physiologic functions and interrelationships of organ systems in mammals (musculoskeletal, cardiovascular, renal, respiratory, nervous, endocrine, and reproductive). Framework for understanding physiological processes, allowing students to integrate knowledge gained at molecular level with functions of whole organism.

**PHSL 5602. Physiology of Organ Systems II.** (2 cr; A-F or Aud. Prereq—5601 or #)

Advanced study of organ system functions in context of interaction of organism with environment.

**PHSL 5701. Sensory Physiology.** (2 cr; A-F only. Prereq—5601 or IBS 8103, #)

Comprehensive study of mammalian sensory processing, with a focus on the auditory, visual and gustatory systems.

**PHSL 8333. FTE: Master's.** (1 cr; No grade. Prereq—Master s student, adviser and DGS consent)

**PHSL 8401. Physiology of Aging.** (2 cr; Stndt Opt. Prereq—5601, #)

In-depth study of several theories concerning physiological processes that appear to set the limits of maximum human life span.

**PHSL 8405. Muscle Physiology.** (2 cr; A-F or Aud. Prereq—5601, #)

In-depth review and discussion of physiological processes involved in muscle contraction from subcellular events to neural-controlled function of whole muscle (skeletal, cardiac, and smooth muscle).

**PHSL 8415. Special Topics: (Various Titles to be Assigned).** (2 cr; Stndt Opt. Prereq—5601, #)

Selected topics 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.

**PHSL 8441. Transport Processes.** (2 cr; Stndt Opt. Prereq—5601, #)

In-depth, quantitative approach to transport processes in biological systems.

**PHSL 8444. FTE: Doctoral.** (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

**PHSL 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. Prereq—Max 6 cr per semester or summer; doctoral student who has not passed prelim oral; no required consent for the first two registrations up to 12 cr; departmental consent for the third and fourth registrations up to an additional 12 cr, or 24 cr total (for doctoral students admitted summer 2007 and beyond; doctoral students admitted prior to summer 2007 may register up to 4 times totaling 60 cr)

**PHSL 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**PHSL 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

## Medical Microbiology and Immunology (MICB)

School of Medicine

**MICB 5545. Immunobiology.** (3 cr; A-F or Aud. Prereq—%, no Grad School cr)

The immune system including the cells and molecules which work cooperatively to resist disease and aberrations resulting in immune disorders.

**MICB 5546. Immunopathology.** (3 cr; A-F or Aud. Prereq—5545, #, no Grad School cr)

A rigorous analysis of the immune-defense mechanisms in disease processes, including infection, inflammation and autoimmune disorders utilizing the Problem-Based Learning method to address the selected content and to study current technical literature.

**MICB 5555. Molecular Pathogenesis: Current Concepts.** (3 cr; A-F or Aud. Prereq—Biol 2201 or equiv, Biol 4501 or equivalent or #, no Grad School cr)

Study of current discoveries in microbial pathogenesis and the molecular techniques used in elucidating pathogenic mechanisms of viral, bacterial and parasitic agents. A survey of current literature related to human infectious disease including malignant transformation.

**MICB 5591. Problems in Medical Microbiology and Immunology.** (1-4 cr [max 8 cr]; Stndt Opt. Prereq—Open to med students or qualified upper div and grad students with #)

Independent study on tutorial basis. Emphasis on basic and clinical microbiology problems, including immunology. Investigative work and appropriate reading arranged with tutorials consistent with interests and capabilities of individual students.

**MICB 8333. FTE: Master's.** (1 cr; No grade. Prereq—Master s student, adviser and DGS consent)

**MICB 8444. FTE: Doctoral.** (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

**MICB 8554. Advanced Immunology and Immunobiology.** (2 cr; A-F or Aud. Prereq—5545 or #)

Detailed study of mechanisms involved in immunologic defense. Emphasis on concepts and current literature.

**MICB 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**MICB 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

## Medicine (MED)

School of Medicine

**MED 601. Basic Science I.** (0 cr; P-N or Aud. Prereq—Regis Med Student)

For selected medical students working toward an M.D. who are doing continuing work in their first year. Students must be recommended by the Scholastic Standing Committee or associate dean for student affairs. May be repeated.

**MED 602. Basic Science II.** (0 cr; P-N or Aud. Prereq—Regis Med Student)

For selected students working towards an M.D. who are doing continuing work in their second year. Students must be recommended by the Scholastic Standing Committee or associate dean for student affairs. May be repeated.

**MED 691. Independent Study.** (0 cr; P-N or Aud. Prereq-Regis Med Student)

For selected medical students working toward an M.D. who are pursuing independent study (e.g., remedial coursework, repeating a course, medical leave). Students must be recommended by the Scholastic Standing Committee or associate dean for student affairs.

**MED 693. Directed Study.** (0 cr; P-N or Aud. Prereq-Regis Med Student)

For selected medical students working toward an M.D. who are in a supervised program preparing for the National Boards Exam. Students must be recommended by the Scholastic Standing Committee or associate dean for student affairs.

**MED 694. Research.** (0 cr; P-N or Aud. Prereq-Regis Med Student)

For selected medical students working toward an M.D. who are doing research over an extended period of time. Students must be recommended by the Scholastic Standing Committee or associate dean for student affairs. May be repeated.

**MED 3998. Human Biology and Behavior Topics.** (1-10 cr [max 12 cr]; Stdnt Opt. Prereq-#)

Advanced undergraduate or graduate students can study in depth normal human biology and behavior. During the academic year, students may elect to enroll in one or several subtopics. No basic science clinical correlation.

**MED 5085. Medical Research Ethics, Responsible Conduct of Research.** (1 cr; S-N only. Prereq-#, no Grad School cr)

Designed for postdoctoral fellows and graduate and undergraduate students to define and investigate ethical behavior in research. The potential pitfalls encountered when doing medical research also will be emphasized. Topics include morality and ethics; rationale for training in responsible conduct of research; definition of research misconduct; fabrication and falsification; conflict of interest; financial misconduct; authorship; grant writing; peer review; mentorship; animal research issues; human research issues; technology transfer; gender/race issues; and whistleblowing

**MED 6023. Seminars in Indian Health.** (1-2 cr [max 3 cr]; P-N or Aud. Prereq-Regis med student, social work student with #)

Current issues impacting health of Indian people. Causes of morbidity and mortality, including social, cultural, and economic issues. Discussion focuses on solutions to problems in context of Indian communities.

**MED 6301. Medical Epidemiology and Biometrics.** (3 cr; P-N only. Prereq-=[BhSc 6301], Regis med student) Basic elements of biostatistics, including descriptive and inferential statistics, study design, probability statistics, and ordering and interpreting diagnostic tests. Topics in clinical epidemiology and epidemiologic methods.

**MED 6420. Introduction to Rural Family Medicine.** (2 cr; P-N or Aud. Prereq-Regis med student)

Introduces medical students to rural medicine and community health assessments through lecture, panel discussions, small group encounters and rural community site visits.

**MED 6505. Applied Anatomy.** (8 cr; O-N or Aud. Prereq-Regis med student)

Adult gross structure taught using regional approach with strong emphasis on functional and clinical applications. Basic-clinical science correlation conferences held frequently to emphasize applied anatomy of a region.

**MED 6510. Histopathology.** (6 cr; O-N or Aud. Prereq-Regis med)

Integrated course correlating normal structure and function of cells, tissues, and organs of the body with examples of pathological changes that take place within these cells, tissues, and organs during disease processes.

**MED 6520. Principles of Basic Medical Science.** (9 cr [max 18 cr]; O-N only. Prereq-Regis med student) Introduction to cellular homeostatic principles and mechanisms associated with normal and abnormal structure and function. Basic science principles of integrative medical sciences. Interdisciplinary sessions emphasize fundamental concepts of biochemistry, molecular biology, anatomy, microbiology, physiology, and pharmacology.

**MED 6541. Hematopoiesis and Host Defenses.** (9 cr; O-N or Aud. Prereq-Regis med student)

Introduction to principles of human immunology and hematology. Basic science principles, including pharmacology and pathology together with clinical aspects of innate and acquired immunity within context of hemato-lymphoreticular system.

**MED 6566. Cardiovascular System.** (7 cr; O-N only. Prereq-Regis med student)

Integrated comprehensive overview of cardiovascular system. Anatomical, biochemical, physiological, pathological, and pharmacologic aspects of heart, blood vessels, and blood, including histology, embryology, anatomy, gross and microscopic pathology, as well as clinical features, diagnosis, and pharmacological therapy.

**MED 6573. Nervous System.** (11 cr; O-N only. Prereq-Regis med student or #)

Interdisciplinary study of human nervous system, including consideration of eye and ear. Basic sciences of anatomy, behavioral science, biochemistry, microbiology, pathology, pharmacology, and physiology correlated with clinical material.

**MED 6724. Gastrointestinal Hepatobiliary System.** (6 cr; O-N only. Prereq-Regis med student)

Interdisciplinary integrative course discusses fundamental concepts of anatomy, physiology, nutrition, pathology, clinical medicine, and microbiology as they relate to issues of gastrointestinal and hepatobiliary system.

**MED 6728. Respiratory System.** (5 cr; O-N only. Prereq-Regis med student)

Maintenance and regulation of human internal environment by the respiratory system. Histology of upper airways and lungs; respiratory gas exchange; introduction to respiratory component of acid-base balance. Integrative lab covering cardiovascular-respiratory adjustments to exercise.

**MED 6746. Fluids and Electrolytes.** (4 cr; O-N or Aud. Prereq-Regis med student)

Introduction to principles and mechanisms associated with human renal and genitourinary function in health and disease. Integrates anatomical, physiological, pharmacological, pathological, immunological, and basic clinical aspects of renal and genitourinary systems in context of fluid and electrolyte homeostasis.

**MED 6762. Endocrine and Reproductive System.** (5 cr; O-N only. Prereq-Regis med student)

Structure and function of endocrine and reproductive systems. Essential background for understanding findings of clinical medicine related to endocrine regulation of reproduction and homeostasis.

**MED 6773. Integrated Clinical Medicine.** (6 cr; O-N or Aud. Prereq-Regis med student)

Integration of basic, clinical, and behavioral science principles to understand the human body and its integrative function and psychosocial responses, especially in multisystem conditions.

Emphasizing evidence-based medicine principles, health issues are explored over the life cycle from pediatrics to geriatrics.

**MED 6788. Dermatology and Musculoskeletal System.** (5 cr; O-N or Aud. Prereq-Regis med student)

Interdisciplinary study of integument and musculoskeletal system. Basic sciences of anatomy, microbiology, pathology, pharmacology, and physiology correlated with clinical material.

**MED 6997. Summer Internship in Medicine.** (3-12 cr [max 12 cr]; P-N or Aud. Prereq-Regis med, satisfactory completion of first year of medical school, #; no Grad School credit)

Medical students, typically between their first- and second-year of medical school, may elect to participate in either directed clinical experiences in small communities or research studies.

## Music (MU)

### School of Fine Arts

**MU 100. Recital Hour.** (0 cr; S-N only. Prereq-Concurrent registration in applied instruction)

Attendance at scheduled musical events.

**MU 1001. Introduction to Music.** (3 cr; Stdnt Opt. Prereq-Not for music majors or minors LEIP 09)

Various historical style periods; listening to develop understanding and enjoyment of music.

**MU 1003. Beethoven to the Beatles.** (3 cr; Stdnt Opt. LE 9)

Survey of 19th- and 20th-century classical, jazz, rock, pop, and ethnic music genres.

**MU 1005. Jazz Studies.** (3 cr; A-F only. LECD 09)

Evolution of jazz; social problems in America that fostered its origin and continues to shape its development.

**MU 1010. Introductory Theory.** (2 cr [max 4 cr]; A-F only. Prereq-=[Th 1114, Mu 1111], Music major or musical theatre major or %, &1011)

Introduction to basic Western theoretical concepts: music reading, key signatures, key signatures, intervals, scale and chord construction, elementary harmonic analysis, basic time signatures and rhythms, form, terminology, elementary keyboard, transposition, and musical communication with other musicians. Prepares students for successful entry into MU 1111 (Tonal Harmony I).

**MU 1011. Introductory Ear-Training and Sight-Singing.** (1 cr [max 2 cr]; A-F only. Prereq-=[Th 1114, Mu 1112], Music major or musical theatre major or %, &1010)

Introductory training in hearing and distinguishing musical rhythms, melodies, harmonies, and nuance. Singing, conducting, written dictation, and active body movement to enhance musical performance and to prepare for successful entry into MU 1112 (Ear-Training and Sight Singing I).

**MU 1111. Tonal Harmony I.** (2 cr; A-F only. Prereq-=[Mu 1010 or Th 1114], Music major or music minor)

Introduction to four-part harmony, Common Practice methods of composition and analysis.

**MU 1112. Ear-Training and Sight-Singing I.** (1 cr; A-F only. Prereq-=[Mu 1112 or Th 1114], Music major or music minor)

Introduction to ear-training and sight-singing of tonal music.

**MU 1121. Tonal Harmony II.** (2 cr; A-F only. Prereq-1111)

Continued study of four-part harmon, Common Practice methods of composition and analysis. Introduction to secondary dominants and modulation.

**MU 1122. Ear-Training II.** (1 cr; A-F only. Prereq-1112)

Continued study of ear-training and sight-singing of tonal music.

## Course Descriptions

**MU 1311. Voice.** (1-3 cr [max 18 cr]; A-F only. Prereq—Music major, %, performance majors register for 3 cr in major instrument only; all others register for 1 cr) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1312. Voice.** (1 cr; A-F or Aud. Prereq—Non-music major or music major secondary instr; may be repeated) Individual lesson: one-half hour weekly.

**MU 1321. Piano.** (1-3 cr [max 18 cr]; A-F only. Prereq—Music major, %) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1322. Piano.** (1 cr; A-F or Aud. Prereq—Non-music major or music major sec instr; may be repeated) Individual lesson: one-half hour weekly.

**MU 1325. Jazz Piano.** (1-3 cr [max 18 cr]; A-F only. Prereq—Music major, %) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1326. Jazz Piano.** (1 cr [max 12 cr]; A-F only. Prereq—Non-music major or music major sec instrument) Individual lesson: one-half hour weekly.

**MU 1328. Jazz Applied.** (1 cr [max 12 cr]; A-F only. Prereq—Non-music major or music major secondary instrument; #) Individual lesson; 1/2 hour weekly.

**MU 1331. Organ.** (1-3 cr [max 18 cr]; A-F only. Prereq—Music major, %) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1332. Organ.** (1 cr; A-F or Aud. Prereq—Non-music major or music major sec instr; may be repeated) Individual lesson: one-half hour weekly.

**MU 1351. Strings.** (1-3 cr [max 18 cr]; A-F only. Prereq—Music major, %) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1352. Strings.** (1 cr [max 12 cr]; A-F or Aud. Prereq—Non-music major or music major sec instrument) Individual lesson: one-half hour weekly.

**MU 1357. Harp.** (1-3 cr [max 18 cr]; A-F only. Prereq—Music major, %) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1358. Harp.** (1 cr [max 12 cr]; A-F or Aud. Prereq—Non-music major or music major sec instrument) Individual lesson: one-half hour weekly.

**MU 1361. Woodwinds.** (1-3 cr [max 18 cr]; A-F only. Prereq—Music major, %) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1362. Woodwinds.** (1 cr [max 12 cr]; A-F or Aud. Prereq—Non-music major or music major sec instrument) Individual lesson: one-half hour weekly.

**MU 1371. Brass.** (1-3 cr [max 12 cr]; A-F only. Prereq—Music major, %) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1372. Brass.** (1 cr [max 12 cr]; A-F or Aud. Prereq—Non-music major or music major sec instrument) Individual lesson: one-half hour weekly.

**MU 1381. Percussion.** (1-3 cr [max 12 cr]; A-F only. Prereq—Music major, %) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1382. Percussion.** (1 cr [max 12 cr]; A-F or Aud. Prereq—Non-music major or music major sec instrument) Individual lesson: one-half hour weekly.

**MU 1391. Classical Guitar.** (1-3 cr [max 12 cr]; A-F only. Prereq—Music major, %) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1392. Classical Guitar.** (1 cr [max 12 cr]; A-F or Aud. Prereq—Non-music major or music major sec instrument) Individual lesson: one-half hour weekly.

**MU 1395. Jazz Guitar.** (1-3 cr [max 12 cr]; A-F only. Prereq—Music major, %) Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 1396. Jazz Guitar.** (1 cr; A-F or Aud) Individual lesson: one-half hour weekly.

**MU 1398. Pop Styles Guitar.** (1 cr [max 12 cr]; A-F only. Prereq—Non-music major or music major sec instrument) Individual lesson: one-half hour weekly.

**MU 1411. Diction: Italian and English.** (1 cr; A-F or Aud. Prereq—Principal instr voice or #) Proper enunciation of English and Italian as applied to vocal literature.

**MU 1412. Diction: German.** (1 cr; A-F or Aud. Prereq—1411 or #) Proper enunciation of German as applied to vocal literature.

**MU 1413. Diction: French.** (1 cr; A-F or Aud. Prereq—1411 or #) Proper enunciation of French as applied to vocal literature.

**MU 1421. Piano Class I.** (1 cr; A-F or Aud. Prereq—Music major or #) Basic piano technique; sight reading, harmonizing melodies, improvisation for music major working toward department piano proficiency requirement.

**MU 1422. Piano Class II.** (1 cr; A-F or Aud. Prereq—Music major or #) Continuation of piano skills introduced in MU 1421: sight-reading, harmonizing melodies, scale playing, transposition, score reading, improvisation for the music major working toward the departmental piano proficiency requirement.

**MU 1440. Survey of Instrumental Techniques.** (1 cr; A-F or Aud. Prereq—Music major or #) Pedagogical, technical and acoustical principles of percussion, brass, woodwinds, and strings; practical experience with each instrument group.

**MU 1441. Vocal Techniques.** (1 cr; Stdnt Opt. Prereq—Music major or #) Beginning group instruction in voice and vocal pedagogy; principles of vocal acoustics.

**MU 1442. Percussion Techniques.** (1 cr; A-F or Aud. Prereq—Music major or #) Beginning group instruction and pedagogy on instruments in the percussion family; principles of percussion acoustics.

**MU 1501. Concert Band.** (1 cr [max 12 cr]; Stdnt Opt. Prereq—Instructor determines placement LE 10) Study and performance of transcribed and original concert literature.

**MU 1502. Symphonic Wind Ensemble.** (1 cr [max 12 cr]; Stdnt Opt. Prereq—Instructor determines placement LEIP 10) Study and performance of symphonic wind ensemble and contemporary band literature by a select group.

**MU 1503. Symphony Orchestra.** (1 cr [max 12 cr]; Stdnt Opt. Prereq—Instructor determines placement LEIP 10) Rehearsal and performance of representative musical literature for symphony orchestra.

**MU 1504. Chamber Orchestra.** (1 cr [max 12 cr]; Stdnt Opt. Prereq—# LE 10) Rehearsal and performance of chamber orchestra literature.

**MU 1505. Jazz Ensemble.** (1 cr [max 12 cr]; Stdnt Opt. Prereq—Instructor determines placement LECD 10) Study and performance of large jazz ensemble literature.

**MU 1510. Concert Chorale.** (1 cr [max 12 cr]; Stdnt Opt. Prereq—Instructor determines placement LE 10) Rehearsal and performance of representative choral literature from a variety of periods and cultures.

**MU 1511. University Singers.** (1 cr [max 12 cr]; Stdnt Opt. Prereq—Instructor determines placement LEIP 10) A select group for study and performance of distinctive choral literature from diverse historical periods, cultures, and languages. Regional tour usually taken during spring semester. Extended domestic or international tours when possible.

**MU 1512. Chamber Singers.** (1 cr [max 12 cr]; Stdnt Opt. Prereq—&1511 or 4511; instructor determines placement LE 10) Study and performance of vocal chamber music.

**MU 1513. Vocal Jazz Ensemble.** (1 cr [max 12 cr]; Stdnt Opt. Prereq—Instructor determines placement LECD 10) Study and performance of music for vocal jazz ensemble.

**MU 1541. Chamber Music.** (.5 cr [max 6 cr]; A-F or Aud. Prereq—Instructor determines placement) Study and performance of chamber music literature, classical and/or jazz.

**MU 1601. Music Fundamentals.** (1 cr; A-F or Aud. Prereq—Pre-EIEd major) Functional music skills for classroom teachers; singing and playing classroom and accompanying instruments; introduction to music notation and elements of music.

**MU 1901. Music Technology.** (1 cr; A-F or Aud. Prereq—Music major or #) Introduction to music notation software and ear-training software.

**MU 2001. Ethnic and Folk Music of the World.** (3 cr; Stdnt Opt. LEIP 09) Survey of music of selected world cultures.

**MU 2003. Survey of American Music.** (3 cr; Stdnt Opt. LE 9) American folk, popular, and art music from colonial times to present.

**MU 2005. African Roots of American Music.** (3 cr; Stdnt Opt. LECD 09)  
Traditional African music and culture and their influence on American musical styles.

**MU 2105. Composition I.** (2 cr [max 4 cr]; A-F or Aud. Prereq–1121, 1122 or 1102)  
Beginning music composition technique leading to creation of original works.

**MU 2111. Tonal Harmony III.** (2 cr; A-F only. Prereq–1102 or 1121)  
Continued study of tonal theory with an emphasis on late 18th and early 19th century methods of composition and analysis.

**MU 2112. Ear-Training III.** (1 cr; A-F only. Prereq–1102 or 1122)  
Continued study of ear-training and sight-singing of tonal music.

**MU 2121. Tonal Harmony IV.** (2 cr; A-F only. Prereq–2111)  
Continued study of tonal theory with an emphasis on 19th century methods of composition and an introduction to 20th century and contemporary modes of musical organization.

**MU 2122. Ear-Training and Sight Singing IV.** (1 cr; A-F only. Prereq–2112)  
Continued study of ear-training and sight-singing of tonal and an introduction to post-tonal music.

**MU 2422. Piano Proficiency Preparation.** (1 cr [max 2 cr]; A-F only. Prereq–Music major, %)  
For students who have completed 1422 or studied piano privately, this course provides training in specific skills required by the departmental piano proficiency exam.

**MU 2443. Woodwind Techniques I.** (1 cr; A-F or Aud. Prereq–Music major or #)  
Beginning group instruction and pedagogy on single reed instruments; principles of woodwind acoustics.

**MU 2444. Woodwind Techniques II.** (1 cr; A-F or Aud. Prereq–Music major or #)  
Beginning group instruction and pedagogy on double reed instruments; principles of double reed acoustics.

**MU 2445. String Techniques I.** (1 cr; A-F or Aud. Prereq–Music major or #)  
Beginning group instruction and pedagogy on high string instruments; acoustic principles for strings.

**MU 2446. String Techniques II.** (1 cr; A-F or Aud. Prereq–Music major or #)  
Beginning group instruction and pedagogy on low string instruments; acoustic principles for strings.

**MU 2447. Brass Techniques I.** (1 cr; A-F or Aud. Prereq–Music major or #)  
Beginning group instruction and pedagogy on high brass instruments; acoustic principles for brass instruments.

**MU 2448. Brass Techniques II.** (1 cr; A-F or Aud. Prereq–Music major or #)  
Beginning group instruction and pedagogy on low brass instruments; acoustic principles for brass instruments.

**MU 2605. Introduction to Music Education.** (1 cr; A-F or Aud. Prereq–Music Ed major or #)  
Introduction to the music education profession; includes career options, history of the profession, professional writings, current research.

**MU 2624. Group Piano Teaching Techniques.** (2 cr; A-F or Aud. Prereq–Music major or #)  
Study of recognized group piano curricula and materials; discussion of significant research. Group keyboard teaching (various ages) in a lab setting.

**MU 2701. Fundamentals of Conducting.** (1 cr; A-F or Aud. Prereq–1102 or [1121, 1122], Music major or #)  
Beginning instruction in leading musical ensembles: meter patterns, conventional gestures, instrumental transposition, choral techniques.

**MU 2801. Improvisation.** (1 cr; A-F or Aud. Prereq–1102 or [1121, 1122])  
Introduction to basic principles and techniques.

**MU 2802. Jazz Improvisation I.** (1 cr; A-F or Aud. Prereq–2801)  
Beginning techniques and concepts.

**MU 2803. Jazz Improvisation II.** (1 cr; A-F or Aud. Prereq–2101, 2801 or #)  
Study and development of improvisational facility as used in the jazz idiom.

**MU 2901. Recording Techniques and Methods.** (2 cr; A-F only. Prereq–Music major or #)  
The study of sound, hearing, and the aesthetics of audio recording as applied to recording processes and technologies (microphones, recording systems, digital signal processing, editing, and synchronization techniques). Recording studio techniques (mixing, multi-track recording, production), and digital audio workstation application.

**MU 2911. Electronic Composition I.** (2 cr; A-F only. Prereq–#)  
Introduction to composing using only digital resources. Understanding the electronic composition workstation environment, basic MIDI sequencing, virtual instruments, electronic transcription of engraved scores, and synthesis.

**MU 2912. Electronic Composition II.** (2 cr; A-F only. Prereq–2911 or #)  
Continued study of composition using primarily digital resources. Advanced MIDI sequencing and processing, recording live-to-virtual instruments, handling complex workflow, and orchestration with synthetic sound courses. Introduction to scoring of video and computer music.

**MU 3101. Form and Analysis.** (2 cr; A-F or Aud. Prereq–[2121, 2122] or 2102)  
Overview of form in music; structure from Renaissance through 20th-century.

**MU 3105. Composition II.** (2 cr [max 4 cr]; A-F or Aud. Prereq–2105)  
Continued study of musical composition techniques leading to creation of original works.

**MU 3201. Music History I.** (4 cr; A-F or Aud. Prereq–2121, 2122 or 2102 or #)  
Study of Medieval, Renaissance, Baroque, and Classical eras of Western musical development, emphasizing works of Josquin, Palestrina, J.S. Bach, Handel, Haydn, Mozart, and Beethoven.

**MU 3202. Music History II.** (4 cr; A-F or Aud. Prereq–3201 or #)  
Styles in 19th- and 20th-century Western music from romanticism through impressionism, atonality, primitivism, serialism, neo-classicism, to avant-garde and contemporary composers; non-Western musics.

**MU 3211. Art Song Literature.** (2 cr; A-F or Aud. Prereq–1102 or [1121, 1122], music major or #)  
Survey of art song, emphasizing German, French, and English compositions and composers.

**MU 3212. Opera Literature.** (2 cr; A-F or Aud. Prereq–1102 or [1121, 1122], music major or #)  
Survey of opera solo and ensemble literature from Italian, German, French, English, and American traditions.

**MU 3300. Recital.** (1 cr [max 3 cr]; A-F or Aud. Prereq–%, may be repeated)  
Preparation and presentation of a solo performance.

**MU 3510. Opera Studio.** (1 cr; A-F or Aud. Prereq–#, may be repeated)  
Production techniques and performances of solo and ensemble opera literature.

**MU 3511. Performance Practicum.** (1-2 cr [max 2 cr]; A-F or Aud. Prereq–Music major, #)  
Performance of significant role in a musical production.

**MU 3601. Elementary School Music Teaching.** (2 cr; A-F or Aud. Prereq–Elem/middle educ major)  
Methods and materials for teaching music in elementary school classroom. Philosophy of music education, curriculum design, lesson planning, implementation, evaluation, integrated arts experiences.

**MU 3605. Teaching Classroom Music.** (4 cr; A-F or Aud. Prereq–60 cr, music ed major, &3606)  
Philosophy, theory, techniques of instruction for general classroom music, grades K-12.

**MU 3606. Field Experience: Classroom Music Pre K-8.** (1 cr; A-F or Aud. =ELED 3425. Prereq–60 cr, music ed major, &3605)  
Observations and micro-teaching in general music classrooms grades Pre-K through 8. Supervised by music education faculty member from the department of music, in cooperation with general music teachers.

**MU 3607. Instrumental Music Methods.** (3 cr; A-F or Aud. Prereq–60 cr, music major or #)  
Methods and materials for teaching instrumental students in the secondary setting: role and extent of instrumental music in the school curriculum, philosophies and current trends in instrumental music education, recruiting, scheduling, administrative tasks, literature, organizing and training athletic bands.

**MU 3627. Art of Accompanying: Vocal Music.** (2 cr; A-F or Aud. Prereq–#)  
Vocal accompanying (art song, recitative and aria, choral music, and functional skills (e.g., score reading, keyboard harmony). Vocal coaching techniques, listening to standard vocal repertoire, performance.

**MU 3628. Art of Accompanying: Instrumental Music.** (2 cr; A-F or Aud. Prereq–#)  
Instrumental accompanying (strings, brass, and woodwinds) and functional skills (e.g., score reading, keyboard harmony). Rehearsal techniques, listening to standard instrumental repertoire, performance.

**MU 3701. Choral Conducting and Methods I.** (3 cr; A-F or Aud. Prereq–2701 or #)  
Conducting, vocal pedagogy, and methods and materials related to choral rehearsal, emphasizing elementary and middle/junior high.

**MU 3702. Choral Conducting and Methods II.** (3 cr; A-F or Aud. Prereq–3701 or #)  
Continued conducting instruction, with methods and materials related to high school choral ensembles.

**MU 3705. Instrumental Conducting I.** (1 cr; A-F or Aud. Prereq–2701 or #)  
Intermediate techniques, reading, and interpretation of full and condensed orchestral, band, and vocal scores; lab practice in rehearsal procedures.

**MU 3706. Instrumental Conducting II.** (1 cr; A-F or Aud. Prereq–3705 or #)  
Advanced techniques, reading, and interpretation of full and condensed orchestral, band, and vocal scores; lab practice in rehearsal procedures.

**MU 3801. Jazz Improvisation III.** (1 cr; A-F or Aud. Prereq–2803 or #)  
Study and development of improvisational facility as used in jazz idiom.

## Course Descriptions

**MU 3802. Jazz Improvisation IV.** (1 cr; A-F or Aud. Prereq–3801 or #)  
Study and development of improvisational facility as used in jazz idiom.

**MU 3805. Jazz Writing I.** (2 cr; A-F or Aud. Prereq–2102 or [2121, 2122] or #)  
Transpositions, voicings, and arranging concepts for large and small jazz ensembles; development of composition in jazz idiom.

**MU 3806. Jazz Writing II.** (2 cr; A-F or Aud. Prereq–2102 or [2121, 2122], 3805 or #)  
Continuation of arranging concepts for large and small jazz ensembles; further development of composition in jazz idiom.

**MU 3901. Sound Design Techniques of Digital Music in New Media.** (3 cr; A-F only. Prereq–Music major or #)  
Application of digital music composition to a variety of media, including film, video, and the internet. Methods for integrating and editing music with spoken text, sound effects, and mixing for visual production. Introduction to Final Cut, Dreamweaver, and ProTools.

**MU 3911. Electronic Composition III.** (2 cr; A-F only. Prereq–2912 or #)  
Continued study of composition using primarily digital resources. Integrating live electronics and live performance with digital music, sampling techniques. Algorithmic composition introduced as part of the study of computer assisted music creation.

**MU 3991. Independent Study.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq–#)  
Directed study in area of student interest arranged with instructor before registration.

**MU 3995. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; A-F or Aud. Prereq–#)  
Selected topics defined by type, period, or composer.

**MU 3997. Field Study in Music.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq–%)  
Off-campus travel, research, and creative activities in specialized area. Credit allowed depends on nature and scope of study. Requires advance planning with faculty sponsor.

**MU 4101. Instrumental Arranging.** (2 cr; A-F or Aud. Prereq–1901, 3101 or #)  
Idiomatic scoring for instruments; individual assignments in problems and possibilities of various instrument combinations.

**MU 4103. Contrapuntal Techniques.** (2 cr; A-F or Aud. Prereq–2102 or [2121, 2122] or #)  
Study of, and practice in, use of polyphonic devices in Western art music.

**MU 4105. Composition III.** (2 cr [max 4 cr]; A-F or Aud. Prereq–3105)  
Advanced creative composition; individual assignments in various contexts.

**MU 4201. Piano Literature.** (3 cr; A-F or Aud. Prereq–Music major or #)  
Study of representative piano literature from various periods of music history.

**MU 4311. Voice.** (1-3 cr [max 12 cr]; A-F only. Prereq–Music major or fee-waiver student, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4312. Voice.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Non-Music major or music major secondary instrument)  
Individual lesson: one-half hour weekly.

**MU 4321. Piano.** (1-3 cr [max 12 cr]; A-F only. Prereq–Music major, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4322. Piano.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Non-music major or music major secondary instrument)  
Individual lesson: one-half hour weekly.

**MU 4325. Jazz Piano.** (1-3 cr [max 12 cr]; A-F only. Prereq–Music major, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4331. Organ.** (1-3 cr [max 12 cr]; A-F only. Prereq–Music major, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4332. Organ.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Non-music major or music major secondary instrument)  
Individual lesson; one-half hour weekly.

**MU 4351. Strings.** (1-3 cr [max 12 cr]; A-F only. Prereq–Music major, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4352. Strings.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Non-music major or music major secondary instrument)  
Individual lesson; one-half hour weekly.

**MU 4357. Harp.** (1-3 cr [max 12 cr]; Stdnt Opt. Prereq–Music major, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4358. Harp.** (1 cr [max 12 cr]; Stdnt Opt. Prereq–Non-music major or music major secondary instrument)  
Individual lesson; one-half hour weekly.

**MU 4361. Woodwinds.** (1-3 cr [max 12 cr]; A-F only. Prereq–Music major, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4362. Woodwinds.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Non-music major or music major secondary instrument)  
Individual lesson; one-half hour weekly.

**MU 4371. Brass.** (1-3 cr [max 12 cr]; A-F only. Prereq–Music major, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4372. Brass.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Non-music major or music major secondary instrument)  
Individual lesson; one-half hour weekly.

**MU 4381. Percussion.** (1-3 cr [max 12 cr]; A-F only. Prereq–Music major, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4382. Percussion.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Non-music major or music major secondary instrument)  
Individual lesson; one-half hour weekly.

**MU 4391. Classical Guitar.** (1-3 cr [max 12 cr]; A-F only. Prereq–Music major, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4392. Classical Guitar.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Non-music major or music major secondary instrument)  
Individual lesson; one-half hour weekly.

**MU 4395. Jazz Guitar.** (1-3 cr [max 12 cr]; A-F only. Prereq–Music major, %)  
Individual and one-hour group lesson weekly. Partial fee waiver lessons are provided to music majors for a maximum of eight semesters. (Performance majors register for 3 cr in major instrument only; all others register for 1 cr)

**MU 4396. Jazz Guitar.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Non-music major or music major secondary instrument)  
Individual lesson; one-half hour weekly.

**MU 4501. Concert Band.** (1 cr [max 6 cr]; A-F or Aud. Prereq–Instructor determines placement)  
Study and performance of transcribed and original concert literature.

**MU 4502. Symphonic Wind Ensemble.** (1 cr [max 6 cr]; A-F or Aud. Prereq–Instructor determines placement)  
Study and performance of symphonic wind ensemble and contemporary band literature by a select group.

**MU 4503. Symphony Orchestra.** (1 cr [max 6 cr]; A-F or Aud. Prereq–Instructor determines placement)  
Rehearsal and performance of representative literature for symphony orchestra.

**MU 4504. Chamber Orchestra.** (1 cr [max 6 cr]; A-F or Aud. Prereq–Instructor determines placement)  
Study and performance of chamber orchestra literature.

**MU 4505. Jazz Ensemble.** (1 cr [max 6 cr]; A-F or Aud. Prereq–Instructor determines placement)  
Study and performance of large jazz ensemble literature.

**MU 4510. Concert Chorale.** (1 cr [max 6 cr]; A-F or Aud. Prereq–Instructor determines placement)  
Study and performance of representative choral literature from various style periods and cultures.

**MU 4511. University Singers.** (1 cr [max 6 cr]; A-F or Aud. Prereq–Instructor determines placement)  
A select group for study and performance of distinctive choral literature from diverse historical periods, cultures, and languages. Regional tour usually taken during spring semester. Extended domestic or international tours when possible.

**MU 4512. Chamber Singers.** (1 cr [max 6 cr]; A-F or Aud. Prereq–&1511 or 4511; instructor determines placement)  
Study and performance of vocal chamber music.

**MU 4513. Vocal Jazz Ensemble.** (1 cr [max 6 cr]; A-F or Aud. Prereq–Instructor determines placement)  
Study and performance of music for vocal jazz ensemble.

**MU 4541. Chamber Music.** (.5 cr [max 12 cr]; A-F or Aud. Prereq–#)  
Study and performance of chamber music literature, classical and/or jazz.

**MU 4601. Applied Music Teaching.** (1 cr; A-F or Aud. 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 practice; lesson observation; and supervised student teaching.

**MU 4605. Kodaly, Orff, Dalcroze: Classroom Applications.** (1 cr; A-F or Aud. Prereq-Music ed major and #; no Grad School cr)  
Study and application of the philosophies and instructional approaches of Zoltan Kodaly, Carl Orff, and Emile Jaques-Dalcroze to American music education.

**MU 4621. Piano Pedagogy and Practicum I.** (2 cr; A-F or Aud. Prereq-Music major or #)  
Principles and materials for teaching elementary piano students; supervised practice teaching.

**MU 4622. Piano Pedagogy and Practicum II.** (2 cr; A-F or Aud. Prereq-Music major or #)  
Principles and materials for teaching intermediate piano students; supervised practice teaching.

**MU 4623. Piano Techniques and Style.** (3 cr; A-F or Aud. Prereq-1321 or #)  
Technical and stylistic considerations for teaching and performing advanced piano literature.

**MU 4801. Evolution and Analysis of Jazz Styles.** (2 cr; A-F or Aud. Prereq-2102 or [2121, 2122])  
Study and analysis of various jazz styles and idioms.

**MU 4803. Jazz Pedagogy.** (3 cr; A-F or Aud. Prereq-2102 or [2121, 2122])  
Techniques and materials necessary to organize and develop a jazz band in junior and senior high school.

**MU 4807. Music Industry.** (2 cr; A-F or Aud. Prereq-#)  
Study of developing commercial applications and trends in the music industry, including basic concepts of business and marketing.

**MU 4901. Digital Capstone Project.** (3 cr; A-F only. Prereq-3911 or #, no Grad School cr)  
One large-scale, semester-long project designed to provide a cumulative assessment of the student's development and breadth of knowledge, including artistic maturation and technical expertise. Collaboration with a similarly experienced peer from another SFA discipline is encouraged.

**MU 4997. Internship in Music.** (1-2 cr [max 4 cr]; A-F or Aud. Prereq-%)  
Participation in music tutoring or recognized campus/community activity related to student's musical program and career objectives.

**MU 5005. African Roots of American Music.** (3 cr; A-F or Aud. Prereq-60 cr or #)  
Traditional African music and culture and their influences on American musical styles.

**MU 5201. Advanced Music History.** (2 cr; A-F or Aud. Prereq-3201, 3202 or #)  
Specialized study of selected composers and/or genres.

**MU 5203. Advanced Choral Literature.** (3 cr; A-F or Aud. Prereq-3702 or #)  
Study of representative choral literature from various periods of music history.

**MU 5204. Instrumental Ensemble Literature.** (2 cr; A-F or Aud. Prereq-Grad Student or #)  
Study of major works for large wind and orchestral ensembles.

**MU 5205. Instrumental Solo Literature.** (1 cr [max 3 cr]; A-F or Aud. Prereq-Grad student or #)  
Survey of instrumental solo literature within the student's applied field of study.

**MU 5206. Vocal Solo Literature.** (1 cr; A-F or Aud. Prereq-Grad student or #)  
A historical survey of standard repertoire for solo voice in art song, opera, and oratorio; focus varies by semester.

**MU 5207. Instrumental Chamber Music Literature.** (1 cr; A-F or Aud. Prereq-Grad student or #)  
Study of chamber music literature with emphasis on student's major applied area.

**MU 5208. Vocal Chamber Literature.** (1 cr; A-F or Aud. Prereq-Grad student or #)  
A survey of standard repertoire for solo voice with chamber ensembles.

**MU 5510. Opera Studio.** (1 cr [max 6 cr]; A-F or Aud. Prereq-3510 or equivalent, Grad student or #)  
Opera production techniques; performance of solo and ensemble opera literature.

**MU 5695. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; A-F or Aud. Prereq-#; can apply max 6 cr to Grad School program)  
Selected topics of interest to music educators concerning philosophy, history, and teaching/learning theory and practice.

**MU 5701. Advanced Conducting.** (3 cr; A-F or Aud. Prereq-3702 or #)  
Score reading, analysis, styles, and conducting and rehearsal techniques related to performance.

**MU 5991. Independent Study.** (1-3 cr [max 9 cr]; A-F or Aud. Prereq-Min 60 cr or Grad Student or #; can apply max 6 cr to a Grad School program)  
Directed study in areas of student interest arranged with instructor before registration.

**MU 5995. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq-#)  
Selected studies in topics defined by type, period, or composer.

**MU 8101. Graduate Music Theory.** (2 cr; A-F or Aud. Prereq-Graduate student or #)  
Advanced analytical studies of representative historical musical compositions. Students will utilize multiple analytical processes and compose model pieces.

**MU 8222. Music Bibliography and Research.** (3 cr; A-F or Aud. Prereq-Grad student or #)  
Research methods in music; preparation for writing plan B project.

**MU 8300. Graduate Recital.** (1 cr [max 2 cr]; A-F or Aud. Prereq-Grad student, #)  
Preparation and presentation of a solo musical performance.

**MU 8301. Graduate Applied Music: Major Instrument.** (2 cr [max 10 cr]; A-F or Aud. Prereq-Advanced proficiency, grad student, #)  
Studio lesson on major instrument or voice; one-half hour per week per credit.

**MU 8302. Graduate Applied Music: Secondary Instrument.** (1 cr; A-F or Aud. Prereq-Intermediate proficiency, grad student, #; may be repeated)  
Half-hour weekly studio lesson; instrument or voice.

**MU 8333. FTE: Master's.** (1 cr; No grade. Prereq-Master's student, adviser and DGS consent)

**MU 8401. Graduate Music Pedagogy.** (1 cr; A-F or Aud. Prereq-Graduate Student or #)  
Principles and techniques of music pedagogy with emphasis on the student's applied field of study.

**MU 8600. Seminar in Music Education.** (2 cr [max 6 cr]; A-F or Aud. Prereq-Grad student or #)  
Survey and analysis of current issues in music education research and/or practice.

**MU 8601. Foundations of Music Learning.** (3 cr; A-F or Aud. Prereq-Grad student or #)  
Principles and foundations of philosophical aesthetics, psychology of music, music advocacy, history of music education, current issues and research in music learning.

**MU 8605. Leadership in Music Education.** (3 cr; A-F or Aud. Prereq-Grad student or #)  
Techniques, theories, and models of music and arts leadership; considerations for supervising music personnel, facilities, budgets, curricular programs, and policies.

**MU 8701. Graduate Applied Conducting.** (1-2 cr [max 12 cr]; A-F or Aud. Prereq-3702, 3706 or equivalent; Graduate Student or #)  
Studio lessons in conducting; one half-hour per week per credit.

**MU 8899. Directed Project in Music Education.** (1-12 cr [max 12 cr]; A-F or Aud. Prereq-Grad, #)  
Directed project, Plan B. Research project on selected theoretical or practical issue/topic in Music Education.

**MU 8900. Seminar in Music.** (2 cr [max 6 cr]; A-F or Aud. Prereq-Grad student, #)  
Survey and analysis of current issues and problems in music research, performance, and pedagogy.

**MU 8991. Independent Study.** (1-2 cr [max 6 cr]; A-F or Aud. Prereq-Grad student, #)  
Directed study in areas of student interest arranged with instructor before registration; written report required.

## Ojibwe Education (OJED)

College of Education and Human Service Professions

**OJED 3100. Advanced Ojibwe Grammar and Narrative.** (4 cr; A-F only. Prereq-[&3101, 3102, 3103, 3104], admission to Ojibwe elem/middle school program, two years college-level Ojibwe or AMIN 2204 or #)  
Advanced study of grammatical forms in Ojibwe; identification and conjugation of major verb types; formation of simple and complex sentences; language learning styles.

**OJED 3101. Circle of Life.** (4 cr; A-F only. Prereq-[&3100, 3102, 3103, 3104, Comp 3140], admission to Ojibwe elem/middle school program)  
Explores human development from an Anishinaabeg perspective, from birth through death; emphasis on early childhood through adolescence. Western theories of development and traditional Anishinaabe development.

**OJED 3102. Historical and Contemporary Issues in American Indian Education.** (3 cr; A-F only. Prereq-[&3100, 3101, 3104, Comp 3140], admission to Ojibwe elem/middle school program)  
Past and present educational experiences of American Indian people in the U.S.; professional conduct and dispositions for teachers; best practices in contemporary American Indian education.

**OJED 3103. Teaching American Indian Students.** (3 cr; A-F only. Prereq-[&3100, 3102, 3104], admission to Ojibwe elem/middle school program)  
Contemporary American Indian education; evaluation of attitudes toward American Indian students; identity development in the middle school years, direct interaction with American Indian communities; teaching plans reflective of American Indians, specifically for the middle school.

## Course Descriptions

**OJED 3104. College Skills for Pre-service Teachers.** (2 cr; S-N only. Prereq—[&3100, 3102, 3103], admission to Ojibwe elem/middle school program) Familiarizes students with the campus community, resources, and the tribal college transition, both personally and academically. Successful college student strategies, including: study skills, balancing life and school, and Praxis test-taking approaches.

**OJED 3200. Ojibwe Language for Teachers.** (4 cr; A-F only. Prereq—3100, &3201, 3202, 3203, Math 1141, admission to Ojibwe elem/middle school program) Provides pre-service teachers the requisite knowledge to interact with students in a classroom. General and specialized language for each of the core subjects taught, daily routines, and common classroom discourse. Relevant methods for teaching Ojibwe language in the classroom.

**OJED 3201. Holistic Instruction and Assessment.** (3 cr; A-F only. Prereq—[&3200, 3202, 3203, Math 1141], admission to Ojibwe elem/middle school program) Student-centered methods of instruction, classroom management, and formal and informal assessments that enhance the whole child. Draws from the American Indian Learner Outcomes for methods and materials to guide instruction and assessment strategies.

**OJED 3202. Anishinaabe Art, Music and Dance.** (3 cr; A-F or Aud. Prereq—[&3200, 3201, 3203, Math 1141], admission to Ojibwe elem/middle school program) Selecting and evaluating materials appropriate for elementary classrooms in American Indian art, music, dance, singing & drumming; developing integrated cross-curriculum elementary programs.

**OJED 3203. Health, Wellness and Movement.** (3 cr; A-F only. Prereq—[&3200, 3201, 3202, Math 1141], admission to Ojibwe elem/middle school program) Health and wellness from an Anishinaabeg perspective; teaching strategies appropriate for holistic health, physical education activities, healthy diets, drug education, mental health and spirituality; comprehensive school health and physical fitness for elementary and middle school levels.

**OJED 4100. Conversational Ojibwe for the Classroom and Community.** (4 cr; A-F only. Prereq—3200, [&4101, 4102, 4103, 4104], admission to Ojibwe elem/middle school program or #, no Grad School cr) Applications of Ojibwe language use to interactions between school and the surrounding community. Key vocabulary, phrases, and dialogues; strategies through which this material may be shared with the community at large.

**OJED 4101. Language, Literacy and Literature.** (4 cr; A-F only. Prereq—[&4100, 4102, 4103, 4104], admission to Ojibwe elem/middle school program, no Grad School cr) Development and instruction in children's literature-based reading, writing and oral language in elementary schools. Methods, materials, research findings related to teaching integrated language arts.

**OJED 4102. Oral Tradition and Language Acquisition.** (4 cr; A-F only. Prereq—[&4100, 4101, 4103, 4104], admission to Ojibwe elem/middle school program, no Grad School cr) Elementary school teaching methods and materials for integrated language arts instruction; understanding of children's language acquisition skills; role of stories in Anishinaabeg culture.

**OJED 4103. Elementary Mathematics Methods.** (4 cr; A-F only. Prereq—[&4100, 4101, 4102, 4104], admission to Ojibwe Elem/Middle School Program; no Grad School cr) Mathematics concepts, classroom methods, curriculum and materials; exploring the nature of mathematics, how children learn mathematics; effective mathematics instruction.

**OJED 4104. Professional Development.** (2 cr; A-F only. Prereq—&4100, 4101, 4102, 4103, admission to Ojibwe Elementary/Middle School Program; no Grad School cr) Documentation, reflection, synthesis of learning; professional portfolio, reflective journaling, dialogue, and goal setting. The Good Path, which reflects personal/ professional growth and development related to integrity of teaching; analyzing how internalized oppression affects families, schools, communities and tribes.

**OJED 4200. Ojibwe Language Methods.** (4 cr; A-F only. Prereq—4100 or #, &4201, 4202, 4203, admission to Ojibwe Elem/Middle School Program, successful completion of block one, no Grad School cr) Methods for teaching Ojibwe, an endangered, indigenous language. Curriculum development to support Ojibwemowin; grammatical structure of the Ojibwe language; indigenous language revitalization movement; developmental and cognitive understanding of children, especially as related to language learning.

**OJED 4201. Understanding Our Environment and Mother Earth.** (4 cr; A-F only. Prereq—&4200, 4202, 4203, admission to Ojibwe Elem/Middle School Program; successful completion of block one courses; no Grad School cr) Methods and materials for elementary school science instruction based on research, Anishinaabeg culture & traditions. Integration of theory and practice; understanding our relationship as human beings to the world around us.

**OJED 4202. Minnesota Based Treaties, Sovereignty, and Tribal Government.** (4 cr; A-F only. Prereq—&4200, 4201, 4203, admission to Ojibwe Elem/Middle School Program; successful completion of block one courses; no Grad School cr) Content and organization of social studies; treaties, sovereignty, and tribal government of Minnesota Ojibwe & Dakota people. Planning instruction, methods, and assessment; relationships among humans, the environment, and land.

**OJED 4203. The Inclusive Classroom.** (4 cr; A-F only. Prereq—&4200, 4201, 4202, admission to Ojibwe Elem/Middle School Program; successful completion of block one courses; no Grad School cr) Philosophy and psychology of the inclusive classroom; management, materials and methods; understanding children with a variety of special needs; FAS/FAE; writing IEPs; making adaptations and accommodations; working with American Indian families.

**OJED 4310. American Indians and Special Education.** (4 cr; A-F or Aud. =OJED 5310. Prereq—Naadamaadwin Tribal Special Education cohort (SpEd licensure), no Grad School cr) Exploration of disability awareness in traditional and contemporary native culture, exploring historical and contemporary issues effecting American Indian students in special education. Overview of special education including standards, law theories, rules, and examination of the high incidence of American Indians in special education including FAS, autism, biological and environmental conditions. Portfolio requirements will be introduced. A field component will accompany this course.

**OJED 4320. Assessment of American Indian Learners.** (4 cr; A-F or Aud. =OJED 5320. Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure), 4310, no Grad School cr) Examination of the cultural bias and discrimination issues with mainstream educational systems, providing alternative assessments appropriate with native populations. Identify differences in assessment tools and strategies, native student learning and best practices in assessment. Core skills and strategies will meet special education standards of effective practice. Characteristics of learning deficits and how they

interfere with the Circle of Courage will be examined and approaches for compensation will be developed. A field component will accompany this course.

**OJED 4330. Working with American Indian Families and Community.** (4 cr; A-F or Aud. =OJED 5330, OJED 5340. Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure, 4310, no Grad School cr) Examines techniques appropriate for working with American Indian families, extended families, professionals, paraprofessionals and the community when planning and implementing IEPs and transitions for American Indian students with special needs. Skills and strategies to build partnerships to work within and among Native families and communities to best meet the needs of the student. Resiliency will be examined within the context of the Circle of Courage. A field component will accompany this course.

**OJED 4340. Manifestation of Multi-generational Trauma and Internalized Oppression.** (4 cr; A-F or Aud. Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure), 4310, no Grad School cr) Focus on how multi-generational trauma and internalized oppression manifests itself in families, communities, schools and student's learning. Examine and explore strategies that provide practical skills and tools to mitigate these effects. EBD, ADHA, Autism, and fetal alcohol syndrome will be examined as contemporary issues of American Indian children. Behavioral support options appropriate for students identified with EDB will be provided. A field component will accompany this course.

**OJED 4350. Indigenous Learners and Disabilities.** (4 cr; A-f or Aud. Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure), 4310, no Grad School cr) Identify best practices in American Indian education incorporating culturally appropriate methods and materials for students in special education. Exploration of cultural differences in learning and behavior modifications, community and environment variables; examining the high incidence of AI students in special education, cultural misunderstandings that impedes placement, services and diagnosis. A field component will accompany this course.

**OJED 4360. Indigenous Methods of Instruction: Practical Application.** (4 cr; A-F or Aud. Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure), 4310, no Grad School cr) Current best practices in American Indian education will provide students with hands on skills and strategies for curriculum development including unit planning, lesson planning and individualization. Various models of instruction for teaching students that include development of intervention plans that are culturally, academically and socially appropriate based on assessment and observation to meet the needs of American Indian special education students. A field component will accompany this course.

**OJED 4600. Student Teaching.** (12 cr; S-N only. Prereq—&4610, admission to Ojibwe Elementary/Middle School Program, successful completion of block one and block two courses, #, no Grad School cr) Fifteen weeks of full-time student teaching in a K-8 classroom. Demonstration of competence in planning, teaching, and evaluating elementary curriculum, age-appropriate Ojibwe language, and American Indian Learner Outcomes. Application of knowledge and skills in assessing and meeting the learning needs of children.

**OJED 4610. Professional Issues.** (2 cr; A-F only. Prereq—84600, admission to Ojibwe Elementary/Middle School Program, successful completion of block one and block two courses, #, no Grad School cr) Reflections on current issues and ethical dilemmas in the fields of elementary education, American Indian education, and Ojibwe language education. Preparation for professional job-seeking, interviewing, and continued professional development as a teacher.

**OJED 5100. Educational Foundations in Ojibwe Language.** (2 cr; A-F only. Prereq—#, no Grad School cr) Introduces the fundamentals of teaching and learning language, advanced writing features, pronunciation skills, basic grammar and the formal structure of words and sentences. Offers an appreciation for the cultural and social context of language use, and how this is important to the teaching and learning of Ojibwe.

**OJED 5110. Teaching and Learning Ojibwe As A Second Language.** (2 cr; A-F only. Prereq—#, no Grad School cr) Study of advanced writing features, grammatical structure of sentences and paragraphs, and key methodologies of teaching Ojibwe as a second language. Advanced topics include introduction to narrative structure and dialectology.

**OJED 5120. Ojibwe Language Grammatical Pedagogy.** (2 cr; A-F only. Prereq—#, no Grad School cr) Provides students with a knowledge of core Ojibwe grammar structures for use in second language and immersion programs. Students will investigate the teaching and learning of grammar, its socio-linguistic application, and how advanced structures are created. Includes a strong written and oral component.

**OJED 5130. Narrative and Conversation Structures in Ojibwe.** (2 cr; A-F or Aud. Prereq—#, no Grad School cr) Provides knowledge of how to design, compose, and use conversational and narrative structures. Students will develop oral and written proficiency in the production of basic structures. The use and application of conversation and narrative in the teaching and learning of Ojibwe is a central theme.

**OJED 5200. Methods in Ojibwe Language Immersion.** (2-6 cr [max 12 cr]; A-F only. Prereq—#, no Grad School cr) Designed to improve comprehension and oral proficiency in Ojibwemowin. A total immersion approach will be complemented by structured conversational patterns, language mini-lessons, and defined situational experiences.

**OJED 5310. American Indians and Special Education.** (4 cr; A-F or Aud. =OJED 4310. Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure)) Exploration of disability awareness in traditional and contemporary native culture, exploring historical and contemporary issues effecting American Indian students in special education. Overview of special education including standards, law theories, rules, and examination of the high incidence of American Indians in special education including FAS, autism, biological and environmental conditions. Portfolio requirements will be introduced. A field component will accompany this course.

**OJED 5320. Assessment of American Indian Learners.** (4 cr; A-F or Aud. =OJED 4320. Prereq—Naadamaadwin Tribal Special Education cohort, 4310) Examination of the cultural bias and discrimination issues with mainstream educational systems, providing alternative assessments appropriate with native populations. Identify differences in assessment tools and strategies, native student learning and best practices in assessment. Core skills and strategies will meet special education standards of effective practice. Characteristics of learning deficits and how they interfere with the Circle of Courage will be

examined and approaches for compensation will be developed. A field component will accompany this course.

**OJED 5330. Working with American Indian Families and Community.** (4 cr; A-F or Aud. =OJED 4330, OJED 5340. Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure), 4310 or 5310)) Examines techniques appropriate for working with American Indian Families, extended families, professionals, paraprofessionals and the community when planning and implementing IEPs and transitions for American Indian students with special needs. Skills and strategies to build partnerships to work within and among Native families and communities to best meet the needs of the student. Resiliency will be examined within the context of the Circle of Courage. A field component will accompany this course.

**OJED 5340. Manifestation of Multi-generational Trauma and Internalized Oppression.** (4 cr; A-F or Aud. =OJED 4330, OJED 5330. Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure), 4310 or 5310) Focus on how multi-generational trauma and internalized oppression manifests itself in families, communities, schools and student's learning. Examine and explore strategies that provide practical skills and tools to mitigate these effects. EBD, ADHA, Autism, and fetal alcohol syndrome will be examined as contemporary issues of American Indian children. Behavioral support options appropriate for students identified with EDB will be provided. A field component will accompany this course.

**OJED 5350. Indigenous Learners and Disabilities.** (4 cr; A-f or Aud. Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure), 4310 or 5310) Identify best practices in American Indian education incorporating culturally appropriate methods and materials for students in special education. Exploration of cultural differences in learning and behavior modifications, community and environment variables; examining the high incidence of AI students in special education, cultural misunderstandings that impedes placement, services and diagnosis. A field component will accompany this course.

**OJED 5360. Indigenous Methods of Instruction: Practical Application.** (4 cr; A-F or Aud. Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure), 4310 or 5310)

Current best practices in American Indian education will provide students with hands on skills and strategies for curriculum development including unit planning, lesson planning and individualization. Various models of instruction for teaching students that include development of intervention plans that are culturally, academically and socially appropriate based on assessment and observation to meet the needs of American Indian special education students. A field component will accompany this course.

**OJED 5600. Tribal Special Education Student Teaching.** (3-12 cr; S-N. Prereq—#) Demonstrate competency in planning, teaching, and evaluating special education curriculum. Application of knowledge and skills in assessing and meeting the learning needs SpEd students. A student teaching experience.

**OJED 5610. Professional Issues in Special Education.** (2 cr; A-F or Aud, Prereq—Naadamaadwin Tribal Special Education cohort (special education licensure), 4310 or 5310) Reflections on professional development, current issues and ethical dilemmas in the fields of special education/American Indian education. Documentation, reflection, synthesis of learning; professional portfolio, reflective journaling, dialogue, and goal setting. The Circle of Courage, which reflects personal/professional

growth and development, related to integrity of teaching. Preparation for continued professional development as a teacher.

## Pharmacology (PHCL)

### School of Medicine

**PHCL 4094. Directed Research in Pharmacology I.** (1-10 cr [max 10 cr]; A-F or Aud. Prereq—Upper div sci major, #) Directed Research in Pharmacology

**PHCL 5001. Introduction to Pharmacology.** (2 cr; A-F only. Prereq—5601 or 3011 or equivalent) Elementary course in pharmacology. Actions and use of drugs in selected health conditions.

**PHCL 5204. Pharmacology Seminar.** (1 cr [max 4 cr]; A-F or Aud. Prereq—Grad student, #) Presentation of selected research problems and current journal articles.

**PHCL 5702. Cell Signaling.** (2 cr; A-F only. Prereq—PHSL 5601 or IBS 8103, #) Comprehensive study of the intracellular processes used by mammalian cells to respond to signals from other cells.

**PHCL 8333. FTE: Master's.** (1 cr; No grade. Prereq—Master s student, adviser and DGS consent)

**PHCL 8444. FTE: Doctoral.** (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

**PHCL 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. Prereq—Max 6 cr per semester or summer; doctoral student who has not passed prelim oral; no required consent for the first two registrations up to 12 cr; departmental consent for the third and fourth registrations up to an additional 12 cr, or 24 cr total (for doctoral students admitted summer 2007 and beyond; doctoral students admitted prior to summer 2007 may register up to 4 times totaling 60 cr))

**PHCL 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**PHCL 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

## Pharmacy (PHAR)

### College of Pharmacy

**PHAR 1001. Orientation to Pharmacy.** (2 cr; Stdnt Opt) Pharmaceutical care practice model, various pharmacy settings, pharmacy education. Current opportunities/challenges within profession.

**PHAR 1003. Non-Prescription Medications and Self-Care: Treating Minor Conditions.** (2 cr; Stdnt Opt) Self study. Nonprescription medication, self care. How to become informed consumer of over-the-counter medications and testing devices. Textbook supplemented with online course work. Partially Internet-delivered course.

**PHAR 1004. Common Prescription Drugs and Diseases.** (2 cr; A-F or Aud) Self study. Frequently prescribed medications. Conditions medications are intended to treat. Diagnostic criteria, complications, mechanism-of-action, side effects. Direct-to-consumer advertising. Students use Vista to view presentation, download materials, and complete study guides. Partially Internet-delivered course.

**PHAR 3700. Fundamentals of Pharmacotherapy.** (3 cr; A-F only. =PHAR 5700. Prereq—Medical terminology) Drug therapy. Emphasizes recognition of brand/generic drug names, their therapeutic classes and common uses. Use of drug information resources.

## Course Descriptions

### PHAR 4200. Drugs and the US Health Care System.

(3 cr; A-F only. =PHAR 3200, PHAR 5200)  
Online course. How to be informed/responsible user of medications. Medication development, regulation, distribution. Business, political, and legal/ethical issues. Weekly writing assignments, self-reflections, final paper.

### PHAR 5101. Pharmacology for Pharmacy Students.

(3 cr; A-F only. Prereq—Regis 2nd yr pharmacy student or #, =Phcl 5101)

Action/fate of drugs. Lectures, lab.

### PHAR 5102. Pharmacology for Pharmacy Students.

(2 cr; A-F only. Prereq—5101 or #, =Phcl 5102)

Action/fate of drugs.

### PHAR 5200. Drug-Related Policy and the US Healthcare System.

(3 cr; A-F only. Prereq—Not for pharmacy students; =PHAR 3200, PHAR 4200)  
Prepares students to be informed and responsible users of medications within the US healthcare system. This is a writing intensive course.

### PHAR 5201. Health Sciences Applied Terminology.

(2 cr; Stdnt Opt. Prereq—Basic knowledge of human anatomy/physiology)  
Self-study course. Medical terms, how to apply them when documenting/reporting patient care procedures.

### PHAR 5210. Diminishing Health Disparities Through Cultural Competence.

(2 cr; A-F only)  
Various dynamics of health disparities, cultural competencies. Uses sociological framework

### PHAR 5270. Therapeutics of Herbal and Other Natural Medicinals.

(2 cr; A-F only. Prereq—Phsl 6051, organic chemistry, pathophysiology of disease states, 3rd or 4th yr pharmacy student)

Herbal products/supplements. Pharmacology, clinical indications, and drug interactions of most commonly used products in nontraditional complementary health care. Historical significance and evidenced-based role of these products in health care. Case studies of clinical applications.

### PHAR 5620. Drug Metabolism and Disposition.

(3 cr; A-F or Aud)  
Oxidative/conjugative enzymes systems involved in human drug metabolism/disposition. Various in vitro models used to evaluate drug metabolism or chemical entity, pros/cons of each. Factors involved in conducting in vivo studies.

### PHAR 5700. Applied Fundamentals of Pharmacotherapy.

(3 cr; A-F only. =PHAR 3700. Prereq—Medical Terminology and admission to a graduate program or #)  
Online course. Recognition of brand/generic drug names, their therapeutic classes, common uses. Use of drug information resources.

### PHAR 6061. Systems Physiology for Pharmacy.

(5 cr; A-F only. Prereq—[Biochemistry, human anatomy] recommended; First-year pharmacy student)  
Survey of general physiology, neurophysiology, endocrine, circulatory, respiratory, digestive, energy metabolism, and renal physiology at molecular, cellular, and organ level. Emphasizes homeostasis and basic regulatory aspects of physiological processes of organ systems.

### PHAR 6111. The Practice of Pharmaceutical Care I.

(3 cr; A-F only. Prereq—First yr pharmacy student, &6171)  
The practice of pharmaceutical care, the pharmacy profession, drug information retrieval, professional communications, problem-solving skills, introductory clerkship.

### PHAR 6112. The Practice of Pharmaceutical Care II.

(3 cr; A-F only. Prereq—First yr pharmacy student, 6111, &6172)  
Comprehensive pharmaceutical care, health belief model, legal issues, prescription processing, clerkship continued and introduction to pharmacotherapy issues

### PHAR 6121. Pharmacotherapy I: Patient-Centered

**Pathophysiologic Approach.** (5 cr; A-F only. Prereq—6111, 6112, &5101, 6163, 6154 and 6173)  
Pathophysiology/pharmacotherapy of common fluid-electrolyte, renal, acid-base, immunologic, and hematologic disorders.

### PHAR 6122. Pharmacotherapy II: Patient-Centered

**Pathophysiologic Approach.** (5 cr; A-F only. Prereq—5101, 6121, 6131, 6163, &5102, 6154 and 6173)  
Pathophysiology/pharmacotherapy of common cardiovascular, endocrine, and gastrointestinal disorders.

### PHAR 6123. Pharmacotherapy III: Patient-Centered

**Pathophysiologic Approach.** (5 cr; A-F only. Prereq—5101, 5102, 6112, 6153, 6163, &6175)  
Pathophysiology/pharmacotherapy of common neurologic, psychiatric, pulmonary, and geriatric disorders.

### PHAR 6124. Pharmacotherapy IV: Patient-Centered

**Pathophysiologic Approach.** (5 cr; A-F only. Prereq—6121, 6122, 6123, 6155, 6163, &5102)  
Pathophysiology and pharmacotherapy of common infectious diseases, oncologic and toxicologic disorders.

### PHAR 6131. Pharmacy and Health Care System.

(3 cr; A-F only. Prereq—Second year pharmacy student)  
Delivery of pharmaceuticals and pharmacy services in the U.S. health care system, issues in hospital and community practice, characteristics of the pharmaceutical industry, economic and financial issues in delivering pharmaceutical services.

### PHAR 6132. Biostatistics and Drug Literature Evaluation.

(2 cr; A-F only. Prereq—6111, &6173)  
Biostatistical methods for data analysis and principles of study design for clinical research. Use of small computers to analyze and present data. Methods of searching for and evaluating drug-related information.

### PHAR 6133. Pharmacy Practice Management.

(3 cr; A-F only. Prereq—Third year pharmacy student)  
Principles of pharmacy management, including inventory control, purchasing, pricing, financial analysis, and personnel management.

### PHAR 6134. Law and Ethics in Pharmacy Practice.

(2 cr; A-F only)  
Minnesota and federal laws, rules, regulations and court decisions affecting pharmacy practice. Moral and ethical considerations that affect and influence pharmacy practice.

### PHAR 6135. Pharmacy Outcomes.

(2 cr; A-F only. Prereq—6123, 6175)  
How to integrate knowledge of basic sciences, pharmacotherapy, pharmacy practice management, pharmaceutical care, written communication, literature evaluation, drug information retrieval, law/ethics, and pharmacoconomics to manage patients with multiple medical conditions.

### PHAR 6141. Medical Microbiology and Immunizations.

(1 cr; A-F only)  
Background knowledge in medical microbiology. Evaluating information on emerging infectious diseases, recommending immunization schedules for childhood/adult vaccines.

### PHAR 6150. Honors: Medicinal Chemistry Seminar.

(1 cr [max 2 cr]; A-F or Aud. Prereq—6150)  
Current topics in medicinal chemistry.

### PHAR 6151. Biochemistry of Medicinals I.

(3 cr; A-F only. =CHEM 4351)  
Biochemistry topics required for understanding pharmacodynamic action and therapeutic use of medicinal agents.

### PHAR 6152. Biochemistry of Medicinals II.

(3 cr; A-F only. =CHEM 4352. Prereq—6151, &6172)  
Intermediary metabolism of carbohydrates, lipids, amino acids and nucleic acids and how these pathways are affected by therapeutic agents. Introduction to bioenergetics and drug metabolism.

### PHAR 6154. Medicinal Agents I.

(3 cr; A-F only. Prereq—6152, &5101)  
Basic principles of drug design, metabolism of action, and receptor interaction. Chemical/biological properties and therapeutic uses of autonomic, antihistaminic, renal, and cardiovascular drugs.

### PHAR 6155. Medicinal Agents II.

(2 cr; A-F only. Prereq—6154, &5102 and 6174)  
Chemical/biological properties and therapeutic uses of drugs affecting central nervous, endocrine, and intermediary metabolism systems.

### PHAR 6156. Medicinal Agents III.

(4 cr; A-F only. Prereq—6152, 6153, 6154)  
Therapeutic properties and uses of antiviral, anti-infective and antineoplastic agents.

### PHAR 6157. Human Nutrition and Drug Therapy.

(3 cr; A-F only. Prereq—6152)  
Basic concepts of human nutrition and clinical application.

### PHAR 6158. Recombinant DNA-Derived Drugs.

(1 cr; A-F only. Prereq—6151)  
Biotechnology as it related to basic/clinical pharmaceutical sciences. Emphasizes recombinant DNA techniques and preparation/use of biotechnology-derived agents in diagnosing/treating disease.

### PHAR 6159. Pharmaceutical Immunology and Biotechnology.

(3 cr; A-F only. Prereq—6151)  
Basic biological mechanisms of immune system. Emphasizes drug allergies, immunosuppressives, monoclonal antibodies, and preparation/use of immunologic derived agents in diagnosing/treating disease. Biotechnology as it relates to basic/clinical pharmaceutical sciences. Emphasizes recombinant DNA techniques and preparation/use of biotechnology-derived agents in diagnosing/treating disease.

### PHAR 6160. Honors: Experimental and Clinical Pharmacology Seminar.

(1 cr; A-F only. Prereq—#)  
Selected topics in experimental and clinical pharmacology.

### PHAR 6161. Drug Delivery I.

(3 cr; A-F only. Prereq—&6171)  
Mathematics associated with drug dispensing; technology of common pharmaceutical dosage forms. Phenomenological and theoretical basis of equilibrium and steady-state processes controlling drugs and dosage forms.

### PHAR 6162. Drug Delivery II.

(3 cr; A-F only. Prereq—6161, &6172)  
Phenomenological and theoretical basis of kinetic and dynamic processes controlling drugs and dosage forms.

### PHAR 6163. Pharmacokinetics.

(3 cr; A-F only. Prereq—Calculus I or equiv, 6162)  
Physiological basis for drug absorption, distribution, metabolism and excretion; use of mathematical principles and equations to describe these processes as well as design dosage regimens for individual patients.

### PHAR 6164. Biopharmaceutics.

(3 cr; A-F only. Prereq—6163, &6175)  
Applied theory of dosage form design for optimal drug activity and bioavailability for all routes of drug administration.

### PHAR 6165. Pharmaceutical Calculations.

(1 cr; A-F only. Prereq—First yr pharmacy student)  
Performing pharmaceutical calculations for patient care in all pharmacy practice environments.

**PHAR 6171. Pharmaceutical Care Skills.** (2 cr; A-F only. Prereq—Concurrent registration is required (or allowed) in 6151, 6111, 6161)  
Integrating basic and clinical science curriculum in a lab setting.

**PHAR 6172. Pharmaceutical Care Skills.** (2 cr; A-F only. Prereq—6112, 6152, 6162)  
Basic/clinical science curriculum in lab setting. Longitudinal care in lab setting.

**PHAR 6173. Pharmaceutical Care Skills.** (2 cr; A-F only. Prereq—Concurrent registration is required (or allowed) in 6121, 6132)  
Integrating basic/clinical science curriculum in a lab setting.

**PHAR 6174. Pharmaceutical Care Skills.** (2 cr; A-F only. Prereq—6122)  
Basic/clinical science curriculum in lab setting. Longitudinal care in lab setting.

**PHAR 6175. Pharmaceutical Care Skills V.** (2 cr; A-F only. Prereq—Concurrent registration is required (or allowed) in 6123 and 6164 and 6171 and 6172 and 6173 and 6174 or #)  
Integrating basic and clinical science curriculum in a lab setting.

**PHAR 6177. Patient Assessment.** (1 cr; A-F only. Prereq—first yr pharmacy student)  
How to obtain accurate health histories and perform systemic physical assessments of adult patients in pharmacy practice.

**PHAR 6181. Pharm.D. Paper & Seminar.** (1 cr; A-F or Aud. Prereq—Third year pharmacy student)  
How to write a research paper. Students present research project plan. Professional behavior, patient confidentiality, universal precautions.

**PHAR 6182. Pharm.D. IV Seminar.** (1 cr; S-N only. Prereq—4th yr pharmacy student, 6181)  
Students present thesis topics to peers and faculty evaluators.

**PHAR 6183. Pharm.D. IV Paper.** (2 cr; S-N only. Prereq—4th yr pharmacy student, 6181)  
Final paper describing a hypothesis-driven research project, patient-care oriented project, management project, drug-usage evaluation, or extensive literature review.

**PHAR 6200. Directed Studies: Drug-related Controversies in the U.S. Health Care System.** (2 cr; A-F only. Prereq—Pharmacy student)  
Online course, Medication development, regulation, and distribution in the U.S. Business, political, and legal/ethical issues involved. Weekly reading/writing assignments, exams, final paper.

**PHAR 6208. Community-based Immunization Delivery.** (1 cr; S-N only)  
Students will learn about, plan, and implement influenza immunization clinics.

**PHAR 6211. Non-Prescription Drug Therapy: Focus on Patient Self-Care.** (2 cr; A-F only. Prereq—6112)  
Expands on over-the-counter medications presented in 6112. Diagnostic and durable medical equipment available in community pharmacies as well as the use of alternative medications is discussed.

**PHAR 6212. Dermatology.** (1 cr; A-F only. Prereq—2nd or 3rd yr pharmacy student)  
Pathophysiology and pharmacotherapy of dermatologic disorders.

**PHAR 6215. Applied Pharmacokinetics.** (2 cr; A-F only. Prereq—6163)  
Applying clinical pharmacokinetics and assay methodologies to patient care. Assessing drug therapy outcomes.

**PHAR 6217. Advanced Pharmaceutical Care Clinic.** (1-2 cr [max 2 cr]; Stdnt Opt. Prereq—2nd or 3rd yr pharmacy student)  
Expanded, direct patient care opportunities. Students conduct comprehensive pharmaceutical care assessments in presence of practitioners. Weekly student case presentations/discussions.

**PHAR 6219. Building a Pharmaceutical Practice.** (2 cr; A-F only. Prereq—6111, 6112)  
Initiating a pharmaceutical care practice. Building a personal practice plan.

**PHAR 6220. Pediatric Drug Therapy.** (2 cr; A-F only. Prereq—3rd or 4th yr pharmacy student)  
Pathophysiology/therapeutics of disease states. Common issues encountered in providing pharmaceutical care to pediatric patients.

**PHAR 6221. Geriatric Pharmacotherapy.** (2 cr; A-F only. Prereq—3rd or 4th yr pharmacy student)  
Pharmacokinetic/pharmacodynamic changes and their implications in elders. Effects of drug-drug/drug-disease interactions. Drug adherence barriers to provide optimum pharmacotherapy to elderly persons.

**PHAR 6222. Advanced Pharmaceutical Compounding.** (2 cr; A-F only. Prereq—2nd or 3rd yr pharmacy student)  
Expands compounding skills beyond those gained in pharmaceutical care lab.

**PHAR 6223. Pharmacokinetics Research Seminar.** (1 cr; A-F only. Prereq—6163 with a grade of "B" or better)  
Students critically evaluate literature in pharmacokinetics, pharmacodynamics, and drug metabolism.

**PHAR 6224. Pharmacogenomics: Genetic Basis for Variability in Drug Response.** (2 cr; A-F only. Prereq—2nd or 3rd yr pharmacy student or grad student)  
Theory/practice of pharmacogenomics. Principles of human genetics/genomics. Applications to scientific education, problems in drug therapy optimization, and patient care.

**PHAR 6225. Diabetes Experience.** (1 cr; A-F only. Prereq—2nd or 3rd yr Pharm student)  
Diabetes mellitus. Student presentations, hands-on learning.

**PHAR 6227. Leading Change Project.** (2 cr; S-N only. Prereq—6237)  
Hands-on experience leading a change initiative. Students create a vision for change, plan an approach, implement their plan, and evaluate outcomes. Project focuses on area of pharmacy practice or education.

**PHAR 6228. Leading Change Portfolio.** (2 cr; S-N only. Prereq—6237)  
Supports completion of Leadership Emphasis Designation. Documentation/self-reflection of leadership learning experiences pursued inside/outside of classroom.

**PHAR 6230. Ambulatory PC Clinic.** (2 cr; Stdnt Opt. Prereq—Enrolled pharmacy student)  
How to conduct pharmaceutical care assessments, for patients with actual drug-related needs, in a controlled clinic setting.

**PHAR 6231. Community Pharmacy Management.** (2 cr; A-F only. Prereq—6133)  
Management techniques needed in community pharmacy practice, with emphasis on marketing and service.

**PHAR 6232. Institutional Pharmacy Management.** (2 cr; A-F only. Prereq—2nd or 3rd year pharmacy student)  
Management techniques needed in various institutional pharmacy settings. Integrating distributive and clinical components of institutional practice

**PHAR 6233. Drug Use Review and Management.** (2 cr; A-F only. Prereq—3rd yr pharmacy student, #)  
Principles of drug use review in various health care settings. Optimizing quality, minimizing cost.

**PHAR 6236. Clinical and Pharmacy Management in Modern U.S. Health-Care and Regulatory Landscape.** (2 cr; A-F only)  
U.S. Food and Drug (FDA) law, civil liability of malpractice, duty of pharmacy professionals, implications of intellectual property rights of others. Business law topics ranging from contracts to non-compete agreements.

**PHAR 6237. Leading Change in Pharmacy.** (2-8 cr [max 8 cr]; S-N only)  
Mini-curriculum. Focuses on leadership development and its relation to advancing the profession of pharmacy.

**PHAR 6238. Leading Change in Pharm II.** (2 cr; S-N only)  
Mini-curriculum. Focuses on leadership development and its relation to advancing the profession of pharmacy.

**PHAR 6248. Drugs of Abuse.** (2 cr; A-F only. Prereq—Organic chemistry I/II or [organic chemistry I, biochemistry])  
Basic medicinal chemistry of substances of abuse, associated paraphernalia.

**PHAR 6249. Addiction Medicine, Substance Abuse, and Chemical Dependency.** (2 cr; A-F or Aud)  
Addiction, chemical abuse, and chemical dependency. How pharmacists can impact those affected.

**PHAR 6250. Honors: Social and Administrative Pharmacy Seminar.** (1 cr; A-F only. Prereq—#)  
Current topics in hospital pharmacy

**PHAR 6255. Medicating the Soul: Advanced Issues in Psychopharmacology.** (2 cr; A-F only. Prereq—6155)  
New developments in study of major psychiatric disorders. Potential of findings for development of novel pharmacological treatments.

**PHAR 6260. Honors: Pharmaceutics Seminar.** (1 cr; A-F or Aud. Prereq—#)  
Contemporary topics in pharmaceutics research.

**PHAR 6270. Honors: Critical Care Seminar.** (2 cr; A-F only. Prereq—#)  
Research/topics of importance to experimental/clinical pharmacology.

**PHAR 6293. Directed Research I.** (1-5 cr [max 5 cr]; Stdnt Opt. Prereq—#)  
Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

**PHAR 6294. Directed Study I.** (1-5 cr [max 5 cr]; Stdnt Opt. Prereq—#)  
Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, and experimental or clinical pharmacology.

**PHAR 6393. Directed Research II.** (1-5 cr [max 5 cr]; Stdnt Opt. Prereq—#)  
Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

**PHAR 6394. Directed Study II.** (1-5 cr [max 5 cr]; Stdnt Opt. Prereq—#)  
Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, and experimental or clinical pharmacology.

**PHAR 6493. Directed Research III.** (1-5 cr [max 5 cr]; Stdnt Opt. Prereq—#)  
Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

**PHAR 6494. Directed Study III.** (1-5 cr [max 5 cr]; Stdnt Opt. Prereq—#)  
Directed studies in pharmacy, pharmaceutics, medicinal chemistry, and experimental or clinical pharmacology.

## Course Descriptions

**PHAR 6501. Ethics in Pharmacy Practice.** (2 cr; A-F only. Prereq—2nd or 3rd yr pharmacy student)  
Ethical principles, selected schools of ethical thought. Students discuss/debate ethical dilemmas in pharmacy practice and health care.

**PHAR 7001. Early Pharmacy Practice Experience I.** (1 cr; A-F only. Prereq—Criminal bkgr chk, BLS CPR cert for infants/child/adults, [proof of negative Mantoux test or explanation of positive test], proof of chicken pox immunity)  
First in a series of four courses. Focuses on patient's perspective in managing and living with chronic conditions and chronic medication use. Includes community-based instruction, mentor program

**PHAR 7002. Early Pharmacy Practice Experience II.** (1 cr; A-F only. Prereq—7001 or #, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test or explanation of positive test, proof of chicken pox immunity)  
Second in a series of four courses. Focuses on patient's perspective in managing and living with chronic conditions and chronic medication use. Includes community-based instruction, mentor program.

**PHAR 7003. Early Pharmacy Practice Experience III.** (.5 cr; A-F only. Prereq—7002 or #, criminal bkgr chk, BLS CPR cert for infants/child/adults, [proof of negative Mantoux test or explanation of positive test], proof of chicken pox immunity)  
Third in a series of four courses. Focusing on patient's perspective in managing and living with chronic conditions and chronic medication use. Includes community-based instruction. Emphasizes mentoring.

**PHAR 7004. Early Pharmacy Practice Experience IV.** (.5 cr; A-F only. Prereq—7003 or #, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test or explanation of positive test, proof of chicken pox immunity)  
Fourth in a series of four courses. Focuses on patient's perspective in managing and living with chronic conditions and chronic medication use. Includes community-based instruction. Emphasizes mentoring. Upcoming patient care opportunities.

**PHAR 7005. Introductory Community-Practice Pharmacy Experience.** (2.5 cr; S-N only. Prereq—6111, 6171, 7001, 1st-yr pharmac student)  
Experience in patient care at community practice setting. Three weeks, 40 hrs/week.

**PHAR 7006. Introductory Institutional-Pharmacy Practice Experience.** (2.5 cr; S-N only. Prereq—6121, 6132, 6173, &7003, pharmacy students completing their 2nd yr)  
Experience in patient care in hospital setting. Three-week, 40 hours/week.

**PHAR 7120. Community Practice Experience.** (4 cr; A-F only. Prereq—Pharm. D. IV, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Students assigned to participating community pharmacies and involved in community practice activities full-time for five weeks.

**PHAR 7121. Institutional Practice Experience.** (4 cr; A-F only. Prereq—Pharm. D. IV, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Students are assigned to participating hospital pharmacies. Student participate in drug distribution, IV compounding, clinical services, and administrative activities. Full-time for five weeks.

**PHAR 7122. Acute Patient Care Practice Experience I.** (4 cr; A-F only. Prereq—Pharm. D. I-III, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Experience in an inpatient setting. Students are responsible for all drug-related needs of individual patients. Full-time for five weeks.

**PHAR 7123. Ambulatory Patient Care Practice Experience.** (4 cr; A-F only. Prereq—Pharm. D. IV, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Experience in an ambulatory setting. Students responsible for drug-related needs of individual patients. Full-time for five weeks.

**PHAR 7126. Patient Care Practice Experience.** (4 cr; A-F only. Prereq—Pharm. D. I-III, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Patient care experience in any setting. Students responsible for drug-related needs of individual patients. Full-time for five weeks.

**PHAR 7128. Acute Patient Care Practice Experience II.** (4 cr; A-F only. Prereq—Pharm. D. I-III, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Experience in an inpatient setting. Students are responsible for all drug-related needs of individual patients. Full-time for five weeks.

**PHAR 7211. Elective Practice Experience I.** (4 cr; A-F only. Prereq—Pharm. D. I-III, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Patient care experience in any patient care setting. Students are responsible for drug-related needs of individual patients. Full-time for five weeks.

**PHAR 7212. Elective Practice Experience II.** (4 cr; A-F only. Prereq—Pharm. D. I-III, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Patient care experience in any setting. Students are responsible for drug-related needs of individual patients. Full-time for five weeks.

**PHAR 7213. Elective Practice Experience III.** (4 cr; A-F only. Prereq—Pharm. D. I-III, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Patient care experience in any setting. Students are responsible for drug-related needs of individual patients. Full-time for five weeks.

**PHAR 7216. Elective Practice Experience IV.** (4 cr; A-F only. Prereq—Pharm. D. I-III, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Experience in an inpatient setting. Students responsible for all drug-related needs of individual patients. Full-time for five weeks.

**PHAR 7217. Elective Practice Experience V.** (4 cr; A-F or Aud. Prereq—Pharm.D. I-III, Minn Board of Pharm Intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Experience in an inpatient setting. Students responsible for all drug-related needs of individual patients full-time for five weeks.

**PHAR 7231. Research Practice Experience I.** (4 cr; A-F only. Prereq—Pharm. D. I-III, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Experience using research techniques in basic or clinical sciences or pharmacy practice. Full-time for five weeks.

**PHAR 7232. Research Practice Experience II.** (4 cr; A-F only. Prereq—Pharm. D. I-III, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Experience using research techniques in basic or clinical sciences or pharmacy practice. Full-time for five weeks.

**PHAR 7233. Research Practice Experience III.** (4 cr; A-F only. Prereq—Pharm. D. I-III, MN Board of Pharm intern, criminal background check, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity)  
Experience using research techniques in basic or clinical sciences or pharmacy practice. Full-time for five weeks.

## Philosophy (PHIL)

### College of Liberal Arts

**PHIL 1001. Introduction to Philosophy.** (3 cr; A-F or Aud. =PHIL 1101, LE 7)

Introduction to philosophical heritage through examination of several classic philosophical problems such as the existence of God, nature of knowledge, free will versus determinism, and the relation of mind to body.

**PHIL 1003. Ethics and Society.** (3 cr; A-F or Aud. Prereq—=CLA 1101 LEIP 08)

Classic theories addressing questions of whether morality is subjective or objective, cultural relativism versus universal rules, how right and wrong should be determined. Moral issues such as euthanasia, the environment, population and birth control, nuclear deterrence, alternative life styles, and capital punishment in their international dimension.

**PHIL 1007. Philosophy and World Religions.** (3 cr; A-F or Aud. LEIP 07)

Comparative philosophical examination of 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; A-F or Aud. LE 2)

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; A-F or Aud. =PHIL 1118, LE 2)

Introduction to symbolic logic. Nature of language, species of arguments, informal versus formal arguments, techniques of translation, methods of sentential logic, and methods of predicate logic.

**PHIL 1021. Classical Mythology.** (3 cr; A-F or Aud. LE 9)

Readings in Greek and Roman myths, especially in those that have influenced Western culture.

**PHIL 1101. Honors: Introduction to Philosophy.** (3 cr; A-F only. =PHIL 1001. Prereq—Honors student LE 7)

Honors introduction to philosophical heritage through examination of several classic philosophical problems such as the existence of God, nature of knowledge, free will versus determinism, and the relation of mind to body.

**PHIL 1118. Freshman Seminar: Honors: Logic.** (4 cr; A-F or Aud. =PHIL 1018. Prereq—Freshman, fewer than 30 credits, honors student LE 2)

Honors introduction to symbolic logic. Formal systems, deductive validity, proofs and translation in sentence and predicate logics. Introduction to met-theory and extensions of logic.

**PHIL 2001. Existential Literature.** (3 cr; A-F or Aud. Prereq—Comp 1120, 30 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 2011. Philosophy of Language.** (3 cr; A-F or Aud. Prereq—Course in logic or literary analysis or human communication or CS or math or # LE 3)

Introduction to theories of meaning and truth and the structure of language. Relation of language to thought and the world; semantics and syntax; speech acts and performative utterances; descriptions and reference; and structuralism and the possibility of objective knowledge.

**PHIL 2021. Science and Pseudo-Science: Thinking about Weird Things.** (3 cr; A-F or Aud. LE 8)

A critical introduction to the nature of knowledge and belief by focusing on contemporary issues, such as UFOs, ESP, mysticism, creationism and evolution, and near-death experiences, which explains the differences between rational beliefs and articles of faith and between science and pseudo-science.

**PHIL 3118. Special Topics: (Various Titles to be Assigned).** (3-9 cr [max 9 cr]; A-F or Aud. Prereq—1001 or #) In-depth examination of a particular philosopher or problem in philosophy. Specific course announced in [Class Schedule].

**PHIL 3222. Medical Ethics.** (4 cr; A-F or Aud)

Values underlying the health care professions and ethical dilemmas in medical contexts. Patients' rights and autonomy, medical paternalism, confidentiality, truth-telling, euthanasia.

**PHIL 3231. Law and Punishment.** (4 cr; A-F or Aud. Prereq—1001 or Soc 1301)

Nature of law, natural law theory, and legal positivism and their relationship to traditional and contemporary theories of punishment; deterrence, reform, retribution, rehabilitation, social defense, restitution.

**PHIL 3242. Values and Technology.** (3 cr; A-F or Aud. Prereq—60 cr or # LE 8)

Problems related to science and technology. Application of moral theory to issues raised by technology, such as distribution of power, effects on environment, labor and social life, privacy, intellectual property rights, product liability, and professional codes of ethics.

**PHIL 3245. Aesthetics.** (3 cr; A-F or Aud. Prereq—Min 45 cr or #, =[5245])

Possibility of definition of art or of the aesthetic experience examined through survey of classic aestheticians; philosophy of art criticism.

**PHIL 3252. Philosophy of Science.** (3 cr; A-F only. Prereq—1001 or 45 cr)

Introduction to the central issues in philosophy of science, such as the nature of scientific explanation, laws of nature, induction, prediction, evidence, confirmation, intertheoretic reduction, empiricism, and scientific realism.

**PHIL 3281. Ethical Theory.** (4 cr; A-F or Aud. Prereq—1001 or 1003 or #; =CLA 1101)

Characteristics and criteria of value statements; justification of moral standards; some 20th-century ethical theories.

**PHIL 3291. Current Social Political Philosophy.** (4 cr; A-F or Aud. 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; A-F or Aud. Prereq—30 cr or #)

Greek philosophy from the pre-Socratic era through Socrates, Plato, and Aristotle to Neoplatonism and the rediscovery of Aristotle. Philosophy of nature, theories of persons, possibility of human knowledge, happiness, and the good life.

**PHIL 3303. The Birth of Modern Philosophy.** (4 cr; A-F or Aud. Prereq—30 cr, course in phil, hist, pol sci or lit or #)

Impact of science and secularity on the rationalism of Descartes, Spinoza, Leibniz and the empiricism of Locke, Berkeley, and Hume.

**PHIL 3319. 19th Century Philosophy.** (4 cr; A-F or Aud. Prereq—Min 30 cr or #)

Survey of the main issues and philosophers of the 19th century.

**PHIL 3320. 20th Century Philosophy.** (4 cr; A-F or Aud. Prereq—Min 30 cr or #)

Survey of the main issues and philosophers of the 20th century.

**PHIL 3325. Environmental Ethics.** (4 cr; A-F or Aud. Prereq—30 cr or #)

Moral dimension of relationship between humans and 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 3570. Philosophy of Psychology.** (4 cr; A-F or Aud. Prereq—1001 or Psy 1003, 60 cr or #)

Current philosophical issues surrounding psychology: behaviorism, dualism, mind/brain identity theories, computer models of cognition, and functionalism.

**PHIL 3655. Theory of Knowledge.** (4 cr; A-F or Aud. Prereq—(Min 45 cr or #), 1001, 1003, 1007, 1008, 1018, (1101 or 1118), =[PHIL 4655])

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 strengths and weaknesses of alternative accounts.

**PHIL 3900. Colloquium for Majors.** (1 cr; S-N or Aud. Prereq—Phil major/minor, % ; attendance at 12 dept-approved lectures/discussions over 4-yr period; regis only during semester of 10th lect)

Lectures and discussion groups on variety of philosophical topics; required reading; places and topics to be announced.

**PHIL 4900. Seminar in Philosophy.** (4 cr [max 12 cr]; A-F or Aud. Prereq—12 cr Phil or #; no Grad School credit)

Detailed examination of major topics or philosophical works. See department for details.

**PHIL 5991. Independent Study.** (1-3 cr [max 10 cr]; A-F or Aud. Prereq—#, cannot be used to satisfy requirements for phil major or minor)

Work in problems of special interest to student arranged with instructor before registration. Written work required. May be taken in conjunction with another philosophy course.

**PHIL 5997. Intern Teaching Assistantship.** (2 cr [max 4 cr]; A-F or Aud. Prereq—#)

Practical experience in assisting teaching of philosophy. Application deadline one week before beginning of registration for the following semester.

## Physical Education (PE)

College of Education and Human Service Professions

**PE 1220. Intermediate Swimming.** (1 cr; Stdnt Opt. PE) Development of intermediate aquatic skills and techniques for personal participation. Intermediate principles of safety in and on the water.

**PE 1300. Ballroom Dance.** (1 cr; Stdnt Opt. PE) Development of the basic steps and patterns for ballroom dance. Development of technical and choreographic skill for personal expressive communication through movement.

**PE 1304. Square Dance.** (1 cr; Stdnt Opt. PE) Development of the basic steps and patterns of square dance. Development of technical and choreographic skill for personal expressive communication through movement.

**PE 1402. Tennis.** (1 cr; Stdnt Opt. PE) Development of personal skills in tennis. Understanding of strategies and concepts for participation in the game.

**PE 1410. Golf.** (1 cr; Stdnt Opt. PE) Development of personal golf skills and understandings for participation in the sport.

**PE 1414. Bowling.** (1 cr; Stdnt Opt. PE) Development of personal skills in bowling. Understanding of concepts and strategies for participation in the game.

**PE 1500. Cross-Country Skiing.** (1 cr; Stdnt Opt. PE) Development of personal skills in cross country skiing. Understanding of the techniques and concepts for participation in the sport.

**PE 1502. Alpine Skiing.** (1 cr; A-F or Aud. PE) Development of personal skills in alpine skiing. Understanding of the techniques and concepts for participation in the sport.

**PE 1507. Introduction to River Kayaking.** (1 cr; Stdnt Opt. PE) River kayaking techniques. History, safety, kayak design, basic braces, paddle strokes, and maneuvering for river conditions.

**PE 1508. Flatwater Canoeing.** (1 cr; Stdnt Opt. PE) Basic skills and terminology relevant for safe canoeing on flatwater and slow-stream conditions.

**PE 1510. Whitewater Kayaking.** (2 cr; Stdnt Opt. Prereq—1507, # PE) Whitewater kayaking on Lake Superior and the St. Louis River to learn about: cold water paddling equipment, reading rapids, maneuvering, basic rescues, bracing, rolling, surfing on waves and in holes, includes leadership skill development related to trip-prep, communication and river safety.

**PE 1511. Sea Kayaking.** (1 cr; A-F or Aud) Sea kayaking techniques; history, safety, kayak design, basic braces, paddle strokes, and maneuvering in large water conditions.

**PE 1512. Fishing Skills.** (1 cr; Stdnt Opt. PE) Development of personal skills in fishing. Acquisition of understanding, techniques, and patterns for participation in the activity.

**PE 1530. Rock Climbing.** (1 cr; Stdnt Opt. PE) History, techniques and safety, equipment, knots, basic belay systems, route finding, face and crack climbing, identification of environmental hazards.

**PE 1531. Intermediate Rock Climbing.** (1 cr; Stdnt Opt. Prereq—1530 or #) Intermediate rock climbing skills and knowledge including use of and placement of anchor systems, top rope set-up, introductory lead climbing and climb site risk management. This course builds upon basic rock climbing skills and techniques which are prerequisite for this course.

## Course Descriptions

**PE 1600. Physical Fitness.** (1 cr; Stdnt Opt. PE)  
Development of personal skills related to physical fitness. Understanding and application of factors and participation patterns contributing to enhanced physical fitness.

**PE 1601. Aerobics.** (1 cr; Stdnt Opt. PE)  
Knowledge of cardiovascular fitness, including aerobic exercise and hydro-aerobics. Physical development through cardiovascular training, muscle strengthening, and stretching.

**PE 1612. Karate.** (1 cr; Stdnt Opt. PE)  
Development of personal skills in karate. Understanding history, cultural background, patterns, and strategies for participation in karate.

**PE 1613. Karate: Advanced Belts.** (1 cr [max 4 cr]; A-F or Aud. Prereq=1612 or equivalent or #)  
An advanced course for the experienced student who has achieved the basic competencies in karate.

**PE 1614. Self Defense.** (1 cr; Stdnt Opt. PE)  
Development of personal skills related to self defense. Understanding of concepts, strategies, and skills for developing a personal system of self defense.

**PE 1616. Weight Training.** (1 cr; Stdnt Opt. PE)  
Development of personal skills related to weight training. Understanding of principles, concepts, and conditioning regimens for participation in weight training.

**PE 1620. Aikido.** (1 cr; Stdnt Opt. PE)  
Development of personal skills in aikido. Understanding of the history, cultural background, patterns, and strategies for participation in aikido.

**PE 1706. Volleyball.** (1 cr; Stdnt Opt. PE)  
Development of personal skills in volleyball. Understanding of strategies, concepts, and skills for participation in volleyball.

**PE 1708. Basketball.** (1 cr; Stdnt Opt. PE)  
Development of personal skills in basketball. Understanding of strategies, concepts, and skills for participation in the sport.

**PE 1901. Varsity Football.** (1 cr [max 4 cr]; S-N only. Prereq=#)  
Participation in intercollegiate football competition.

**PE 1903. Varsity Soccer.** (1 cr [max 4 cr]; S-N only. Prereq=#)  
Participation in intercollegiate soccer competition.

**PE 1905. Varsity Basketball.** (1 cr [max 4 cr]; S-N only. Prereq=#)  
Participation in intercollegiate basketball competition.

**PE 1907. Varsity Ice Hockey.** (1 cr [max 4 cr]; S-N only. Prereq=#)  
Participation in intercollegiate ice hockey competition.

**PE 1913. Varsity Cross Country.** (1 cr [max 4 cr]; S-N only. Prereq=#)  
Participation in intercollegiate cross country competition.

**PE 1917. Varsity Volleyball.** (1 cr [max 4 cr]; S-N only. Prereq=#)  
Participation in intercollegiate volleyball competition.

**PE 1919. Varsity Track.** (1 cr [max 4 cr]; S-N only. Prereq=#)  
Participation in intercollegiate track competition.

**PE 1921. Varsity Tennis.** (1 cr [max 4 cr]; S-N only. Prereq=#)  
Participation in intercollegiate tennis competition.

**PE 1925. Varsity Baseball.** (1 cr [max 4 cr]; S-N only. Prereq=#)  
Participation in intercollegiate baseball competition.

**PE 1927. Varsity Softball.** (1 cr [max 4 cr]; S-N only. Prereq=#)  
Participation in intercollegiate softball competition.

**PE 2001. Sport Ethics and Society.** (3 cr; A-F or Aud. LE 7)  
Explores ethical issues in sport to develop moral reasoning skills for a successful life.

**PE 2240. Lifeguarding Today.** (1 cr; Stdnt Opt. Prereq=Ability to swim 500 yards, #)  
Provides knowledge and skills necessary to qualify as a non-surf lifeguard. Meets current American Red Cross standards. Includes CPR and first aid instruction.

**PE 2244. Water Safety Instructor.** (2 cr; A-F or Aud. Prereq=1240, 17 yrs old, knowledge and skill based on Emergency Water Safety Standard)  
Knowledge, skills, and strategies to teach American Red Cross swimming and water safety courses.

**PE 2500. Advanced Nordic Ski: Telemark and Back-country Ski Techniques.** (2 cr; A-F or Aud. Prereq=1500 or #)  
Traditional Nordic Techniques of telemark skiing will be presented. Background on the history of Nordic skiing will set the foundation for this active physical skill development course. Students will develop skills for Telemark and back country skiing such as safety, body position, weighting, use of the fall line, and pole planting. Contemporary telemark/back-country gear will be used and reviewed.

**PE 3495. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 4 cr]; A-F only)  
Treatment of topics beyond those included in regular curriculum or in-depth treatment of topics associated with normal curricular offering.

## Physical Education Professional (PEP)

### College of Education and Human Service Professions

**PEP 1001. Introduction to Physical Education.** (2 cr; A-F or Aud. Prereq=Pre-PE major or #)  
Introduction to physical education as a profession. Course will address professional standards, accrediting procedures, portfolio development, and an orientation to the disciplines of the field.

**PEP 1010. Teaching Elementary Games and Gymnastics.** (1 cr; A-F or Aud. Prereq=[1000], PE or rec major or #)  
Basic skills, teaching strategies, practices, and drills for teaching elementary games and gymnastics.

**PEP 1020. Teaching Rhythms.** (1 cr; A-F or Aud. Prereq=[1000], PE or rec major or #.)  
Basic skills, teaching strategies, and practices for teaching rhythms.

**PEP 1310. Teaching Dance.** (2 cr; A-F or Aud. Prereq=Pre PE major or rec major)  
Basic skills, teaching strategies, practice drills, and skill analysis for teaching ballroom, folk and square dance.

**PEP 1400. Teaching Tennis and Golf.** (1 cr; A-F or Aud. Prereq=Pre PE major or rec major)  
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching tennis and golf.

**PEP 1504. Teaching Skating.** (1 cr; Stdnt Opt. Prereq=Pre PE major or rec major or #)  
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching skating.

**PEP 1600. Teaching Fitness and Weight Training.** (2 cr; A-F or Aud. Prereq=Pre PE major or rec major or #)  
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching physical fitness, weight training, and aerobics.

**PEP 1700. Teaching Soccer and Softball.** (1 cr; A-F or Aud. Prereq=Pre PE major or rec major or #)  
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching soccer and softball.

**PEP 1710. Teaching Volleyball and Basketball.** (1 cr; A-F or Aud. Prereq=Pre PE major or rec major or #)  
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching volleyball and basketball.

**PEP 2000. Foundations of Physical Education.** (3 cr; A-F or Aud. Prereq=Pre PE major or rec major and min 30 cr or #)  
Historical, philosophical, sociological, and scientific foundations within physical education and its subdisciplines.

**PEP 3010. Adapted Physical Education.** (3 cr; A-F or Aud. Prereq=PE major or candidate or #)  
Developmental/adapted physical education for children with disabilities.

**PEP 3126. Elementary School Physical Education.** (2 cr; A-F or Aud. Prereq=elem/middle schll teach educ pre- or candidate or #)  
Teaching physical education for elementary education majors; need for physical education for elementary school children, planning and teaching age appropriate developmental movement experiences.

**PEP 3501. Teaching Cross-Country Skiing.** (1 cr; A-F or Aud. Prereq=[1500], PE, exer sci or rec major or #)  
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching cross-country skiing.

**PEP 3507. Teaching Outdoor Skills.** (2 cr; Stdnt Opt. Prereq=[1507], PE or rec major, (Rec 1201 or Rec 1203), (Rec 1202 or Rec 1204), Rec 2300 or #)  
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching outdoor recreation skills; includes navigation, camp craft, backpacking, back country travel, and safety.

**PEP 3508. Teaching Rock Climbing.** (1 cr; Stdnt Opt. Prereq=[1508], Exer sci or pe or rec major, PE 1530 or #)  
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching rock climbing.

**PEP 3509. Teaching Canoeing.** (1 cr; Stdnt Opt. Prereq=[1509], Exer sci or pe or rec major, PE 1508 or #)  
Basic skills, teaching strategies, practice, drills, and skill analysis for teaching canoeing. Successful completion results in American Canoe Association instructor certification.

**PEP 3700. Student Assessment in Physical Education.** (3 cr; A-F or Aud. Prereq=Secondary Teacher Education Program (STEP) or #)  
Key components of student assessment for physical education teacher education candidates.

**PEP 3720. Elementary Physical Education Methods.** (4 cr; A-F or Aud. Prereq=3010, 3700, Secondary Teacher Education Program (STEP), #; &PEP 3721)  
Methods, instructional techniques and strategies, classroom management, lesson planning, developmental levels, elementary curriculum and standards.

**PEP 3721. Apprenticeship: Elementary.** (2 cr; A-F or Aud. Prereq=Secondary Teacher Education Program (STEP), #, &PEP 3720)  
Supervised clinical teaching experience with responsibilities that include planning, managing, and implementing instructional experiences for elementary school children.

**PEP 3730. Secondary Physical Education Methods.** (4 cr; A-F only. Prereq–3720, PE 2244, Secondary Teacher Education Program (STEP), #)  
Methods, instructional techniques and strategies, classroom management, lesson planning, developmental levels, secondary curriculum and standards.

**PEP 3731. Apprenticeship: Secondary.** (2 cr; A-F only. Prereq–Secondary Education Teacher Program, #; &3730)  
Supervised teaching experience with responsibilities that include planning, managing, and implementing instructional experiences for secondary school children.

**PEP 3970. Supervised Teaching: College.** (1 cr; A-F only. Prereq–Secondary Teacher Education Program (STEP), #)  
Supervised teaching experience in a college setting.

**PEP 4991. Independent Study.** (1-4 cr [max 8 cr]; A-F or Aud. Prereq–PE or exer sci major and #; no Grad School credit)  
Research or study in selected noncurricular area of exercise science or physical education.

**PEP 4992. Directed Readings.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq–#; no Grad School credit)  
Study of varying topics by reading specific books, journal articles, etc. Topics selected based on student interests or academic preparation.

**PEP 4997. Practicum.** (1-5 cr [max 5 cr]; A-F or Aud. Prereq–PE or exer sci major; no Grad School credit)  
Supervised practical experience related to physical education teaching or exercise science professional experiences.

## Physics (PHYS)

Swenson College of Science and Engineering

**PHYS 1001. Introduction to Physics I.** (5 cr; A-F or Aud. Prereq–Algebra, trig LE 4)  
Noncalculus general physics course primarily for certain preprofessional fields. Topics in mechanics, heat, and sound.

**PHYS 1002. Introduction to Physics II.** (5 cr; A-F or Aud. Prereq–1001)  
Noncalculus general physics course primarily for certain preprofessional fields. Topics in light, electricity, magnetism, and modern physics.

**PHYS 1011. Ideas in Physics.** (3 cr; A-F or Aud. Prereq–Will not satisfy major or minor requirements in phys LE 5)  
Descriptive, nonmathematical survey of basic concepts in physics from Newton to present. Instructor has considerable latitude regarding content. Primarily for liberal arts students; not for preprofessional preparation.

**PHYS 1021. Exploring Current Topics in Physics.** (1 cr; A-F or Aud)  
Introduction to current topics in the field of physics, with emphasis on recent research developments and local research activities.

**PHYS 2011. General Physics I.** (4 cr; A-F or Aud. Prereq–Math 1290 or Math 1296 or Math 1596 LE 4)  
Calculus-based introduction to Newtonian mechanics, fluid mechanics, and heat.

**PHYS 2012. General Physics II.** (4 cr; A-F or Aud. Prereq–=[1202 or 1204], 2011, Math 1297 or Math 1597)  
Calculus-based introduction to electricity, magnetism, and optics.

**PHYS 2021. Relativity and Quantum Physics.** (4 cr; A-F or Aud. Prereq–1202 or 1204 or 2012)  
Descriptive course; relativity, quantum mechanics, hydrogen atom, multielectron atoms, molecular structure, quantum statistics, thermal radiation, solid state physics, nuclear physics.

**PHYS 2022. Classical Physics.** (4 cr; A-F or Aud. Prereq–=[1203 or 1205 or 2001], 2012.)  
Survey of various topics in classical physics: vector angular momentum, AC circuits, oscillatory motion, waves, physical optics.

**PHYS 2033. Classical and Quantum Physics Lab.** (2 cr; A-F or Aud. =PHYS 2031. Prereq–&2021 and 2022)  
Experiments and computer simulations selected to provide experience with both concepts and techniques in classical and quantum physics.

**PHYS 2111. Solving Physics Problems I.** (1 cr; S-N or Aud. =PHYS 1101. Prereq–Math 1296 or Math 1596, concurrent registration is required in 2011)  
Extended practice in applying basic physics principles and mathematical reasoning to problems in mechanics and thermodynamics.

**PHYS 2112. Solving Physics Problems II.** (1 cr; S-N or Aud. Prereq–Math 1297 or Math 1597, concurrent registration is required in 2012)  
Extended practice in applying basic physics principles and mathematical reasoning to problems in electricity, magnetism and optics.

**PHYS 2199. Physics Tutoring.** (1-2 cr [max 4 cr]; S-N or Aud. Prereq–2012 or %)  
Tutoring students in 1xxx- and 2xxx-level physics courses.

**PHYS 3061. Instrumentation.** (3 cr; A-F or Aud. Prereq–2022 or 1203 or 1205, 1 sem programming)  
Introduction to electronics for scientific applications. DC and AC circuits, linear and nonlinear devices, integrated circuits. Analog electronics. Transducers. Digital electronics. Applications of microcomputers to lab data acquisition.

**PHYS 3091. Independent Study.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq–%)  
Directed individual study.

**PHYS 3094. Physics Research.** (1-6 cr [max 6 cr]; S-N or Aud. Prereq–%)  
Supervised research.

**PHYS 3561. Astrophysics.** (3 cr; A-F only. =PHYS 5561. Prereq–2021)  
The application of physical laws and processes to the understanding of astrophysical objects: celestial mechanics, energy transport, stellar structure and evolution, the interstellar medium, stellar remnants, galactic structure and dynamics, large scale structure and cosmology.

**PHYS 4001. Classical Mechanics.** (4 cr; A-F or Aud. Prereq–2022 or 2001, Math 3280)  
Theoretical mechanics, including Lagrangian and Hamiltonian functions, symmetries, and conservation laws.

**PHYS 4011. Electromagnetic Theory.** (4 cr; A-F or Aud. Prereq–2022 or 1203 or 1205, Math 3280)  
Electric and magnetic fields, Maxwell's equations and applications, radiation.

**PHYS 4021. Quantum Physics II.** (4 cr; A-F or Aud. Prereq–2021, Math 3280)  
Quantum wave mechanics with applications; Schrödinger equation, angular momentum, hydrogen atom, symmetries, identical particles.

**PHYS 4031. Thermal and Statistical Physics.** (4 cr; A-F or Aud. Prereq–2021)  
Elements of thermodynamics; principles of statistical physics applied to equilibrium properties of classical and quantum systems.

**PHYS 4110. Physics for Science Teachers.** (2 cr; A-F or Aud. Prereq–1002 or 2012, no Grad School cr)  
Preparation for teaching physics at the high school level. Review of physics concepts important at the high school level. Methods for effective presentation, including problem solving, discussions, demonstrations and lab experiments.

**PHYS 5041. Optics.** (3 cr; A-F or Aud. Prereq–2022 or 2001)  
Fundamentals of physical optics.

**PHYS 5043. Environmental Optics.** (3 cr; A-F or Aud. Prereq–2012 or course containing elementary optics)  
Application of optics in environmental measurements of irradiance and radiance, optical remote sensing using ship-borne and satellite platforms, diffuse spectra, single vs. multiple scattering, object visibility, inherent vs. apparent optical properties, scattering in Beer's law, optical algorithms.

**PHYS 5052. Computational Methods in Physics.** (3 cr; A-F or Aud. Prereq–2021, 1 sem programming, Math 3280)  
Applications of numerical methods to problems in classical and quantum physics, emphasizing ordinary and partial differential equations. Computer modeling of physical systems and experimentation with simulations of physical systems.

**PHYS 5053. Data Analysis Methods in Physics.** (3 cr; A-F or Aud. Prereq–2012, 1 sem programming, lab or field experience beyond 2012)  
Problems of data analysis in the context of dynamical models. Emphasis will be placed on large datasets that arise in astrophysics, particle dynamics, physical oceanography and meteorology. (2 hr lect & 2 hr lab)

**PHYS 5061. Experimental Methods.** (3 cr; A-F or Aud. Prereq–2033 or 2031, 3061)  
Instruction and practice in methods of experimental physics; microcomputer-based data acquisition; vacuum techniques.

**PHYS 5090. Physics Seminar.** (1 cr [max 2 cr]; A-F or Aud. Prereq–Sr or grad student)  
Preparation and presentation of oral reports on approved physics topics, research projects, and journal articles.

**PHYS 5501. Advanced Classical Mechanics.** (3 cr; A-F or Aud. Prereq–4001)  
Hamiltonian and Lagrangian formulations for discrete systems, canonical transformations, nonlinear dynamics, and chaos theory.

**PHYS 5511. Electrodynamics.** (3 cr; A-F or Aud. Prereq–4011)  
Maxwell's equations, relativity and electrodynamics, radiation and scattering of electromagnetic waves, relativistic particles in electromagnetic fields, and radiation reaction.

**PHYS 5521. Quantum Mechanics I.** (3 cr; A-F or Aud. Prereq–4021)  
Schrödinger equation, operator formulation, angular momentum, symmetries.

**PHYS 5522. Quantum Mechanics II.** (3 cr; A-F or Aud. Prereq–5521)  
Identical particles, perturbation theory, scattering, interaction with electromagnetic field.

**PHYS 5531. Introduction to Solid State Physics.** (3 cr; A-F or Aud. Prereq–4021, 4031)  
Solid structure, thermal, and electronic properties of solids and solid surfaces.

**PHYS 5541. Fluid Dynamics.** (3 cr; A-F or Aud. Prereq–2022 or 2001, Math 3280)  
Analytic and numeric treatment of dynamics of fluids. Rotating, stratified fluids, with applications in limnology, oceanography, and meteorology.

**PHYS 5551. General Relativity.** (4 cr; A-F or Aud. Prereq–4001)  
Differential geometry, tensors, metrics, curvature, Einstein's equation, Newtonian limit, Killing vectors, cosmology, perfect fluids, Schwarzschild and Kerr solutions, observational tests, black holes.

## Course Descriptions

**PHYS 5561. Astrophysics.** (3 cr; A-F or Aud. =PHYS 3561. Prereq=2021 and 2022, Math 3280)

The application of physical laws and processes to the understanding of astrophysical objects: celestial mechanics, energy transport, stellar structure and evolution, the interstellar medium, stellar remnants, galactic structure and dynamics, large scale structure and cosmology.

**PHYS 5591. Independent Study.** (1-3 cr [max 6 cr]; S-N or Aud. Prereq=Consent of director of graduate studies, #) Special studies, useful in individual graduate programs, not available in regular course offerings.

**PHYS 5594. Physics Research.** (1-3 cr [max 6 cr]; S-N or Aud. Prereq=#)

**PHYS 8333. FTE: Master's.** (1 cr; No grade. Prereq=Master s student, adviser and DGS consent)

**PHYS 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq=Max 18 cr per semester or summer; 10 cr total required [Plan A only])

## Political Science (POL)

### College of Liberal Arts

**POL 1011. American Government and Politics.** (3 cr; A-F or Aud. LE 6)

Principles of American national government. Survey of American governmental system, structure, operations, and services; constitutionalism, federalism, civil liberties, parties, pressure groups, and elections.

**POL 1050. International Relations.** (3 cr; A-F or Aud. LEIP 08)

Introduction to contemporary international politics: levels of analysis; the international system; nation-state behavior; foreign policy decision making; economic and defense policy issues.

**POL 1195. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 8 cr]; A-F or Aud) Contemporary topics in American governmental systems and processes. Specific course announced in [Class Schedule].

**POL 1500. Introduction to Comparative Politics.** (3 cr; A-F or Aud. LEIP 06)

Survey of the politics of countries selected 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. Introduction to Political Theory.** (3 cr; A-F or Aud. LE 7)

Introduction to the history of political thought from a thematic perspective such as freedom and citizenship, democracy and its critics, political obligation and justice, diversity and inequality. Close attention to method of interpretation and argument.

**POL 2700. Methodology and Analysis.** (4 cr; A-F or Aud) Theory and methods of conducting political research: theory construction, concept formulation, survey research and sampling design, basic statistical analysis, and measurement of relationships.

**POL 3001. American Public Policy.** (3 cr; A-F or Aud. Prereq=1011, min 45 cr or #)

Approaches to policy study, context of policy process, and discussion of policy issues.

**POL 3015. State and Local Government.** (4 cr; A-F or Aud. Prereq=1011, 45 cr or #; =3020)

State and local governments in the United States; governmental institutions and processes; intergovernmental relations. Special reference to Minnesota

**POL 3025. Popular Culture and Politics.** (4 cr; A-F or Aud. Prereq=45 or incl 6 cr soc sci or #)

Evaluation of the presentation of American political institutions, officials, and policy issues in mass entertainment. How accurate are the portrayals? How influential is Hollywood's view of American government? How do Americans know what they think they know about politics?

**POL 3040. Women and Politics.** (3 cr; A-F or Aud. Prereq=45 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 3080. Environment and Politics.** (3 cr; A-F or Aud. Prereq=1011, 45 cr or #)

American natural resource problems with special attention to conservation activities on national, state, and local levels; development of conservation agencies in Minnesota.

**POL 3097. Government Internship.** (1-12 cr [max 12 cr]; S-N or Aud. Prereq=60 cr; 4 cr max from 3097, 3197, 3297 may be applied toward advanced Pol major requirements; #)

Scheduled work assignments with direct supervision in performance of governmental functions; full- or part-time employment.

**POL 3109. Intern Teaching in Political Science.** (1-2 cr [max 3 cr]; S-N or Aud. Prereq=90 cr, Pol major; 3 cr max may be applied to upper div Pol major requirements; #) Practical experience teaching in Department of Political Science. Application deadline one week before beginning of registration for the following semester. Before interning in a course, students must obtain a grade of at least B+ in the course.

**POL 3120. Congress and the Presidency.** (4 cr; A-F or Aud. Prereq=1011, 45 cr or #)

Functioning and structure of the United States Congress and Presidency. Members of Congress and the Presidency: their characteristics, their selection, roles they play, how they interact with each other as well as with others in the policy-making process.

**POL 3131. Judicial Politics and Policy Making.** (3 cr; A-F or Aud)

An examination of the characteristics and behavior of judicial institutions, emphasizing the interaction with other policy-makers and social and political problems. Investigates the policy roles of state and lower federal courts and the U.S. Supreme Court.

**POL 3141. American Political Parties.** (3 cr; A-F only. Prereq=1011 or equivalent, 45 cr)

History of political parties in the U.S.; the role of parties in the executive, legislative, and judicial branches of government and their effect on public policy; party organization; parties at the state and local level; party competition and third parties.

**POL 3142. Voting, Campaigning, and Elections.** (3 cr; A-F only. Prereq=1011, 45 cr)

Covers theories of voting, including how they explain who votes and vote choice. Examines how campaign money, policy issues, the media, and campaign advertising play a role in presidential and congressional elections

**POL 3150. American Constitutional Law I.** (4 cr; A-F or Aud. Prereq=1011, 45 cr or #)

Institutional powers and civil rights: judicial review; authority of Congress and President; powers in war and foreign affairs; power of national and state governments; property rights; civil rights and equal protection (race, gender, and other groups); anti-discrimination; affirmative action.

**POL 3151. American Constitutional Law II.** (4 cr; A-F or Aud. Prereq=1011, 45 cr or #)

Civil liberties: incorporation of the Bill of Rights; Due Process clause; freedom of religion; freedom of speech; freedom of press; privacy rights; rights of the accused; search and seizure; rights before the Courts; cruel and unusual punishment.

**POL 3170. Political Interest Groups and Individuals.** (3 cr; A-F or Aud. Prereq=1011, 45 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 3195. Special Topics: (Various Titles to Be Assigned).** (1-4 cr [max 8 cr]; A-F or Aud. Prereq=45 cr incl 6 cr in soc sci or #)

Detailed examination of contemporary topics in political science. Specific course announced in [Class Schedule].

**POL 3197. Nongovernmental Internship.** (1-12 cr [max 12 cr]; S-N or Aud. Prereq=60 cr; 4 cr max from 3097, 3197, 3297 may be applied toward advanced Pol major requirements; #)

Supervised, scheduled work assignments in performance of political functions in nongovernmental organizations; full- or part-time employment. Not all outside work is eligible; see department head for requirements.

**POL 3222. The Politics of Bureaucracy.** (3 cr; A-F only. =POL 3221. Prereq=1011 or equivalent, min 45 cr)

Operations of bureaucratic organizations and their role in government policy making. Capability of modern bureaucracy in meeting own goal of technical efficiency; impact of bureaucratic forms of organization on democratic society

**POL 3311. Public Opinion and Polling Methods.** (4 cr; A-F only. Prereq=1011 or equivalent, 45 cr)

Formation of public opinion; attitudes and nonattitudes; polls in the media; role of public opinion in democracy; measurement of opinion; survey methods; questionnaire construction; sampling techniques.

**POL 3400. Contemporary Issues in World Politics.** (4 cr [max 8 cr]; A-F or Aud. Prereq=1050, 45 cr; 4 cr may be applied toward Pol major requirements)

Detailed examination and analysis of selected contemporary issues in world politics and international relations. Policy recommendations dealing with each issue.

**POL 3403. American Foreign Policy.** (3 cr; A-F only. =POL 3402. Prereq=1011 or 1050, min 45 cr)

Various influences on the making of American foreign policy; understanding why particular foreign policy choices are made and the effects of a changing international environment on American foreign policy.

**POL 3451. Theories of International Relations.** (4 cr; A-F or Aud. Prereq=45 cr incl 8 cr soc sci or #)

Historical and contemporary theories of international relations. Views of contending theorists are analyzed and assessed.

**POL 3456. International Security: Theory and Policy.** (4 cr; A-F or Aud. Prereq=45 cr incl 6 cr soc sci or #)

Introduces undergraduates to the principal theories used in international security studies and to the major security issues faced by the United States in the post-Cold War world.

**POL 3457. Understanding Terrorism and the Terrorist Threat to America.** (4 cr; A-F or Aud. Prereq=30 cr incl 6 cr soc sci or #)

Introduces students to the major causes of terrorism in the Cold War and post-Cold War worlds and the threats terrorist groups pose to the United States and its interests around the world.

**POL 3511. Politics of South Asia.** (4 cr; A-F or Aud. Prereq=1500, 45 cr incl 8 cr soc sci or #)  
Comparative study of five South Asian countries (namely India, Pakistan, Bangladesh, Sri Lanka, and Nepal). It analyzes the history and impact of colonialism in South Asia; state formations in South Asia; and controversies in recent South Asian politics over issues like globalization; democratization; religious fundamentalism; nuclearism; and gender. Policy solutions to these problems will be considered.

**POL 3515. Theories of Comparative Politics.** (4 cr; A-F or Aud. Prereq=1500, 45 cr incl 8 cr soc sci or #)  
Introduces the theoretical, methodological, and substantive debates in the discipline of Comparative Politics.

**POL 3517. Western European Political Systems.** (4 cr; A-F or Aud. Prereq=45 cr incl 8 cr soc sci or #)  
Comparative analysis of development and operation of political-governmental 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 3518. Transitional Politics of Asia.** (3 cr; A-F only. Prereq=1500, 3570, or equivalent, 45 cr)  
A comparative study of transitional societies in Asia (i.e., societies undergoing political, economic, technological, and socio-cultural changes—in varying degrees and forms—as part of their state building projects). Addresses the political economy of transitional states of Asia such as China, Japan, Korea, Taiwan, and India. Exploration, in the context of their historical experiences, of the rise of their state structures; ideologies; their transition from agrarian to industrialization; and how has this transition impacted their indigenous social cultures and identities.

**POL 3525. African Politics.** (3 cr; A-F or Aud. Prereq=1050 or 1500, 45 cr including 8 social science cr or #)  
A survey of politics in Africa, with an emphasis on sub-Saharan Africa. Includes discussions of pre-colonial history, colonialism and its effects, the politics of independence movements, contemporary political systems, and the forces influencing politics on the continent.

**POL 3570. Politics of Developing Nations.** (3 cr; A-F or Aud. Prereq=1050 or 1500 or 8 cr soc sci, 45 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; A-F or Aud. Prereq=45 cr or #)  
Fundamental political themes and concepts in political theory, including but not limited to justice, liberty, equality, power, democracy, political obligation, and community. Perspectives of diverse political philosophies and cultures may be addressed.

**POL 3610. Political Economy: An Introduction.** (4 cr; A-F or Aud. Prereq=45 cr incl 6 cr soc sci or econ or bus or #)  
Relationship between politics and economics and ways they affect each other, focusing on political and economic values/goals and their role in shaping public policy; policies and policy making in selected national systems; the international economy.

**POL 3651. Classical Political Thought.** (4 cr; A-F or Aud. Prereq=1610 or #)  
Justice and the political community; classical Greek thought and medieval thought, concentrating on Plato, Aristotle, Augustine, Aquinas, Machiavelli, and More.

**POL 3652. Modern Political Thought.** (4 cr [max 12 cr]; A-F or Aud. Prereq=1610 or #, course is repeatable with instructor consent only)  
Advanced survey of political thought from Enlightenment to the present; course topic may include one or more of the following traditions of political theorizing: English (e.g. Hobbes, Locke, Burke, Bentham, Mill, Wollstonecraft), German (e.g. Kant, Hegel, Marx, Nietzsche, Habermas) or French (e.g. Montesquieu, Rousseau, Tocqueville, Foucault, Derrida).

**POL 4190. The Senior Seminar.** (4 cr; A-F or Aud. Prereq=6 cr in relevant upper div pol courses, #)  
Supervised research and writing in current areas or issues of politics and political science, subject matter varying with instructor.

**POL 4191. Independent Study.** (1-4 cr [max 6 cr]; A-F or Aud. Prereq=8 cr in pol, 6 cr in other soc sci, #)  
Advanced study and research under supervision of a staff member; student must consult with instructor before registration.

**POL 4195. Special Topics: (Various Titles to Be Assigned).** (1-4 cr [max 6 cr]; A-F or Aud. Prereq=45 cr incl 8 cr in soc sci or #)  
Detailed examination of contemporary topics in political science. Specific course announced in Class Schedule.

## Psychology (PSY)

### College of Education and Human Service Professions

**PSY 1003. General Psychology.** (4 cr; A-F or Aud. LE 6)  
Scientific method of behavior; current knowledge of biological, social, and cognitive areas of psychology. Assessment, research methods, human development, personality, mental disorders, and therapy.

**PSY 2003. Psychology: Discipline and Profession.** (1 cr; A-F only. Prereq=Pre-psychology or psychology major)  
Orientation to psychology: the major, discipline, and professions available. Subfields of psychology, ethical issues, careers, preparation for graduate school, and opportunities for professional development. Introduction to research, available resources, and preparation for writing assignments required in upper-division psychology courses.

**PSY 2020. Introduction to Statistics and Research Methods.** (3 cr; A-F or Aud. Prereq=[Soc 2155 or Econ 2030 or Stat 2411 or Esat 4700 or any other comparable courses as approved by the department], 1003, psy minors only, #)  
Scientific method and designs used in published psychological research including quasi-experimental and survey designs accompanied by inferential statistics used to test research questions (including correlation and analysis of variance).

**PSY 2021. Developmental Psychology.** (4 cr; A-F or Aud. LECD 06)  
Major processes in human development, conception through lifespan; biological and cultural influences on physical-motor, cognitive, social, and emotional development; effects of diverse cultural traditions and values; social policy implications.

**PSY 2023. Marriages and Families Worldwide.** (4 cr; A-F or Aud. LEIP 08)  
Family functions and structures worldwide; impact of expectations, gender roles, race, culture, and values on partner and parenting; love, sex, communication, power, abuse, stress, and satisfaction; small group experiences with focus on strengthening families.

**PSY 2223. Gender in Society.** (4 cr; A-F or Aud. LECD 08)  
Sociocultural, historical, and developmental formations of men's and women's roles and experiences in society. Effects on personality, interpersonal relationships, and life choices.

**PSY 3010. Internship Preparation.** (2 cr; A-F only. Prereq=Psy major, #)

For psychology majors preparing to complete an internship. Includes career development, site selection, exploration of community or business organizations and study of ethics.

**PSY 3011. Internship in Psychology.** (3 cr [max 6 cr]; A-F only. Prereq=3010, #)  
Internship with a school, community agency or business. Nine hours supervised experience on site and one hour on campus per week. Students complete an internship contract, weekly log, relevant readings, and paper or presentation. Includes direct contact with clients and staff.

**PSY 3020. Statistical Methods.** (4 cr; A-F or Aud. Prereq=Elem Algebra, Math placement test)  
Descriptive statistics; introduction to correlational analysis and regression; sampling techniques and statistical inference; applications of simple and factorial design analysis of variance and other parametric and nonparametric hypothesis-test statistics in the behavioral sciences.

**PSY 3021. Experimental Design and Methodology.** (4 cr; A-F or Aud. Prereq=2003, 3020)  
Introduction to problems and methods of experimentation in psychology; logical and scientific basis of experimental psychology; problems and techniques of designing, conducting, and reporting experiments. (3 hrs lect, 1 hr lab)

**PSY 3022. Applied Methods and Measurement.** (4 cr; A-F or Aud. Prereq=3020, 3021, #)  
Designing, conducting, and reporting experiments; constructing, choosing, and interpreting psychological instruments; experimental procedures and research findings from various areas within psychology. (3 hrs lecture, 1 hr lab)

**PSY 3051. Cross-cultural Psychology.** (3 cr; A-F or Aud. Prereq=1003, #)  
Role of culture on behavior. Universal versus culture-specific aspects of psychological principles. Definition of culture, methodology, development of self and others, cognition, attitudes, emotions, applications in organizations, therapy, well-being.

**PSY 3061. Physiological Psychology.** (4 cr; A-F or Aud. Prereq=4 cr Psy or #)  
Physiological basis of behavior, including central and peripheral nervous systems, sensory processes as they relate to perception, cognition, emotion, motivation, intelligence, and learning.

**PSY 3081. History and Systems of Psychology.** (3 cr; A-F or Aud. Prereq=3 cr Psy)  
Survey of historical development and current status of contemporary systems and theories in psychology.

**PSY 3098. The Psychological Principles of Stress Management.** (3 cr; A-F or Aud)  
Examines the psychological principles applicable to stress management and holistic life management. Advanced experiential application of a wide spectrum of approaches integrating the mental, physical, and spiritual characteristics of wellbeing.

**PSY 3111. Theories of Personality.** (3 cr; A-F or Aud. Prereq=3 cr Psy)  
Basic concepts, issues, and methods involved in study of human personality; introduction to selected theories on motives, dynamics, development, and description of human nature.

## Course Descriptions

**PSY 3112. Psychology of Religion.** (3 cr; A-F or Aud. Prereq—Upper div standing, strong interest in scientific study of religious experience and behavior)  
Religious beliefs and their functional value in human life. Varieties of religious experience and behavior.

**PSY 3121. Abnormal Psychology.** (4 cr; A-F or Aud. Prereq—3 cr Psy)  
Mental disorders, including DSM-IV classification system, etiology, and treatment.

**PSY 3122. Child and Adolescent Abnormal Psychology.** (3 cr; A-F only. Prereq—1003, 2021)  
Overview of psychological disorders common among children and adolescents, including theoretical approaches, diagnostic criteria, developmental trajectory and framework, etiology, risk and protective factors, and treatment. Ethical considerations, research methodology, and diversity considerations in child clinical psychology will also be covered.

**PSY 3201. Social Psychology.** (3 cr; A-F or Aud. Prereq—3 cr Psy)  
How thoughts, feelings, and behavior of individuals are affected by others. Social influence and interaction. Attitude measurement and change, conformity, impression formation, attribution theory, aggression, and prosocial behavior.

**PSY 3211. Group Dynamics.** (3 cr; A-F or Aud. Prereq—3 cr Psy)  
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; A-F or Aud. =PSY 3216. Prereq—Min 3 cr Psy)  
Biological and psychosocial factors relating to human sexuality, sexual functioning, gender, and related issues. Group discussion of societal factors, values, and attitudes and their impact on behavior.

**PSY 3231. Psychology of Drug Use.** (3 cr; A-F or Aud. Prereq—3 cr Psy)  
Basic understanding of drug effects: tolerance and withdrawal; commonality among drugs of abuse; how antischizophrenic, antimanic, anti-anxiety, and antidepressant drugs are thought to work; reward centers in brain.

**PSY 3371. Child and Adolescent Psychology.** (3 cr; A-F or Aud. Prereq—1003)  
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 3381. Adult Development and Aging.** (3 cr; A-F or Aud. Prereq—2021 or #)  
Change and continuity in physiological, psychological, and sociocultural development in early, middle, and late adulthood; theories and research on effects of demographics, cohort, race, ethnicity, gender, culture, family, friends, work, health, education, housing, public policies; dying, grief, bereavement.

**PSY 3445. Transpersonal Psychology.** (3 cr; A-F or Aud. Prereq—1003 or #)  
Branch of psychology that studies spiritual and transcendental experiences. Concerned with the whole of being, it recognizes potential for a variety of states of consciousness; it acknowledges developmental psychology and draws further insights from the spiritual dimensions of human beings. Lab fee.

**PSY 3520. Introduction to Industrial/Organizational Psychology.** (4 cr; A-F or Aud. Prereq—3 cr psy or #, =3701 or 3707)

Introduction to the field of industrial/organizational psychology. Major content areas within the field will be covered, including selection, training, performance evaluation, motivation, work stress, organizational culture, teams, and leadership.

**PSY 3524. Basic Helping Skills.** (4 cr; A-F or Aud)  
Rationale for and practice of basic skills needed for effective interpersonal helping.

**PSY 3540. Psychology of Food Abuse.** (3 cr; A-F or Aud. Prereq—3 cr Psy)  
Basic understanding of eating disorders: obesity, binge eating, anorexia, bulimia, and social, psychological, and physical influences on normal and abnormal eating. Social evaluation of obesity.

**PSY 3601. Psychology of Personal Development.** (3 cr; A-F or Aud. Prereq—3 cr Psy)  
Focuses on discovery of self and spiritual journey. Examines personal development by exploring ways to change, grow, and achieve creative potential. Individual and group counseling experiences required to increase self-awareness and self-knowledge.

**PSY 3611. Learning and Behavior.** (4 cr; A-F or Aud. Prereq—3 cr Psy)  
Study of basic learning and behavior processes including the evolution of behavior, pavlovian conditioning, instrumental learning, and elementary cognitive processes.

**PSY 3621. Cognition.** (4 cr; A-F or Aud. Prereq—3 cr Psy)  
An overview of cognitive processes, using historical, philosophical, biological and experimental perspectives. Course topics include attention, perception, knowledge representation memory, language, thinking, reasoning, and decision-making.

**PSY 3631. Cognitive Development: Ways of Knowing.** (3 cr; A-F or Aud)  
Development of cognitive processes from infancy through adolescence. Perception in infancy; development of information processing capacities; constructing understandings; language, culture and thinking; thinking as theory building; thinking about self and others. Impact of research on child rearing, education, public policy.

**PSY 3661. Psychology of Language.** (3 cr; A-F or Aud. Prereq—3 cr Psy)  
Psychological processes underlying comprehension, production, and acquisition of language(s); cognitive, social, biological, and educational perspectives on language and their applications.

**PSY 3691. Sensation and Perception.** (4 cr; A-F or Aud)  
Theories, methods, and findings in study of sensory and perceptual processes; psychophysics and psychophysiology of visual, auditory, gustatory, olfactory, cutaneous, kinesthetic, vestibular, and pain senses; analysis of perceptions of constancy, illusion, space, time, motion, and form.

**PSY 3701. Personnel Psychology.** (3 cr; A-F or Aud. Prereq—3 cr Psy or #)  
Introduction to personnel psychology. Testing, selection, performance appraisal, job analysis, job evaluation, validity issues in organizational settings, discrimination, and affirmative action programs.

**PSY 3707. Organizational Psychology.** (3 cr; A-F or Aud. Prereq—3 cr Psy or #)  
Overview of organizational topics within industrial/organizational psychology. Leadership, job satisfaction, motivation theories, goal setting, organizational behavior, organizational development, and industrial relations.

**PSY 3990. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 3 cr]; A-F or Aud. Prereq—3 cr Psy)  
Developed by psychology faculty in their expertise areas to instruct on selected advanced and current topics.

**PSY 3991. Projects in Psychology.** (1-4 cr [max 4 cr]; S-N or Aud. Prereq—Psy major or minor, #)  
Supervised practical experience in University or community activities to gain experience in application of psychological principles and techniques; written report required.

**PSY 3994. Directed Research in Psychology.** (1-4 cr [max 4 cr]; S-N or Aud. Prereq—Psy major or minor, #)  
Research problem chosen by instructor; written report required.

**PSY 3995. Research in Psychology.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq—Psy major or minor, #)  
Intensive independent empirical research on problem in psychology chosen by student; research report required.

**PSY 3996. Pre-Professional Field Placement.** (1-4 cr [max 4 cr]; S-N only. Prereq—3010, &3011, #)  
Preprofessional field placement. For students wishing additional internship experience. Requires additional 3 hours per week of supervised experience on site for each credit. Must be taken with Psy 3011 Internship in Psychology.

**PSY 3997. Honors Project in Psychology.** (1-3 cr [max 3 cr]; A-F or Aud. Prereq—Psy major, #, 3.00 GPA overall, 3.25 GPA in psy)  
Advanced individual project demonstrating application of psychological principles based on sound theoretical and research foundations. A psychology faculty adviser, written report, and oral examination required.

**PSY 3998. Honors Research in Psychology.** (1-3 cr [max 3 cr]; A-F or Aud. Prereq—Psy major, #, 3.00 GPA overall, 3.25 GPA in psy)  
Advanced independent empirical research project proposed and conducted by student with psychology faculty adviser. Project must receive Human Use Committee approval and be reported in American Psychological Association publication style.

**PSY 3999. Directed Instruction.** (1-4 cr [max 4 cr]; Stdnt Opt. Prereq—#)  
Students work with department faculty in planning and helping teach an undergraduate course.

**PSY 4021. Research Methods I.** (4 cr; A-F or Aud. Prereq—3020, #; no Grad School cr)  
Provides an overview of research methods in psychology; logical and scientific basis of experimental psychology; problems and techniques of designing, conducting and reporting experiments; selecting and constructing psychological instruments, a review of statistics and how to design a research project.

**PSY 4022. Research Methods II.** (4 cr; A-F or Aud. Prereq—4021, #; no Grad School cr)  
Discusses research methodology as it is applied within different areas of psychology. Reviews statistics and introduces the use of statistical software (e.g., SPSS). Provides an overview of testing and measurement and research ethics.

**PSY 4023. Research Methods III.** (3 cr; A-F or Aud. Prereq—4022, #; no Grad School cr)  
Emphasizes designing and conducting a study, analyzing data, and interpreting and reporting the results.

**PSY 4121. Foundations of Clinical Psychology.** (3 cr; A-F or Aud. Prereq—3121, no Grad School cr)  
An overview of clinical psychology as well as contemporary issues and trends within the field. Emphasizes areas in which clinical psychologists are principally involved, including assessment, treatment, and clinical research.

**PSY 4500. Health Psychology.** (3 cr; A-F or Aud. Pre-req-1003, 12 sem cr in psy or #)  
Concepts, issues, and methods of health psychology; health maintenance and illness prevention integrating biological, psychological, and social factors; utilization of health psychological assessments; and interdisciplinary aspects of health psychology.

**PSY 5051. Research Methods and Measurement in Psychology.** (3 cr; A-F or Aud. Pre-req-Grad student or #)  
Research methods and design for the behavioral sciences; principles and practices of needs assessment, program evaluation, and individual assessment techniques; ethical and legal considerations in research and assessment.

**PSY 5052. Advanced Statistical Methods.** (3 cr; A-F or Aud. Pre-req-3020, 5051 or #)  
Advanced parametric and nonparametric statistics; application of variance, covariance, and linear regression analyses to a variety of multilevel and factorial research designs; psychometric statistics; computer-based data management; ethical and legal considerations.

**PSY 5061. Research Problems I.** (1-2 cr [max 2 cr]; S-N or Aud)  
Application of principles and procedures of research methods, needs assessments, and program evaluations; integration of research concepts with counseling problems through guided study and practice; ethical and legal considerations. Partially fulfills Plan B requirement.

**PSY 5062. Research Problems II.** (1-2 cr [max 2 cr]; S-N or Aud. Pre-req-5061 or #)  
Advanced application of principles and procedures of research methods, needs assessment, program evaluation, and statistics; integration of research concepts with counseling problems; analysis, conclusions, and dissemination of research. Written report and oral exam required; completes fulfillment of Plan B requirement.

**PSY 5123. Psychology of Addictive Behaviors.** (3 cr; A-F or Aud. Pre-req-Sr or grad student or #)  
Examination of a wide spectrum of addictive behaviors, including drug addictions and process addictions, such as gambling, compulsive buying, and compulsive eating. Evaluation and treatment approaches.

**PSY 5130. Evolutionary Psychology.** (3 cr; A-F or Aud. Pre-req-1003, 3020 or #)  
Evolution and the theory of natural selection as it applies to behavioral processes, e.g., survival, mating strategies, parenting and family, cooperation and conflict.

**PSY 5131. Mind-Body Connection.** (3 cr; A-F or Aud)  
Examination of interface between biological and psychological development associated with risks for substance abuse, depression, and conduct disorders; potential commonality of mechanisms. Topics may include communication between brain and endocrine systems, evolution of the brain, homosexuality, psychoneuroimmunology, and psychopharmacology.

**PSY 5155. Forensic Psychology.** (3 cr; A-F or Aud. Pre-req-1003 or #)  
Examines the application of psychology to the judicial system in such diverse areas as criminal diversion and rehabilitation; expert testimony, jury selection; police training; divorce mediation; and custody evaluations.

**PSY 5990. Special Topics: (Various Titles to be Assigned).** (.5-4 cr [max 8 cr]; A-F or Aud. Pre-req-Sr or grad student or #)  
Analysis of selected advanced topics in psychology and/or counseling.

**PSY 5993. Directed Study: Psychology and Counseling.** (1-4 cr [max 8 cr]; Stdnt Opt. Pre-req-Grad student, #)  
Individual in-depth explorations of psychological and/or counseling theories and principles approved and guided by faculty.

**PSY 8333. FTE: Master's.** (1 cr; No grade. Pre-req-Master's student, adviser and DGS consent)

## Recreation (REC)

College of Education and Human Service Professions

**REC 1201. Outdoor Skills I.** (2 cr; A-F or Aud. PE)  
Instruction and practice in skills of fall outdoor activities. Camping, canoeing, hunting, and climbing; equipment, shelters, and navigation.

**REC 1202. Outdoor Skills II.** (2 cr; A-F or Aud. PE)  
Instruction and practice in skills of winter and spring outdoor activities. Camping, backpacking, dog sledding, and fishing; equipment and navigation.

**REC 1203. Outdoor Skills I.** (2 cr; A-F or Aud. Pre-req-rec, rec major or minor)  
Instruction and practice in skills of fall outdoor activities. Camping, canoeing, fishing, hunting; and equipment, shelters, and navigation.

**REC 1204. Outdoor Skills II.** (2 cr; A-F or Aud. Pre-req-rec or rec major or minor or #)  
Instruction and practice in skills of winter and spring outdoor activities. Camping, backpacking, dog sledding, and fishing; equipment and navigation.

**REC 2300. Recreation Programming.** (3 cr; A-F or Aud. Pre-req-1000 or #)  
Designing, presenting, and evaluating recreation programs. Components of planning, such as facilities management and equipment procurement. Leadership practices pertaining to outdoor education programs.

**REC 3327. Large Event Management.** (3 cr; A-F or Aud. Pre-req-2300 or #)  
Organization and administration of life fitness activities and nonformal instruction in recreational sport programs. Design, implementation, and evaluation of large-scale recreational sports events such as triathlons and tournaments.

**REC 3330. Outdoor Recreation.** (3 cr; A-F or Aud. Pre-req-2300 or #)  
Examination of outdoor recreation as a part of natural resource based agencies as well as in nature centers, commercial operations, and in municipal settings. This course will focus on outdoor recreation uses in Northeastern Minnesota.

**REC 4320. GIS Management for Recreation Professionals.** (3 cr; Stdnt Opt. Pre-req-No Grad School credit)  
Using G.I.S. mapping techniques for recreation and outdoor education professionals in resource management decisions. The use of Arcview and Landview software will be used to visualize and analyze landscapes. This course is specific to recreation and/or outdoor education professionals.

**REC 4991. Independent Study.** (1-4 cr [max 4 cr]; A-F or Aud. Pre-req-#; no Grad School credit)  
Independent project that would serve to further the student's knowledge base and/or professional competencies.

**REC 4992. Readings in Recreation.** (1-4 cr [max 4 cr]; A-F or Aud. Pre-req-#; no Grad School credit)  
Complementary readings and discussion in student's area of interest with faculty supervision.

**REC 4997. Recreation Practicum.** (3 cr; S-N only. Pre-req-1000, rec minor; no Grad School credit)  
Field-based experience through a selected recreation agency.

## Russian (RUSS)

College of Liberal Arts

**RUSS 1101. Beginning Russian I.** (4 cr; A-F or Aud. Pre-req-Little or no prior formal study of this language, or # LE 3)  
Grammar, reading, and conversation for students with no previous knowledge of Russian.

**RUSS 1102. Beginning Russian II.** (4 cr; A-F or Aud. Pre-req-1101 or equiv or # LE 3)  
Grammar, reading, and conversation.

**RUSS 2595. Special Topics: (Various Titles to be Assigned).** (4 cr [max 8 cr]; A-F or Aud. LEIP 09)  
Reading of Russian literature in English translation. Specific authors will vary.

## Safety (SAFE)

Swenson College of Science and Engineering

**SAFE 6002. Regulatory Standards and Hazard Control.** (4 cr; A-F or Aud. Pre-req-MEHS student or % and #)  
Overview of OSHA and other health and safety standards, codes and regulations with an emphasis on the recognition and control of workplace hazards as defined by the standards, codes and regulations.

**SAFE 6011. System Safety and Loss Control Techniques.** (4 cr; A-F or Aud. Pre-req-MEHS student or % and #)  
Analytical techniques of data collection, data analysis, and risk assessment in designing and implementing proactive system safety processes. Comprehensive approach to cost reduction and containment processes and programs, which minimize financial and accidental losses. Lab arranged.

**SAFE 6012. Risk Management and Workers' Compensation.** (4 cr; A-F or Aud. Pre-req-6011 or % and #)  
Comprehensive overview of risk management strategies and insurance system; essential elements of workers' compensation cost reduction and containment programs in industry. Workers' compensation and occupational safety in preventing corporate financial losses. Lab arranged.

**SAFE 6051. Construction Safety.** (3 cr; A-F or Aud. Pre-req-6002 or % and #)  
Code of Federal Regulations 1926 and other standards and regulations that affect construction industry. Emphasis on recognition, analysis, and corrective action. Principles of construction safety management, project implementation, and subcontractors management. Lab arranged.

**SAFE 6101. Principles of Industrial Hygiene.** (3 cr; A-F or Aud. Pre-req-MEHS student or % and #)  
Effects of chemical, physical, and biological agents on the body and typical methods of control; lab use of monitoring and corrective devices. Lab arranged.

**SAFE 6102. Advanced Industrial Hygiene and Health Physics.** (3 cr; A-F or Aud. Pre-req-6101 or % and #)  
Recognition, evaluation, and control techniques necessary for prevention of occupationally related diseases. Introduction to health hazards of radiated energy such as ionizing nuclear radiation and x-rays; nonionizing radiation hazards from microwaves, lasers, and infrared and ultraviolet light. Lab arranged.

## Course Descriptions

**SAFE 6201. Fire Prevention and Emergency Preparedness.** (3 cr; A-F or Aud. Prereq—MEHS student or % and #) Hazard analysis and risk assessment as related to prevention and control of undesired fires; analytical study of flammable materials and extinguishing systems found in industrial settings; organization and development of emergency preparedness programs.

**SAFE 6211. Transportation Safety.** (3 cr; A-F or Aud. Prereq—MEHS student or % and #) Study of health and safety programs used in rail, road, air, and marine transportation, emphasizing fleet safety programs.

**SAFE 6212. Noise Control Engineering.** (3 cr; A-F or Aud. Prereq—MEHS student or % and #) A multi-disciplinary approach to a comprehensive introduction to the principles of noise and noise conservation (hygiene, safety, acoustics, audiology, occupational medicine, engineering, behavioral and legal). Emphasis will be on noise control engineering protocols. Lab arranged.

**SAFE 6213. Principles of Ventilation and Indoor Air Quality.** (3 cr; A-F or Aud. Prereq—MEHS student or % and #) Comprehensive introduction on design, maintenance, and evaluation of exhaust ventilation systems. Methodology for conducting indoor air quality investigations. Lab arranged.

**SAFE 6291. Independent Study in Industrial Safety.** (1-3 cr [max 3 cr]; S-N or Aud. Prereq—6002, #) Special projects, field studies, or research in industrial hygiene or safety topics

**SAFE 6295. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 3 cr]; A-F or Aud. Prereq—MEHS student or % and #) Selected topics in industrial safety or hygiene. Similar topics may not be repeated for credit.

**SAFE 6301. Occupational Biomechanics and Work Physiology.** (3 cr; A-F or Aud. Prereq—6302 or % and #) Overview to study physical interaction of workers with their tools, machines, and materials so as to enhance workers' performance while minimizing risk of future musculoskeletal disorders. Lab arranged.

**SAFE 6302. Occupational Ergonomics and Injury Management.** (3 cr; A-F or Aud. Prereq—MEHS student or % and #) Overview of occupational ergonomics and related disciplines such as work physiology, biomechanics, human anatomy, engineering design, medical management. Hands-on approach, including ergonomic job analysis, risk factor quantification, and documentation for demanding tasks. Lab arranged.

**SAFE 6401. Environmental Safety and Legal Implications.** (3 cr; A-F or Aud. Prereq—MEHS student or % and #) Federal, state, and local laws and judicial interpretations that have applications to environmental health and safety programs. Corporate responsibility regarding environment, employee, and product.

**SAFE 6821. Organization and Administration of Safety Programs.** (3 cr; A-F or Aud. Prereq—6012 or % and #) Current administrative practices. Involvement in design and development of safety programs suitable for an industrial facility.

**SAFE 6997. Internship in Environmental Health and Safety.** (3 cr; S-N or Aud. Prereq—MEHS student, %) Cooperative internship in an industrial, governmental, or other organization that has an established safety program or is in the process of implementing one. Requires a significant Plan B-type project for the firm.

## Science (SCI)

### Swenson College of Science and Engineering

**SCI 3351. Chemistry for High School Teachers I.** (2 cr; Stdnt Opt. Prereq—%) Complete participation in Chem 2521—Organic Chemistry I required. Library research paper and special problems assigned. Lab includes experiments of particular importance to high school chemistry. (4 hrs lect, 3 hrs lab; offered summer only)

**SCI 3352. Chemistry for High School Teachers II.** (2 cr; Stdnt Opt. Prereq—%) Complete participation in Chem 2522—Organic Chemistry II required. Library research paper and special problems assigned. Lab assignments include experiments of particular importance to high school chemistry. (4 hrs lect, 3 hrs lab; offered summer only)

## Social Work (SW)

### College of Education and Human Service Professions

**SW 1210. Global Issues.** (3 cr; A-F or Aud. =SW 1211, SW 1212. LEIP 08) Global problems of war, peace, national security; population, food, hunger; environmental concerns, global resources; economic and social development; human rights. Examines issues from a global problem-solving perspective. Value, race, class, gender differences.

**SW 1211. Freshman Seminar: Global Issues.** (3 cr; A-F or Aud. =SW 1210, SW 1212. Prereq—Freshman, fewer than 30 cr LEIP 08) 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 systems, problem solving, and futurist perspectives in seminar format. Consideration of value, race, class, and gender differences.

**SW 1212. Global Issues Honors Seminar.** (3 cr; A-F or Aud. =SW 1210, SW 1211. Prereq—Honors student LEIP 08) Focus on 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 systems, problem solving, and futurist perspectives in honors seminar format.

**SW 1619. Race, Class, and Gender in the United States.** (3 cr; A-F or Aud. LECD 08) Race, class, and gender as pivotal dimensions in American society. Similarities and differences between groups, dynamics of discrimination, and efforts to meet needs and achieve potential for all groups in America.

**SW 5032. Child Welfare and the Law.** (2 cr; A-F only. Prereq—Jr or sr or grad student or #) Intensive advanced course in the federal, state, and tribal laws and court processes regulating child welfare practice. Includes laws and procedures and the role of the social worker in legal proceedings.

**SW 5061. Computers in the Human Services.** (1-2 cr [max 2 cr]; Stdnt Opt. Prereq—Jr or sr or grad student or #) Overview of computers in the human services, including word processing, spreadsheets, databases, communication, and internet.

**SW 5091. Independent Study.** (1-4 cr [max 8 cr]; Stdnt Opt. Prereq—#) Directed reading, research, or other experiences leading to presentation of a report.

**SW 5095. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 12 cr]; Stdnt Opt) Proseminar on contemporary topics of concern to students and faculty. Topics announced in Class Schedule.

**SW 5096. Special Project.** (1-4 cr [max 8 cr]; S-N or Aud. Prereq—#) Approval of faculty sponsor and field coordinator required to do a project in generalist or advanced generalist social work practice. Project may closely coordinate with another course or may be an independent area of interest.

**SW 5101. Human Behavior in the Social Environment.** (3 cr; A-F only. Prereq—Jr or sr or Grad or #) Overview of social psychological and social systems concepts. Applications of concepts to social work and human service issues. Focus on individuals, human development, families, groups, organizations, communities, and society/culture.

**SW 5111. Grant Writing in the Human Services.** (1-2 cr [max 2 cr]; A-F only. Prereq—Jr or sr or Grad or #) Step-by-step development of grant planning and grant writing. Sources of grants: private foundations and public agencies. Needs assessment methodologies, budgeting, and program evaluation.

**SW 5120. Cross-Cultural Exploration Through Learning Circles.** (1 cr; S-N only. Prereq—Admission into MSW, 8100 or #) In a small group (learning circle) students will learn about diverse groups, cross-cultural interactions and explore the concepts of individual and organizational cultural competence through the use of interactive and experimental methods, and applying new knowledge to practice in social work

**SW 5201. Social Welfare Policy.** (3 cr; A-F only. Prereq—Jr or sr or Grad or #) Historical development of field of social welfare in the United States and emergence of social work profession. Social policy analysis techniques and ways to influence social policy and vulnerable/minority issues.

**SW 5222. Intervention in Family Violence.** (1-2 cr [max 2 cr]; A-F only. Prereq—Jr or sr or grad student or #) Current theory, research, and practice in field of family violence. Multidisciplinary assessment and intervention skills for working with families with diverse backgrounds.

**SW 5235. American Indians and Social Policy.** (2 cr; A-F only. Prereq—5201 or advanced standing MSW program or #) Informs human service providers of policies affecting American Indians, including relationships of tribal governments with the United States and Minnesota governments, the interface between Indian and non-Indian service delivery systems, and Indian culture and politics.

**SW 5271. Women and Social Policy.** (2 cr; A-F only. Prereq—Jr or sr or Grad or #) Policies affecting the well-being of women; strategies for better meeting women's needs. Focuses on policies that affect women's roles and statuses within the domestic unit and within larger economic and political spheres.

**SW 5280. Addressing Alcohol Related Problems in Social Work Practice.** (1-2 cr [max 2 cr]; Stdnt Opt. Prereq—Jr or Sr or Grad or #) A multi-level systems perspective in examining the effects of alcohol problems on individuals, families and other populations. Topics will include: epidemiology, etiology, screening, assessment, diagnosis, treatment options, specialized populations and various social work practice areas.

**SW 8021. Methods of Clinical Social Work Practice.**

(1-2 cr [max 2 cr]; A-F only. Prereq-8111 or admission to advanced standing MSW program)

Advanced skill development in clinical assessment and intervention. Through an ecologically based framework, students learn how to address a wide variety of micro-level problems involving many different populations. Social work applications of the DSM-IV.

**SW 8031. Advanced Practice in Child Welfare.** (2-3 cr [max 3 cr]; A-F only. Prereq-5032, 8441)

Advanced skill development in assessment, intervention, and evaluation in relationship to direct child welfare social work practice.

**SW 8051. School Social Work.** (1-2 cr [max 2 cr]; A-F only. Prereq-Soc work grad student or #)

Overview of social work practice in educational settings, roles and functions of social workers within a complex ecological system, and skills and knowledge needed by social workers in a school setting.

**SW 8100. Social Work with Diverse Populations.** (3 cr; A-F only. Prereq-MSW students or #)

Examines societal issues generated by systemic discrimination and explores methods for reducing discrimination. Particular focus on advanced social work practice with diverse populations.

**SW 8101. Introduction to Research.** (2 cr; A-F only. Prereq-SW Grad School student or #)

Introduction to social science research and its applications to social work and social welfare.

**SW 8102. Advanced Research.** (3 cr; A-F only. Prereq-8101 or admission to advanced standing MSW program)

Application of social science knowledge and skills to evaluate practice and to conduct community-based research and program evaluation projects. Develop a research proposal.

**SW 8104. Project Seminar II.** (1 cr; S-N only. Prereq-8103)

Application of research knowledge and skills to final stages of master's research project. Data collection and analysis procedures applied to the Plan B paper.

**SW 8111. Individual, Family and Group Practice I.** (3 cr; A-F only. Prereq-SW grad student or #)

Overview of generalist social work practice, ethics, ecological perspective, and problem-solving model. Application to individuals, families, and groups and to diverse populations. Development of counseling skills.

**SW 8112. Organization and Community Practice I.** (3 cr; A-F only. Prereq-8111)

Using a problem-solving model and the ecological and strengths perspectives, students develop assessment and interventions skills for effective practice with organizations and community. Topics include using supervision, facilitating meetings, advocacy, cultural competence, and promoting organizational and community change.

**SW 8331. Organization and Community Practice II.** (3 cr; A-F only. Prereq-5101, 8112 or Advanced Standing in MSW program)

Prepares students for advanced practice in organizations and communities. It provides a framework for assessing and intervening in organizational and communities using an asset-based and problem-solving approach. Specific strategies and tactics for strengthening organizations and communities are addressed.

**SW 8332. Advanced Practice in Administration and Community Development.** (2-3 cr [max 3 cr]; A-F only. Prereq-8331)

This course focuses on application of advanced knowledge and skills essential for understanding macro practice. Analysis of organizations and communities is required. Emphasis will be on

analysis of complex social problems and the development of organizational and community solutions.

**SW 8333. FTE: Master's.** (1 cr; No grade. Prereq-Master's student, adviser and DGS consent)**SW 8441. Individual, Family and Group Practice II.** (3 cr; A-F only. Prereq-5101, 8112 or advanced standing MSW student)

Examines a range of social work practice theories and their application to practice with individuals, families, and groups. Advanced skills in assessment and intervention in addressing complex problems with a focus on micro practice. Application to diverse populations and settings.

**SW 8442. Advanced Group Work.** (1-2 cr [max 2 cr]; A-F only. Prereq-8441)

Conceptual knowledge and applied experiences needed to lead groups in a variety of social work settings serving diverse populations. Treatment groups and task groups (on both the organizational and community levels). Builds on the advanced generalist framework.

**SW 8443. Advanced Practice in Mental Health.** (2-3 cr [max 3 cr]; A-F only. Prereq-8441)

Advanced skill development in direct practice social work assessment, intervention, and evaluation in relationship to mental health issues.

**SW 8544. Advanced Practice with Families.** (2-3 cr [max 3 cr]; A-F only. Prereq-8441)

Advanced skill development in social work assessment, interventions, and evaluations in relationship to families at various stages across the life span.

**SW 8771. Health in American Indian Communities.** (2 cr; A-F only. Prereq-5235)

Introduction to historical and contemporary concepts of American Indian health. Policy issues, cultural and sensitivity knowledge, and practice methods with American Indian clients and communities at micro, mezzo, and macro levels of intervention.

**SW 8801. Field Placement I.** (3-6 cr [max 6 cr]; S-N only. Prereq-8111, 8112; SW Grad student, #)

Practicum experience with emphasis on developing knowledge and skill base for "beginning generalist" practice in a community agency. Concurrent seminar assists students in integrating classroom theories and intervention methodologies with field experiences. Application to diverse populations.

**SW 8802. Field Placement II.** (4-8 cr [max 8 cr]; S-N only. Prereq-8801 or 8332 or 8443 or 8544, SW Grad Student and #)

Developing knowledge and skill base for "advanced generalist" practice in a community agency. Concurrent seminar focuses on integrating classroom theories and intervention methodologies with experiences with client systems at micro, mezzo, and macro levels of practice. Attention to vulnerable/minority issues.

**SW 8881. Dynamics of American Indian Families.** (2 cr; A-F only. Prereq-5235 or #)

Introduction to traditional and contemporary concepts relating to American Indian families. Public policy, social problems, cultural strengths, conflicts, and culturally competent social work practice.

**SW 8991. Practice in the American Indian Community.** (2-4 cr [max 4 cr]; S-N only. Prereq-Soc work grad student, 8771 or 8881, #)

Gives MSW students supervised direct practice experience in the American Indian community. Application of cultural knowledge and culturally competent practice skills.

**Sociology (SOC)****College of Liberal Arts****SOC 1080. Freshman Seminar: Development of Social Selves.** (3 cr; A-F or Aud. Prereq-Freshman, fewer than 30 credits LE 8)

Examines how the self develops. The primary focus is the socialization process, a process which continues throughout the life course. Special attention will be given to childhood and adolescent socialization. How do we learn? How do we understand behavior? What are the consequences of inadequate socialization?

**SOC 1095. Freshman Seminar: Topics: (Various Titles to be Assigned).** (3-4 cr [max 4 cr]; A-F or Aud. Prereq-Freshman, fewer than 30 cr LE 8)

Seminar designed specifically for freshmen.

**SOC 1101. Introduction to Sociology.** (4 cr; A-F or Aud. LECD 06)

Introduction to sociological concepts and their application.

**SOC 1201. Sociology of the Family.** (3 cr; A-F or Aud. LECD 08)

The family as a basic social institution: similarities and variations in family systems, their interrelationships with other institutions, and patterns of continuity and change.

**SOC 1301. Introduction to Criminology.** (4 cr; A-F or Aud. LE 8)

Analysis of social justice with emphasis on criminal justice system in United States. Nature and extent of crime; social factors related to criminal behavior.

**SOC 1400. Alcohol and College Life.** (1 cr; A-F or Aud. Prereq-Freshman status)

Online web class providing first year students with factual information about how alcohol affects college life and reinforces personal prevention strategies as well as aiming to maximize student and campus safety. This class cannot count toward a sociology major or minor.

**SOC 2111. Sociological Theory.** (4 cr; A-F or Aud. Prereq-1101, 15 cr)

Analysis of classical and contemporary sociological theory. Major theorists, including Durkheim, Weber, and Marx; major paradigms and their importance to sociological thought.

**SOC 2155. Introduction to Research Methods and Analysis.** (4 cr; A-F or Aud. Prereq-[1101 or 1301], min 15 cr, [soc major or crim major or soc minor])

Principles/practice of research design, sampling, data collection including field observation/surveys. Data management, analysis, and reporting of quantitative/qualitative data. Ethics/administration in sociological research. Introduction to SPSS statistical software. Lab

**SOC 2311. Criminological Theory.** (4 cr; A-F or Aud. Prereq-1301, 15 cr)

Examination of the major theories of crime causation. Specific theories include macro and micro sociological explanations, as well as biological and psychological perspectives. Discussion includes the history, social context, and policy implications of each theory.

**SOC 3155. Quantitative Research Methods and Analysis.** (4 cr; A-F or Aud. Prereq-2155, [crim major or soc major], min 30 cr)

Descriptive statistics. Measures of central tendency, deviation, association. Inferential statistics focusing on probability and hypothesis testing. T-tests, Chi-square tests, analysis of variance, measures of association, introduction to statistical control. Statistical software (SPSS) used to analyze sociological data. Lab.

## Course Descriptions

**SOC 3156. Qualitative Research Methods and Analysis.** (4 cr; A-F or Aud. Prereq—[2155 or anth major or urs major or cst minor], at least 60 cr or #)

Application of qualitative research methods to study of social structures. Emphasizes field techniques, secondary data analysis, and interpretation. Lab

**SOC 3306. Deviance.** (3 cr; A-F or Aud. Prereq—[2306], 1101 or 1301, min 15 cr)

Behaviors, beliefs, and physical characteristics defined as deviant; legal and other formal and informal reactions to deviance; subjective and objective effects of being defined as deviant.

**SOC 3322. Law and Society.** (3 cr; A-F or Aud. Prereq—30 cr or #)

Complexities, organization, and elements of legal systems, particularly in the United States. Legal theory used to explain the “working” of the law, historical development of law, current issues in law, and overall interrelationship between law and society.

**SOC 3324. Sociology of Criminal Law.** (3 cr; A-F or Aud. Prereq—30 cr or #)

Nature, goals, and problems in administration of the American criminal judicial process.

**SOC 3328. Delinquency and Juvenile Justice.** (3 cr; A-F or Aud. Prereq—30 cr or #)

Delinquency in contemporary American society. Major issues concerning causes, prevention, and treatment of juvenile offenders. Focus on U.S. juvenile justice system.

**SOC 3336. Crime and the Media.** (3 cr; A-F or Aud. Prereq—Min 30 cr or #)

Examines the relationship between crime, criminal justice and the media. It explores how news and entertainment media portray criminals, crime and the criminal justice system, and the effects of these portrayals on the justice system and society.

**SOC 3338. Sociology of Gangs.** (3 cr; A-F or Aud. Prereq—30 cr or #)

Street and prison gangs in America at the national, state, and local level. Sociological research and theories relative to gang formation and the economics related to street and prison gangs.

**SOC 3344. Law Enforcement and Society.** (3 cr; A-F or Aud. Prereq—30 cr or #)

Role of police and relationship of law enforcement to the community; focuses on crime prevention.

**SOC 3361. Correctional Continuum.** (3 cr; A-F or Aud. Prereq—1101, Soph or higher or #)

Analysis of the range of sanctions and programs in corrections. Topics include both community-based and institutional corrections, as well as juvenile and adult corrections.

**SOC 3363. Correctional Organizations.** (3 cr; A-F or Aud. Prereq—3361, 30 cr or #)

Examination of the factors that influence the operation of correctional organizations. Focus on the impact of organizational and outside actors on correctional policies and everyday correctional practices (e.g., management of inmates/clients and programming).

**SOC 3369. Correctional Assessment and Intervention.** (3 cr; A-F or Aud. =SOC 3365. Prereq—Min 30 cr or #)

Issues germane to intervention with criminal offenders. Philosophical (should we intervene?) and pragmatic (what, if anything “works”) debates are reviewed, and both punishment oriented and rehabilitative intervention programs are discussed.

**SOC 3375. Restorative Justice.** (3 cr; A-F only. Prereq—Min 60 cr or #)

Examines the principles and practices of restorative justice. Covers early and contemporary philosophies and practices, as well as domestic and international examples.

**SOC 3395. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—30 cr or #) Contemporary topics in criminology.

**SOC 3595. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—Min 30 cr or #)

Contemporary topics in sociology.

**SOC 3650–3664. Hazelden Program courses.** (2 cr; A-F or Aud)

**SOC 3701. Social Psychology.** (3 cr; A-F or Aud. Prereq—Min 30 cr or #)

Theory and research issues regarding relation of individual to society. Socialization, effects of social organization and disorganization, and interpersonal interaction.

**SOC 3821. Sociology of Community.** (3 cr; A-F or Aud. Prereq—2111, 30 cr or #)

Theoretical orientations and empirical investigations of community structure, processes, conflict, and change. Community components and types; community development strategies reviewed and applied.

**SOC 3831. Organizations and Society.** (3 cr; A-F or Aud. Prereq—30 cr or #)

Sociological examination of structure and processes of public and private formal organizations and patterns of adaptation to external social environments. Role of voluntary organizations in society.

**SOC 3841. Urban Justice Field Experience.** (2 cr; S-N or Aud. Prereq—Min 60 cr or Grad student or #)

Guided tour of metropolitan neighborhoods and courts, emphasizing race, class, justice, and change.

**SOC 3901. Social Change and Social Policy.** (3 cr; A-F or Aud. Prereq—2111, 30 cr or #)

Social change and maintenance forces as they affect social life. Emphasis on social theory and research along with formation and implementation of social policy leading to both change and maintenance.

**SOC 3945. Social Stratification.** (3 cr; A-F or Aud. Prereq—1101 or 1301 or CSt 1101 or Anth 1604, min 30 cr or #)

Theories and research about the effects of economic inequality in people’s lives. Social class formation and the effects of institutionalized power structures. Intersection of social class, gender and race/ethnicity. Primary focus on the United States but with international comparisons.

**SOC 3960. Sociology of Sport.** (3 cr; A-F or Aud. Prereq—30 cr or #)

Examination of the sociological phenomena of organized and not so organized amateur and professional sports. Topics include culture, socialization, social economics, social organization, inequality, politics, urban stadiums, stratification and history of sports.

**SOC 4323. Women and Justice.** (3 cr; A-F or Aud. =SOC 3326, SOC 4340. Prereq—1101 or 1301 or CSt 1101 or Anth 1604 or WS 1000, 30 cr, or #, no Grad School cr)

Women’s involvement in the civil and criminal justice systems, both historic and contemporary, primarily in the United States. Attention given to women as criminal and civil defendants, issues of women’s civil rights, and to women practitioners within each system. Intersection of social class, gender and race/ethnicities.

**SOC 4333. Legal Research.** (3 cr; A-F or Aud. Prereq—Min 60 cr or Grad School student and 3324 or POL 3150 or POL 3151 or BLAW 2101)

Overview of American legal system, including the courts and 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 associated research.

**SOC 4340. Race, Crime and Justice.** (3 cr; A-F or Aud. =SOC 3326, SOC 4323. Prereq—1101 or 1301 or Anth 1604 or CSt 1101, 30 cr or Grad School student or #)

Examines the intersection of race/ethnicity, gender, and class within the U.S. criminal justice system, with some attention given to global trends and international comparisons. Considers the racialized effects of crime control and criminal justice practices, including law enforcement, prosecution, sentencing, police-minority community relations, and the disproportionate representation of racial/ethnic groups in the prison system. Explores attitudes and perceptions of crime from the perspective of racial/ethnic minorities, and differential crime rates among majority/minority groups.

**SOC 4350. Corporate and Governmental Deviance.** (3 cr; A-F only. Prereq—Min 60 cr or #)

Examination of theories and research relating to deviant and criminal behavior within large scale formal organizations, particularly governmental and business organizations. Causes and consequences, efforts at social control, barriers to social control, prospects for change. Genocide and the emergence of international law.

**SOC 4360. Global Perspectives in Crime, Law and Justice.** (3 cr; A-F or Aud. Prereq—Min 60 cr or Grad School student)

Investigates the forms, nature, and patterns of crime, social control, law, and the administration of justice from a global and comparative perspective. It seeks to bring understanding to the functions of the police, courts, legal entities, and correctional systems in different regions of the world. Emphasis is placed on the philosophical and ideological differences among countries in their responses to crime, the roles of legal institutions, punishment, and public policies to control crime.

**SOC 4382. Victimology.** (3 cr; A-F or Aud. Prereq—1101 or 1301, 60 cr; no Grad School credit)

Extent, nature, and forms of criminal victimizations; profiles of crime victims; coping strategies; victims’ rights; impact of victimizations on victims and nonvictims; victim attitudes about crime and interactions with justice system; evaluation of victim service programs.

**SOC 4384. Child Abuse and Child Protection in Minnesota.** (3 cr; A-F or Aud. Prereq—90 cr or Grad Student or #)

Examine how our legal system and community discovers and protects neglected or abused children. Provide understanding of juvenile court, the role of forensic science, social workers, police, teachers, nurses, physicians, and other professionals mandated to report suspected abuse.

**SOC 4395. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—90 cr or Grad Student or #)

Proseminar on contemporary topics. Course announced in Class Schedule.

**SOC 4587. Internship Preparation.** (1 cr; A-F or Aud. Prereq—(1101, 1301, 2311, 2155) or (1101, 2111, 2155), soc or crim major, min 60 cr, no Grad School cr)

Introduction to internship by learning about internship expectations, developing internship objectives, exploring internship opportunities, and developing an application for an internship. After successfully completing Soc 4587, a student must wait at least one semester before registering for Soc 4597.

**SOC 4595. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—90 cr or Grad Student or #)

Proseminar on contemporary topics.

**SOC 4597. Internship.** (6-9 cr [max 18 cr]; S-N or Aud. Prereq-#; soc or crim major, 4587, WRIT 31xx; no Grad School cr)

Supervised lab experience in a human service agency or project. Internship in a setting related to career interests. (A maximum of 6 credits may be applied to the major)

**SOC 4860. Environmental Sociology.** (3 cr; A-F or Aud. Prereq-90 cr or Grad Student or #)

Examines the relationship between humans and the natural environment, including the role of science, technology, economics, religion, and culture. Emphasis on the social justice implications of environmental issues, and contemporary topics such as global warming and sustainable agriculture and energy. Considers the diverse positions and actions of environmental movements, and possible solutions to environmental problems.

**SOC 4862. Science, Technology and Society.** (4 cr; A-F or Aud. Prereq-90 cr or Grad Student or #)

Applying cultural analysis to assessing the effects of science and technology on communities, institutions, organizations, and individuals. Emphasis on topics involving cross-discipline effects.

**SOC 4911. Alcoholism and other Addictions.** (3 cr; A-F or Aud. Prereq-90 cr or Grad Student or #)

Addictions considered by way of etiologies, social and behavioral involvement, treatment approaches, helping resources, outcome research, and public policy.

**SOC 4925. Sociology of Rape.** (3 cr; A-F or Aud. Prereq-1101 or 1301 or CSt 1101 or Anth 1604 or WS 1000, 30 cr, or #)

Social, moral, and legal definitions and implications of rape.

**SOC 4935. Peace, Conflict, and Violence.** (3 cr; A-F or Aud. Prereq-60 cr or Grad Student or #)

Understanding the causes of violence as well as peaceful responses to conflict at all levels—from the interpersonal to the international. Considers how language, beliefs, economics, ethnicity, religion, and gender influence violent behavior. Analysis of criminal justice and other societal responses to conflict, and how structural inequalities are implicated in forms of violence. Explores theories and practices of peacemaking, conflict resolution, and nonviolence.

**SOC 4947. Sociology of Gender Identities and Systems.** (3 cr; A-F or Aud. Prereq-1101 or 1301 or CSt 1101 or Anth 1604 or WS 1000, min 30 cr, or #)

Status and experiences in society through the exploration of gender identities, systems and social structures. Topics include politics, discrimination, family, education, workplace, popular culture, and changing definitions of gender. Emphasis on the expectations and performance of masculinity/femininity, and the intersection of gender, race, and class. Some consideration given to global explorations and international comparisons.

**SOC 4949. Race and Ethnic Relations.** (3 cr; A-F or Aud. Prereq-1101 or 1301 or CSt 1101 or Anth 1604, 30 cr, or #)

Overview of race and ethnic relations in America; conditions of major racial and ethnic minorities; formation of racial/ethnic identities, sources of prejudice, discrimination; intergroup conflict; assimilation, persistence of ethnicity; intergroup diversity; major racial and ethnic groups; the new immigrants.

**SOC 4950. International Migration to the United States.** (3 cr; A-F or Aud. Prereq-90 cr or grad or #)

Delineates geopolitical, social, legal, economic and cultural factors spurring recent migrations from underdeveloped to developed regions. In-depth analysis of push-pull factors that trigger transnational movement of population. Trace past

and current immigration policies in immigrant receiving countries and highlight parallels between old and new migration. Focus on migration of skilled and unskilled migrants. Identification of economic models that predict the transnational migration of labor and policy implications.

**SOC 4960. Graveyard Culture.** (4 cr; A-F or Aud. Prereq-Min 30 cr or #)

Structure and cultural traditions surrounding resting places of the departed with emphasis on stratification, discrimination, cultural identity, identity tags, community integration as well as preservation issues, community history, and the business end of cemeteries. Further emphasis on cemeteries in Duluth and surrounding areas within the context of broader movements. Exploring Duluth history becomes an essential part of the course.

**SOC 4981. Social Movements, Protest and Change.** (3 cr; A-F or Aud. Prereq-45 cr or #)

Focusing on the origins, dynamics, and consequences of social movements, this course explores debates about the dilemmas and challenges facing movement organizations, the relationship between social movements and political institutions, and the role of social movements in bringing about social change. Draws on empirical case-studies of a wide variety of social movements.

**SOC 4982. Political Sociology and the Global Economy.** (4 cr; A-F or Aud. Prereq-60 cr or # or Grad School student)

Explores the field of power and economics, understanding the major theoretical debates and issues both past and present. Examines the nature of the state and economy, while also examining how class, race, and gender shape both the political and economic process. Focuses on how power is constructed, legitimated, and delegitimated concentrating on state formation, expansion, rebellion, and revolution.

**SOC 4991. Independent Study in Sociology.** (1-6 cr [max 36 cr]; A-F or Aud. Prereq-#)

Directed reading, research, or involvement in social action leading to preparation of a paper or other product.

**SOC 4997. Teaching Assistantship in Sociology/Criminology.** (1-3 cr [max 3 cr]; A-F only. Prereq-60 cr; #; no Grad School cr)

Practical experience in teaching-related activities in sociology or criminology courses.

**SOC 4999. Honors Project.** (1-4 cr [max 8 cr]; A-F or Aud. Prereq-90 cr, approval by dept honors program director; no Grad School credit)

Advanced individual project in any area of sociology, demonstrating sound theoretical and research foundations and resulting in a written report.

## Spanish (SPAN)

### College of Liberal Arts

**SPAN 1101. Beginning Spanish I.** (4 cr; A-F or Aud. Prereq-Little or no prior formal study of this language, or # LE 3)

Conversation and communicative course for students with little or no previous study of Spanish. Emphasis on oral and aural skills; some grammar. Taught primarily in Spanish, with some English.

**SPAN 1102. Beginning Spanish II.** (4 cr; A-F or Aud. Prereq-1-2 yrs high school Span or 1101 or # LE 3)

Conversation and communicative course for students with limited previous study of Spanish. Emphasis on oral and aural skills; some grammar. Taught primarily in Spanish, with some English.

**SPAN 1201. Intermediate Spanish I.** (4 cr; A-F or Aud. Prereq-3-4 yrs high school Span or 1102 or # LE 3)

Consolidation and enrichment of previously acquired abilities in speaking and understanding Spanish, set within introduction to written Spanish and survey of contemporary culture of Spanish-speaking societies. Emphasis on oral, aural, and reading skills; vocabulary building; some writing. Taught in Spanish.

**SPAN 1202. Intermediate Spanish II.** (4 cr; A-F or Aud. Prereq-4 yrs high school Span or 1201 or # LEIP 03)

Consolidation and enrichment of previously acquired abilities in speaking and understanding Spanish, set within introduction to written Spanish and survey of contemporary culture of Spanish-speaking societies. Emphasis on oral, aural, and reading skills; vocabulary building; some writing. Taught in Spanish.

**SPAN 2301. Advanced Spanish.** (4 cr; A-F or Aud. Prereq-5 yrs high school Span or 1202 or # LEIP 03)

Development of Spanish literacy within a culturally authentic contemporary context. Emphasis on practical writing and formal oral and aural communication skills; vocabulary building; enhancement of reading skills; review of key grammar. Taught in Spanish.

**SPAN 2540. Latino Literatures and Cultures.** (3 cr; A-F or Aud. LECD 08)

Literatures and cultures of Latinos in the United States, with attention to their particular issues. Some readings in Spanish for the occasional Spanish major/minor student. Taught in English (unless entire class composed of students of Spanish).

**SPAN 3031. Spanish Language Study Abroad I.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq-%)

Advanced language study abroad.

**SPAN 3032. Spanish Language Study Abroad II.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq-%)

Advanced language study abroad.

**SPAN 3042. Hispanic American Civilization and Culture.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #; offered alt yrs)

Survey of important aspects of Hispanic American civilization and culture, pre- and post-Encounter. Taught in Spanish.

**SPAN 3044. Spanish Civilization and Culture.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #; offered alt yrs)

Historical survey. Taught in Spanish.

**SPAN 3045. Spanish Culture and Civilization Study Abroad I.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq-%)

Study abroad of Spanish or Hispanic American culture.

**SPAN 3046. Spanish Culture and Civilization Study Abroad II.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq-%)

Study abroad of Spanish or Hispanic American culture.

**SPAN 3047. Spanish Culture and Civilization Study Abroad III.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq-%)

Study abroad of Spanish or Hispanic American culture.

**SPAN 3048. Spanish Culture and Civilization Study Abroad IV.** (1-5 cr [max 10 cr]; Stdnt Opt. Prereq-%)

Study abroad of Spanish or Hispanic American culture.

**SPAN 4004. Spanish Conversation.** (1-4 cr [max 8 cr]; Stdnt Opt. Prereq-2301; use of 4 credits only toward degree)

Practice in oral conversation skills.

**SPAN 4011. Hispanic American Prose.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #; no Grad School credit; offered every third yr)

Prose fiction with emphasis on 20th and 21st centuries. Attention also to cultural background. Taught in Spanish.

## Course Descriptions

**SPAN 4013. Hispanic American Poetry and Drama.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #; no Grad School credit; offered every third yr)  
Emphasis on 20th and 21st centuries. Attention also to cultural background. Taught in Spanish.

**SPAN 4017. Hispanic American Cinema and Culture.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #, no Grad School cr)  
Analysis of and insight into contemporary Hispanic American cinema and culture. Taught in Spanish.

**SPAN 4018. Hispanic America From Within.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #; no Grad School credit)  
Study of selected Hispanic American countries; historical, political, cultural, and other defining moments, and literary expressions of those moments, with goal of seeing the country from within. Taught in Spanish.

**SPAN 4019. Seminar: Hispanic America in the 21st Century.** (4 cr; A-F only. Prereq-2301 with C or better or #; no Grad School cr)  
Designed for more advanced students to delve into longer, newer, or less studied (but yet important) literary works, as well as the relative cultural background as on the Web, in scholarly texts and journals, and in films and music.

**SPAN 4022. Medieval to Early Modern Spain.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #; no Grad School cr)  
Survey of Spanish culture from the Middle Ages to Early Modernity. Relies on written tradition but will also delve into other types of cultural production (pictorial, sculptural, architectural, etc.). Also reviews current renditions (textual and filmic) of some of the texts.

**SPAN 4027. Modern Spanish Literature and Culture.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #; no Grad School credit)  
The study of Spanish peninsular literature and culture during the twentieth century up to the death of Francisco Franco, 1975. Taught in Spanish.

**SPAN 4028. Literature and Culture of Spain from the 19th Century to the Present.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #, no Grad School cr)  
Literature and culture (art, film, music, architecture, popular culture) of Spanish romanticism to the present. Works will be studied within their historical, political and social context and will shed light on the author/composer/art's ideology vis-a-vis dominant philosophical and political climates. Taught in Spanish.

**SPAN 4030. Cinema and Culture of Spain.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #, no Grad School cr)  
Overview of Spanish cinema from the 1950s to the present. Examines a variety of filmic genres, from fascist dramas of the François period to the trash-aesthetics comedies of the "New Spanish Cinema" and beyond. Spanish national identity will be the main axis of our inquiry. Taught in Spanish.

**SPAN 4090. Aspects of the Hispanic World.** (4 cr; A-F or Aud. Prereq-2301 with C or better or #; no Grad School credit)  
Sociopolitical, historical, literary, and cultural events of major importance in the Hispanic America, Spain, or among Latinos in the United States. Taught in Spanish.

**SPAN 4091. Independent Study.** (1-4 cr [max 8 cr]; A-F or Aud. Prereq-2301 with C or better or #; no Grad School credit)  
Students devise programs of reading and research in consultation with instructor to expand upon a topic related to one studied in regular coursework. Taught in Spanish.

**SPAN 4095. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 12 cr]; A-F or Aud. Prereq-2301 with C or better or #; no Grad School credit)  
Literature and/or culture of Spanish-speaking populations: Spaniards, Hispanic Americans, or Latinos in the United States. Taught in Spanish.

## Special Education (SPED)

College of Education and Human Service Professions

**SPED 1357. Individuals with Disabilities in Society.** (3 cr; A-F or Aud. LECD 08)  
Major types of disabilities and giftedness, including definitions, causes, characteristics, and educational implications. Disability perspectives. Social, legal, and educational considerations of disability issues.

**SPED 3103. Infants and Toddlers with Special Needs.** (4 cr; A-F or Aud. =SPED 5103. Prereq-UECh major or #)  
Causation and development of disabling conditions in infants and toddlers. Effective intervention techniques in a variety of settings involving interagency collaboration and family involvement. Practicum.

**SPED 3105. Young Children with Special Needs: Ages Three-Eight.** (4 cr; A-F or Aud. =SPED 5105. Prereq-#)  
Identification, assessment, and classification of young children with special needs. Effective intervention techniques for use in a variety of settings, emphasizing integration and teaming strategies. Practicum.

**SPED 3106. Working with Young Children with Low Incidence Disabilities.** (4 cr; A-F or Aud. Prereq-Admission to the UECh program)  
Skills and information useful in the provision of quality services for young children with low incidence disabilities. Class sessions and field-based experiences will address supports young children with low incidence disabilities.

**SPED 3109. Working with Challenging Behavior in Young Children.** (3 cr; A-F or Aud. Prereq-Admission to the UECh program)  
Provides information needed to evaluate and implement behavior change programs that are appropriate for young children who exhibit challenging behaviors. A key element will be functional behavioral assessment procedures and a range of preventative behavioral interventions.

**SPED 3205. Assessment in Early Childhood Special Education.** (4 cr; A-F or Aud. =SPED 5205. Prereq-3103, 3105, #)  
Measurement theory, assessment practices, familiarization with selected instruments, legal and ethical precautions for assessing preschool and primary age children with disabilities. Practicum.

**SPED 3310. Introduction to Special Education for Elementary Education.** (1 cr; A-F or Aud. Prereq-EIEd major)  
Introductory course for elementary education majors, emphasizing attitudes and language towards students with disabilities, focusing on abilities and on understanding differences in learners, social, legal and educational issues, collaboration and individual education planning mandates.

**SPED 3415. Special Education in the Secondary School.** (3 cr; A-F only)  
Exploration of topics in exceptionality for pre-service secondary education majors. Topics include universal design, instructional strategies, characteristics of students, special education law, and differentiated instruction.

**SPED 4204. Assessment for Children and Youth with Disabilities.** (4 cr; A-F or Aud. =SPED 5204. Prereq-45 cr, postbac undergrad or sped minor, no Grad School cr)  
Use assessment data for making decisions about exceptionality, eligibility, and educational programming. Curriculum includes laws governing assessment in special education, standards of professional practice, standardized and teacher-developed assessment procedures, and psychometric theory.

**SPED 4210. Special Education for Secondary Educators.** (3 cr; A-F or Aud. Prereq-No Grad School credit)  
Educator's role and responsibilities in meeting the diverse needs of students with disabilities in the general education setting. Current laws and legislation, characteristics of students with disabilities, informal assessment, and research-based strategies and methods for instruction in the areas of reading, math, and written language.

**SPED 4250. Foundations of Autism Spectrum Disorders.** (4 cr; A-F or Aud. =SPED 5250. Prereq-No Grad School cr)  
Includes history, definitions, assessment, characteristics, legal aspects, varying perspectives, and etiology of the Autism Spectrum Disorders.

**SPED 4260. Language and Social Skills for Children and Youth with Autism Spectrum Disorders.** (4 cr; A-F or Aud. =SPED 5260. Prereq-No Grad School cr)  
Specialized instruction in the foundation of language development, social stories, augmented and alternative communication systems, theory of mind, social skill development and play.

**SPED 4270. Methods for Teaching Children and Youth with Autism Spectrum Disorders.** (4 cr; A-F or Aud. =SPED 5270. Prereq-4250 or 5250 or #, no Grad School cr)  
In-depth assessment, environmental factors, curricular options, instructional strategies, behavioral programming, material for teaching, sensory integration strategies, IEP/IIIP development and implementation, and technology on the continuum of placements for children and youth with ASD.

**SPED 4310. Adapting for Diverse Learners in General Education Settings.** (4 cr; A-F or Aud. Prereq=[5310], EIEd or EdSe major or #)  
Application of foundational knowledge of special education, Section 504 requirements, and students with disabilities and diverse learning needs to school curricula and environments at all levels. Understanding general educators' responsibilities in the special education process. Skills in making adaptations and accommodations.

**SPED 4351. Learning Disabilities Characteristics and Interventions.** (4 cr; A-F or Aud. =SPED 5351. Prereq-4433, postbac or #; no Grad School cr)  
Characteristics of learning disabilities, emphasizing language and processing deficits and how they interfere with academic achievement and social relationships; assessment and intervention approaches for students with learning disabilities. Practicum.

**SPED 4381. Behavior Management Principles and Practices.** (4 cr; A-F or Aud. =SPED 5381. Prereq-Min 45 cr, postbac or sped minor, no Grad School cr)  
Models of behavior change for preschool, elementary, and secondary students; identification and assessment of problem behaviors; proactive and reactive strategies for managing disruptive behavior; application of applied behavior analysis to modifying behaviors; legal and ethical issues in behavior change.

**SPED 4382. Advanced Theory and Practice in Emotional, Behavioral Disorders.** (4 cr; A-F or Aud. =SPED 5382. Prereq-4433, 4381, postbac or #, no Grad School cr) Behavioral and emotional disorders of school-aged children and youth; assessment approaches, models of instruction, curricula, advanced application of skills to change behaviors, crisis intervention skills, knowledge of community resources and services. Practicum.

**SPED 4433. Foundations in Special Education.** (4 cr; A-F or Aud. =SPED 5433. Prereq-Min 45 cr, postbac grad or sped minor, no Grad School cr) Overview of children with disabilities. Special emphasis will be placed on characteristics of exceptional children; the legal aspects of educating students with disabilities; and assessment, instructional, and collaborative strategies.

**SPED 4435. Parent and Professional Communication and Collaboration.** (4 cr; A-F or Aud. =SPED 5435. Prereq-4433, 45 cr, postbac or sped minor or #, no Grad School cr) Group process, problem solving, decision-making, collaboration, and teamwork applied to the special education process. Techniques for working with parents, professionals, paraprofessionals, and community agencies when planning and implementing Individualized Education Plans.

**SPED 4452. Academic Interventions for Students with Disabilities.** (4 cr; A-F or Aud. =SPED 5452. Prereq-4433, postbac or #, no Grad School cr) Understanding various models for teaching students with reading, writing, or math difficulties; development of intervention plan based on assessment and observation. Practicum.

**SPED 4455. Transitional Planning for Adolescents with Disabilities.** (4 cr; A-F or Aud. =SPED 5455. Prereq-4433, postbac or #, no Grad School cr) Assessment procedures, planning and instructional methods to help students with disabilities make the transition from school to postsecondary training, education, and employment. Practicum.

**SPED 4486. Teaching Reading, Writing and Math.** (3 cr; A-F or Aud. =SPED 4434, SPED 5434. Prereq-4433, no Grad School cr) A wide range of strategies for instruction of reading, writing, and math to students with disabilities. Specific areas of instruction includes: laws, technological and information resources pertaining to reading, writing, and math instruction as well as research-based instructional strategies.

**SPED 4555. Assessment and Instruction of Culturally and Linguistically Diverse Exceptional Learners.** (3 cr; A-F or Aud. =SPED 5555. Prereq-4433, postbac or sped minor or %, no Grad School cr) Participants learn assessment, instructional and collaboration models and approaches to address the educational needs of culturally and linguistically diverse exceptional learners. Core skills and strategies are designed to meet special education standards of effective practice in this field.

**SPED 4585. Individual Education Plans: Development and Implementation.** (3 cr; A-F or Aud. =SPED 5585. Prereq-No Grad School cr) Historical perspective of the Individual Education Plan (IEP), its professional significance in education and the impact of the IEP on students and teachers in special education. Explores procedural guidelines, develop an IEP based on best practice and develop lesson and unit plans.

**SPED 4600. Student Teaching.** (3-12 cr [max 12 cr]; S-N or Aud. Prereq-Postbac or #, no Grad School credit) Observational, evaluative, and instructional experience with students with disabilities in K-12 settings.

**SPED 4610. Professional Issues.** (1 cr; S-N or Aud. Prereq-No Grad School credit) Reflections on current issues and ethical dilemmas in the field of early childhood special education, birth through age eight.

**SPED 5010. Mental Health Issues for Teachers.** (1 cr; A-F or Aud. Prereq-No Grad School cr) Devoted to addressing the licensure renewal requirements for all general education teachers. Focus on understanding key warning signs and early detection of mental illnesses in children and adolescents.

**SPED 5103. Infants and Toddlers with Special Needs.** (3 cr; A-F only. =SPED 3103. Prereq-Bachelors degree in a related area of study (early childhood educ, elem educ, comm sci disorders, social work)) Addresses the many causes of disabling conditions in infants and toddlers. Effective intervention techniques and appropriate environments for young children with special needs will be discussed. Family involvement and community support for children with special needs will also be addressed.

**SPED 5105. Young Children with Special Needs: Ages Three to Eight.** (4 cr; A-F or Aud. =SPED 3105. Prereq-UECh major or #) Identification, assessment, and classification of young children with special needs. Effective intervention techniques for use in a variety of settings, emphasizing integration and teaming strategies. Practicum.

**SPED 5106. Working with Children with Low Incidence Disabilities.** (3 cr; A-F only. Prereq-Completion of undergraduate degree) Addresses skills and information useful in the provision of quality services for young children with low incidence disabilities. Class sessions and field-based experiences will address supports for young children with low incidence disabilities.

**SPED 5109. Working with Challenging Behavior in Young Children.** (3 cr; A-F only. Prereq-Min 120 cr, no Grad School cr) Provides information needed to evaluate and implement behavior change programs that are appropriate for young children who exhibit challenging behaviors. A key element will be functional behavioral assessment procedures and a range of preventative behavioral interventions.

**SPED 5204. Assessment for Children and Youth with Disabilities.** (4 cr; A-F or Aud. =SPED 4204. Prereq-4433 or 5433, postbac grad or #) Theory of assessment of students with mild disabilities; knowledge and practice in selecting and administering standardized tests and informal assessment instruments and in designing and conducting behavioral observations; scoring and interpreting assessment results for eligibility and educational planning decisions. Practicum. Concurrent with 4202, additional paper, project or field based practicum required.

**SPED 5205. Assessment in Early Childhood Special Education.** (3 cr; A-F only. =SPED 3205. Prereq-Initial baccalaureate degree in a related area (elem educ, comm disorder, social work, nursing)) Measurement theory, assessment practices, familiarization with selected instruments, legal and ethical precautions for assessing preschool and primary age children with disabilities. Practicum.

**SPED 5250. Foundations of Autism Spectrum Disorders.** (4 cr; A-F or Aud. =SPED 4250) Includes history, definitions, assessment, characteristics, legal aspects, varying perspectives, and etiology of the Autism Spectrum Disorders.

**SPED 5260. Language and Social Skills for Children and Youth with Autism Spectrum Disorders.** (4 cr; A-F or Aud. =SPED 4260) Specialized instruction in the foundation of language development, social stories, augmented and alternative communication systems, theory of mind, social skill development and play.

**SPED 5270. Methods for Teaching Children and Youth with Autism Spectrum Disorders.** (4 cr; A-F or Aud. =SPED 4270. Prereq-4250 or 5250 or #) In-depth assessment, environmental factors, curricular options, instructional strategies, behavioral programming, material for teaching, sensory integration strategies, IEP/IIP development and implementation, and technology on the continuum of placements for children and youth with ASD.

**SPED 5351. Learning Disabilities Characteristics and Interventions.** (4 cr; A-F or Aud. =SPED 4351. Prereq-4433 or 5433, postbac or #) Characteristics of learning disabilities, emphasizing language and processing deficits and how they interfere with academic achievement and social relationships; assessment and intervention approaches for students with learning disabilities. Practicum.

**SPED 5381. Behavior Management Principles and Practices.** (4 cr; A-F or Aud. =SPED 4381. Prereq-4433 or 5433, postbac grad or #) Models of behavior change for preschool, elementary, and secondary students; identification and assessment of problem behaviors; proactive and reactive strategies for managing disruptive behavior; application of applied behavior analysis to modifying behaviors; legal and ethical issues in behavior change. Concurrent with 4381, it will require additional paper, project or field based practicum.

**SPED 5382. Advanced Theory and Practice in Emotional/Behavioral Disorders.** (4 cr; A-F or Aud. =SPED 4382. Prereq-4433 or 5433 or #) Behavioral and emotional disorders of school-aged children and youth; assessment approaches, models of instruction, curricula, advanced application of skills to change behaviors, crisis intervention skills, knowledge of community resources and services. Practicum.

**SPED 5433. Foundations in Special Education.** (4 cr; Stndt Opt. =SPED 4433. Prereq-Postbac grad student) History, philosophy, theories, and issues of special education. Overview of special education rules and processes. Survey of exceptionalities, including disability perspectives. Because this course is taught concurrently with 4433, it will require one or more of the following: paper, project, or field based practicum.

**SPED 5435. Parent and Professional Communication and Collaboration.** (4 cr; Stndt Opt. =SPED 4435. Prereq-4433 or 5433, postbac grad or #) Group process, problem solving, decision making, collaboration, and teamwork applied to the special education process. Techniques for working with parents, professionals, paraprofessionals, and community agencies when planning and implementing Individualized Educational Plans. Because this course is taught concurrently with 4435, it will require one or more of the following: paper, project or field based practicum.

**SPED 5452. Academic Interventions for Students with Disabilities.** (4 cr; A-F or Aud. =SPED 4452. Prereq-4433 or 5433, postbac grad or #) Understanding various models for teaching students with reading, writing, or math difficulties; development of intervention plan based on assessment and observation. Practicum.

## Course Descriptions

**SPED 5455. Transitional Planning for Adolescents With Disabilities.** (4 cr; A-F or Aud. =SPED 4455. Prereq=5433 or 4433, postbac grad or #)

Assessment procedures, planning and instructional methods to help students with disabilities make the transition from school to postsecondary training, education, and employment. Practicum.

**SPED 5585. Individual Education Plans: Development and Implementation.** (3 cr; A-F or Aud. =SPED 4585)

Historical perspective of the Individual Education Plan (IEP), its professional significance in education and the impact of the IEP on students and teachers in special education. Explores procedural guidelines, develop an IEP based on best practice and develop lesson and unit plans.

**SPED 5600. Student Teaching.** (1-12 cr [max 12 cr]; S-N or Aud. Prereq=#; no Grad School credit)

Observational, evaluative, and instructional experience with students with disabilities in K-12 settings. Seminar included.

**SPED 5795. Special Topics: (Various Titles to be Assigned).** (.5-4 cr [max 8 cr]; A-F or Aud. Prereq=No Grad School cr)

Current issues in Special Education to meet needs and interests of various groups, particularly practicing professionals.

**SPED 5991. Independent Study.** (1-6 cr [max 6 cr]; A-F or Aud. Prereq=%)

Directed independent study, readings, or projects of interest to student.

**SPED 5993. Special Area Project.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq=#; no Grad School credit)

Independent project for advanced students to substantially further their theoretical knowledge base or professional competencies.

**SPED 5995. Special Topics: (Various Titles to be Assigned).** (1-6 cr [max 12 cr]; A-F or Aud)

Current issues to meet needs and interests of various groups, particularly practicing professionals. Topics vary; specific title and content announced in [Class Schedule].

**SPED 7100. Professional Issues in Special Education.** (3 cr; A-F or Aud. Prereq=Acceptance into master's of special education program)

Provides graduate candidates a seminar to write about and discuss current professional issues raised in recognized sources within the field of special and general education (e.g., journals, education news sources, and topical conferences).

**SPED 7200. Advanced Behavior Management Principles and Practices.** (3 cr; A-F or Aud. Prereq=Acceptance into M.Sp.Ed. program)

Application of theory and techniques in behavior management, assessment, intervention, monitoring, generalizing, and maintenance in behaviors of individuals with exceptionalities. Focus is on advanced principles and practices in behavior management as well as social skill instruction.

**SPED 7710. Practice, Research, and Leadership I.** (3 cr; A-F or Aud. Prereq=MEd student or #)

Analysis of research approaches, preparation standards, leadership skills, and current issues and trends in special education, leading to a professional development plan. Information technology, professional ethics, and reflective change processes.

**SPED 7720. Practice, Research, and Leadership II.** (3 cr; A-F or Aud. Prereq=SpEd 7710 or #)

Synthesis of research methods, special education research in selected areas, and change processes for groups in order to increase one's leadership capacity. Technology-based sources of educational research, leadership models, and strategic planning processes.

**SPED 7730. Practice, Research, and Leadership III.** (3 cr; A-F or Aud. Prereq=SpEd 7720 or #)

Application of research and leadership skills to improve one's practice in special education. Educational organizations and approaches to organizational change. Socialization into leadership roles in special education profession through presentations, publications, and participation in national discussions.

**SPED 7800. Special Education Law.** (3 cr; A-F or Aud. Prereq=Acceptance into master's of special education program)

Examination of special education statutory law and case law, principles of Individuals with Disabilities Act, Americans with Disabilities Act, and Section 504 of the Rehabilitation Act of 1973.

**SPED 7912. Special Education Administration and Supervision.** (3 cr; A-F or Aud. Prereq=Acceptance into master's of special education program)

Analyze administrative theory that is applicable to special education, curricula development, fiscal issues, interagency agreements, role of human resources management and improvement of teaching with emphasis on effective procedures.

## Statistics (STAT)

Swenson College of Science and Engineering

**STAT 1411. Introduction to Statistics.** (3 cr; A-F or Aud. Prereq=Math ACT 22 or higher or a grade of at least C- in Math 1005 or % LE 2)

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 2411. Statistical Methods.** (3 cr; A-F or Aud.

Prereq=Math ACT 23 or higher or a grade of at least C- in Math 1250 or higher or % LE 2)

Graphical and numerical descriptions of data, elementary probability, sampling distributions, estimations, confidence intervals, one-sample and two-sample t-test.

**STAT 3411. Engineering Statistics.** (3 cr; A-F or Aud. Prereq=MATH 1297, cannot be applied to a math or statistics major)

Statistical considerations in data collection and experimentation. Descriptive statistics, least squares, elementary probability distributions, confidence intervals, significance tests, and analysis of variance as applied analysis of engineering data.

**STAT 3611. Introduction to Probability and Statistics.** (4 cr; A-F or Aud. Prereq=A grade of at least C- in Math 1290 or Math 1296)

Basic probability, including combinatorial methods, random variables, mathematical expectation. Binomial, normal, and other standard distributions. Moment-generating functions. Basic statistics, including descriptive statistics and sampling distributions. Estimation and statistical hypothesis testing.

**STAT 4101. Actuarial Probability.** (1 cr; S-N or Aud. Prereq=3611, Math 3298; credit cannot be applied to math major or minor; no Grad School cr)

Problem-solving techniques in probability used in the mathematical foundations of actuarial science.

**STAT 5411. Analysis of Variance.** (3 cr; Stdnt Opt. Prereq=2411 or 3411 or 3611)

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 5511. Regression Analysis.** (3 cr; A-F or Aud. Prereq=3611, Math 3280 or Math 4326)

Simple, polynomial, and multiple regression. Matrix formulation of estimation, testing, and prediction in linear regression model. Analysis of residuals, model selection, transformations, and use of computer software.

**STAT 5515. Multivariate Statistics.** (3 cr; Stdnt Opt. Prereq=5411 or 5511, Math 3280 or Math 4326)

Multivariate normal distribution, MANOVA, canonical correlation, discriminate analysis, principal components. Use of computer software.

**STAT 5531. Probability Models.** (4 cr; A-F or Aud. Prereq=3611, Math 1297 or Math 1597)

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. Selected topics in stochastic processes.

**STAT 5571. Probability.** (4 cr; A-F or Aud. Prereq=3611, Math 3298)

Axioms of probability. Discrete and continuous random variables and their probability distributions. Joint and conditional distributions. Mathematical expectation, moments, correlation, and conditional expectation. Normal and related distributions. Limit theorems.

**STAT 5572. Statistical Inference.** (4 cr; A-F or Aud. Prereq=5571)

Mathematical statistics; Bayes' and maximum-likelihood estimators, unbiased estimators; confidence intervals; hypothesis testing, including likelihood ratio tests, most powerful tests, and goodness-of-fit tests.

**STAT 8444. FTE: Doctoral.** (1 cr; No grade. Prereq=Doctoral student, adviser and DGS consent)

**STAT 8611. Linear Models.** (3 cr; A-F or Aud. Prereq=5572)

Developing statistical theory of general linear model. Distribution theory, testing, and estimation. Analysis of variance and regression. (offered alt yrs)

**STAT 8711. Statistics Seminar.** (3 cr; S-N or Aud. Prereq=5572)

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 natural sciences, medicine, engineering, and industry.

**STAT 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq=max 18 cr per semester or summer; 24 cr required)

## Supportive Services Program (SSP)

Academic Support and Student Life

**SSP 103. Basic Mathematics and Introductory Algebra.** (0 cr; S-N or Aud. Prereq=[3 cr equiv]; Credit will not be received if credit granted for Math 1004; cannot apply cr toward a degree. (the preparatory course fee is equal to 3 credits of resident tuition))

Computational math skills and applications, including arithmetic, introductory geometry, and introductory algebra.

**SSP 1000. Introduction to College Learning.** (1-2 cr [max 2 cr]; A-F or Aud. =CLA 1001)

Facilitates the successful transition into college learning and student life at UMD.

**SSP 1052. College Writing Strategies.** (2 cr; S-N or Aud. =MED 1004)

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.** (1 cr; S-N or Aud. =MED 1003)

Focuses on the skills necessary to study more efficiently for college. Topics include: time management, test taking strategies, note taking, concentration, and library orientation.

**SSP 1101. Personal Development.** (2 cr; A-F or Aud)

Introduction to some of the components of the human personality and the relationship of the individual to the environment. Focuses on such topics as human relations, values, interpersonal skills and competencies, decision making, and conflict resolution.

**SSP 3001. Preparation for SSP Teaching Assistantship.** (1-3 cr [max 3 cr]; S-N or Aud. 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 appropriate SSP skills course.

**SSP 3002. SSP Teaching Assistantship Practicum.** (1-3 cr [max 6 cr]; A-F or Aud. 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; A-F only. Prereq=#)

Introduction to contemporary learning theory and its application to one-on-one and small group learning situations (tutorials). Emphasis on philosophy, procedures, and practices known to be effective in improving learning.

**SSP 3004. Tutor Practicum.** (1-2 cr [max 3 cr]; A-F only. Prereq=3003 or #)

Supervised practicum for students leading one-on-one and small group tutorials. Tutor responsibilities outlined in contract with instructor.

## Theatre (TH)

### School of Fine Arts

**TH 901. B.F.A. Qualifying Presentation.** (0 cr; S-N or Aud. Prereq=%)

Presentation of performance audition or technical portfolio for admission to full B.F.A. candidacy.

**TH 1001. Introduction to Theatre Arts.** (3 cr; A-F or Aud. LE 9)

Appreciation of theatre arts. Developing sensitivity and critical sophistication as articulate, discriminating theatregoers. Play viewing, play reading, critiques, and term projects.

**TH 1051. Introduction to Film.** (3 cr; A-F or Aud. LE 9)

History and genres of film; how movies are made. Watching and analyzing films and developing an articulate and discerning viewpoint. (2 hrs lect, 2.5 hrs lab)

**TH 1053. Film and Society.** (3 cr; A-F or Aud. LE 9)

An examination of how films influence the moral and cultural life of our time, and how culture affects film.

**TH 1071. Musical Theatre History.** (3 cr; A-F or Aud. LE 9)

Musical theatre genre focusing on integration of theatre, music, and dance. Major librettists, composers, directors, choreographers, and performers.

**TH 1099. Theatre Practicum I.** (1 cr [max 6 cr]; A-F or Aud. LE 10)

Experience in backstage areas and front-of-house operations or rehearsal and performance of a minor role in UMD theatrical or dance productions. Credit can be received for work in one of the following areas: performance, box office/marketing, costumes, scenery, properties, lighting/sound, makeup and stage management before/during performance runs for UMD Theatre productions (45 hours work per semester).

**TH 1111. Acting Fundamentals I.** (3 cr; A-F or Aud.

Prereq=Not open to BFA Th majors LE 10)

Developing the ability to respond to imaginative situations with sincerity, individuality, and effectiveness; projects in elementary acting techniques.

**TH 1112. Acting I.** (3 cr; A-F or Aud. Prereq=1801 or BFA Th major or #)

Introduction to fundamental skills of acting: objectives, actions, given circumstances, activities. Focus on freeing natural impulses through imagination and improvisation. For BFA theatre majors.

**TH 1114. Musical Theatre: Theory/Sight Singing.** (3 cr; A-F or Aud. Prereq=[Mu 1010 or 1011 or Mu 1111 or Mu 1112], #)

Introduction to sight singing, music reading, written music transposition, and melody-line piano keyboard. For musical theatre student performers.

**TH 1116. Audition Techniques.** (3 cr; A-F or Aud.

Prereq=#)

Theory, technique, and application of audition skills for the actor.

**TH 1118. Voice and Movement for the Actor.** (3 cr; A-F or Aud. Prereq=#)

Introduction to voice and movement techniques designed to liberate, develop, and strengthen actor's body and voice.

**TH 1299. Theatre Marketing/Management Practicum.**

(2 cr [max 6 cr]; A-F or Aud. Prereq=Th major or minor) Practical experience working in theatre box office, management, marketing, and advertising promotion for UMD theatre productions. (90 hrs work)

**TH 1301. Stagecraft.** (5 cr; A-F or Aud. Prereq=1801 or #)

Introduction to methods of planning, constructing, painting, rigging, and shifting stage scenery. Lab work required constructing and painting scenery and properties for theatrical productions.

**TH 1351. Stage Rendering Techniques.** (3 cr; A-F or Aud. Prereq=1801 or #)

Practical course in study of different rendering mediums, styles, and techniques for the theatrical designer.

**TH 1399. Scenery and Properties Practicum.** (2 cr [max 6 cr]; A-F or Aud. Prereq=Th major or minor)

Practical experience constructing and painting scenery and properties for theatrical productions. (90 hrs work)

**TH 1401. Costume Construction I.** (5 cr; A-F or Aud.

Prereq=1801 or #)

Introduction to study and practice of methods and materials used in building costumes for theatrical productions. Lab work required.

**TH 1451. Stage Makeup.** (3 cr; A-F or Aud. Prereq=1801 or #)

Introduction to principles and materials of stage makeup and their application in developing a character makeup for theatrical productions.

**TH 1499. Costume Practicum.** (2 cr [max 6 cr]; A-F or Aud. Prereq=Th major or minor)

Practical experience working on costume construction and costume crafts for theatrical productions. (90 hrs work)

**TH 1501. Stage Lighting I.** (4 cr; A-F or Aud. Prereq=1001 or 1801 or #)

Principles and practice of stage lighting.

**TH 1551. Sound Design.** (3 cr; A-F or Aud. Prereq=1801 or #)

Principles and practice of choosing, editing, and running sound cues for theatrical productions.

**TH 1599. Lighting/Sound Practicum.** (1 cr [max 3 cr]; A-F or Aud. Prereq=Th major or minor)

Practical experience working on lighting and sound for theatrical productions. (45 hrs work)

**TH 1601. Stage Management.** (3 cr; A-F or Aud)

Theory and practice of stage management techniques applicable to a variety of theatre forms and situations.

**TH 1699. Running Crew Practicum.** (2 cr [max 6 cr]; A-F or Aud. Prereq=#)

Practical experience working backstage during the run of the theatrical productions. (90 hrs work)

**TH 1801. Elements of Theatre.** (3 cr; A-F or Aud. Prereq=th major)

Intensive study in rudimentary theatre vocabulary, research methods, principles of play production, preproduction script analyses, performance criticism, and postproduction assessment. Play viewing, play reading, critiques, and term projects.

**TH 2112. Acting II: American Realism.** (3 cr; A-F or Aud. Prereq=#)

Continuation of 1112 with a concentration on American realism, characterization, and living truthfully in the moment.

**TH 2113. Acting III: Classical Styles.** (3 cr; A-F or Aud. Prereq=2112 or #)

Acting styles from various classical periods, emphasizes Shakespeare and verse.

**TH 2114. Acting: Musical Theatre.** (3 cr; A-F or Aud. Prereq=#)

Application of theories and techniques of musical theatre performance.

**TH 2118. Speech for the Actor.** (3 cr; A-F or Aud. Prereq=#)

Ear training and articulation (in anticipation of dialects); acquisition of nonregional dialect for the stage through use of phonetics and classical texts.

**TH 2119. Stage Dialects.** (3 cr; A-F or Aud. Prereq=#)

Facilitates actor's acquisition and performance of stage dialects.

**TH 2851. Film History.** (3 cr; A-F only. Prereq=soph or #)

Survey of American and international cinema from 1870s to present day, with special focus on filmmakers, genres, and styles.

**TH 3099. Theatre Practicum II.** (2 cr [max 12 cr]; A-F or Aud)

Experience in backstage areas and front-of-house operations or rehearsal and performance of a minor role in UMD theatrical or dance productions. Credit can be received for work in one of the following areas: performance, box office/marketing, costumes, scenery, properties, lighting/sound, makeup and stage management before/during performance runs for UMD Theatre productions (90 hours per semester).

**TH 3111. Acting Fundamentals II.** (3 cr; A-F or Aud.

Prereq=1111 or 1112 or #; not open to BFA th majors)

Continuation of 1111. Development of acting skills beyond the fundamental level for non-BFA theatre majors. Project work emphasis on characterization and contemporary scene study.

**TH 3112. Improvisation for the Theatre.** (3 cr; A-F or Aud. Prereq=#)

Freeing the actor's natural impulses through in-depth, hands-on exploration of improvisational theatre. Emphasis placed on actor's learning to create without fear.

## Course Descriptions

**TH 3151. Stage Combat/Circus.** (3 cr; A-F or Aud. Prereq-0901 or #)

Intensive study of techniques and principles of stage combat focusing on armed (rapier/dagger/broadsword) and unarmed combat. Physical development through various circus skills: juggling, tumbling, and balancing.

**TH 3171. Acting IV: Character/Masks.** (3 cr; A-F or Aud. Prereq-60 cr, BFA Th major, #)

Using the body to express and develop character through mask work, improvisation, and selected scene work.

**TH 3201. Stage Direction.** (3 cr; A-F or Aud. Prereq-1112, 60 cr, Th major or minor or #)

Comprehensive, portfolio approach focusing on interpretive role of director in contemporary theatre. Major tasks facing director as collaborator; lecture, written assignments, workshops, and projects.

**TH 3331. Scenic Design I.** (3 cr; A-F or Aud. Prereq-1301 or #)

Elements of design used in creation of scenery for theatre.

**TH 3351. Theatrical Drafting.** (3 cr; A-F or Aud. Prereq-1301)

Principles and practice in techniques of drafting traditional and nontraditional types of stage scenery.

**TH 3355. Computer-Aided Theatrical Design.** (3 cr; A-F or Aud. Prereq-1301 or #)

Computer-aided drafting and design with technical applications to scenic design, lighting design, and technical direction.

**TH 3371. Scene Painting.** (3 cr; A-F or Aud. Prereq-1301)

Advanced work in use of both traditional and modern methods of painting stage scenery emphasizing practical lab work. (2 hrs lect, 2 hrs lab)

**TH 3381. Theatre Design: Period Styles.** (3 cr; A-F or Aud. Prereq-3331, 3441 or #)

Introduction to historical styles: architecture, painting, and dress as they influence theatrical design through the ages.

**TH 3401. Costume Construction II.** (3 cr; A-F or Aud. Prereq-1401 or #)

Advanced principles and practices of costume construction techniques emphasizing pattern drafting and draping and a study of advanced craft techniques.

**TH 3441. Costume Design I.** (3 cr; A-F or Aud. Prereq-1401, 1801 or #)

Principles and practice of costume design with emphasis on designing and rendering costumes from various historical periods.

**TH 3501. Advanced Digital Technology for the Theatre.** (3 cr; A-F or Aud. Prereq-1501 or #)

Advanced techniques of computer technology for theatre production including operation and functionality of digitally controlled equipment for lighting, sound and stage equipment.

**TH 3699. Production Management.** (2 cr [max 12 cr]; A-F or Aud. Prereq-#)

Participation in management and leadership in all areas of theatre production. (90 hrs work)

**TH 3801. Drama Titles.** (1 cr; A-F or Aud. Prereq-1801 or #)

Survey of dramatic literature and theatre texts. Play reading, script analysis, term projects.

**TH 3802. Script Analysis for Designers.** (3 cr; A-F or Aud. Prereq-1801)

Design students study the nature of the relationship between play scripts and theatrical designs through script and text analysis, literary criticism and research. Exploration of how dialogue and themes can be visualized through design.

**TH 3851. Screenwriting.** (3 cr; A-F or Aud. Prereq-#)

Introduction to and practice in fundamentals of screenwriting. Dialogue, character, structure, story development, writing for a visual medium, formatting.

**TH 3871. Playwriting.** (3 cr; A-F or Aud. LE 9)

Instruction and practice in fundamentals of playwriting, including dialogue, character, and scenario development; traditional and experimental formal structures; emphasizes theatre format with peripheral screenplay information.

**TH 3881. New Play Development Workshop.** (3 cr [max 6 cr]; A-F or Aud. Prereq-1001 or 1801 or #)

Intensive work in development of new scripts from initial reading to minimally staged performance.

**TH 3991. Independent Study in Theatre.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq-#; undergrads max 6 cr in 3991 and 5991 combined)

Directed readings and projects arranged between student and faculty mentor.

**TH 3995. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 9 cr]; A-F or Aud. Prereq-#)

Intensive study of special topics falling outside usual theatre or dance courses. Topic announced before course offered.

**TH 4112. Acting Scene Study.** (3 cr [max 6 cr]; A-F or Aud. Prereq-#, no Grad School credit)

Concentrated exploration of realistic acting through use of scene study and other text work, with special focus on scenes and characters dealing with heightened emotions and situations.

**TH 4151. Acting V: Senior Studio.** (3 cr; A-F or Aud. Prereq-#, no Grad School credit)

Capstone course utilizes scene study to access actor's skills, proficiencies, and artistic growth. Variety of styles make up final presentation of scenes and monologues rehearsed throughout semester.

**TH 4171. Acting VI: Acting for the Camera.** (3 cr; A-F or Aud. Prereq-4151 or #; no Grad School credit)

Contemporary acting adjustments necessary for film, television, and commercials.

**TH 4331. Scenic Design II.** (3 cr; A-F or Aud. Prereq-3331)

Advanced study in creating scenic designs for a variety of theatrical forms, including musical comedy, opera, dance, and legitimate theatre.

**TH 4351. Portfolio Preparation and Presentation.** (3 cr; A-F or Aud. Prereq-#, no Grad School credit)

Capstone course utilizes presentation of student's work in technical theatre/design to assess design/technical skills. Analysis of portfolio, job applications, resume development, and portfolio development techniques.

**TH 4399. Theatre: Special Projects.** (1-2 cr [max 12 cr]; A-F or Aud. Prereq-#)

Projects in directing, choreography of individual or groups, or designing of costumes, lighting, scenery, or sound.

**TH 4441. Costume Design II.** (3 cr; A-F or Aud. Prereq-3441 or #)

Advanced principles and practice of costume design with emphasis on designing and rendering costumes from various historical periods.

**TH 4501. Stage Lighting II.** (3 cr; A-F or Aud. Prereq-1501 or #; no Grad School credit)

Advanced theories and techniques used in designing lights for traditional and nontraditional theatre works.

**TH 4801. History of the Theatre I.** (3 cr; A-F or Aud. Prereq-3801 or instructor consent)

Survey of style, theory, performance, and production techniques of world theatre from theoretical origins through early 19th century.

**TH 4802. History of the Theatre II.** (3 cr; A-F or Aud. Prereq-4801 or #)

Survey of style, theory, performance, and production techniques of world theatre from 19th century to present.

**TH 4851. Dramatic and Performance Theory.** (3 cr; A-F or Aud. Prereq-3801 or #)

Survey and analysis of dramatic and performance theory texts, play scripts, and criticism.

**TH 4901. Intern Teaching in Theatre.** (3 cr [max 9 cr]; A-F or Aud. Prereq-#, no Grad School credit)

Practical experience teaching beginning courses in department. Students serve as intern teachers, assisting instructor in administration of course.

**TH 5991. Independent Study in Theatre.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq-Sr, %; undergrads max 6 cr in 3991 and 5991 combined; no Grad School credit)

Directed, advanced readings and projects arranged between student and faculty mentor.

**TH 5997. Internship in Professional Theatre.** (1-12 cr [max 12 cr]; S-N or Aud. Prereq-%; 1 cr for each 45 hrs work; no Grad School credit)

Internship with a cooperating professional, commercial, or repertory theatre.

## Toxicology (TXCL)

### School of Medicine

**TXCL 5000. Directed Research in Toxicology.** (1-4 cr [max 16 cr]; S-N or Aud. Prereq-#)

Special project that addresses specific issue in toxicology. Under guidance of faculty member.

**TXCL 5545. Introduction to Regulatory Medicine.** (2 cr; A-F or Aud. Prereq-Grad School student or #)

Explanation of products requiring a pre-market approval and those that may be marketed without approval. Post-market surveillance. Adverse reactions, removal of product from market.

**TXCL 8012. Advanced Toxicology I.** (3 cr; A-F or Aud. Prereq-5011, Chem 4341 or #)

Absorption, distribution, metabolism, and excretion of xenobiotics; toxicokinetics; mechanisms of toxicity or specific classes of chemical agents.

**TXCL 8013. Advanced Toxicology II.** (3 cr; A-F or Aud. Prereq-8012, Chem 4342, Phsl 5601 or #)

Kinetic and dynamic determinants of target organ toxicity; pathological alterations in structure/function relationships for major target organ systems; mechanisms of mutagenesis, carcinogenesis, and teratogenesis.

**TXCL 8100. Investigative Toxicology.** (1 cr [max 2 cr]; A-F or Aud. Prereq-8013 or #)

Evaluating toxicology research issues and literature.

**TXCL 8333. FTE: Master's.** (1 cr; No grade. Prereq-Master's student, adviser and DGS consent)

**TXCL 8444. FTE: Doctoral.** (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

**TXCL 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. Prereq-Max 6 cr per semester or summer; doctoral student who has not passed prelim oral; no required consent for the first two registrations up to 12 cr; departmental consent for the third and fourth registrations up to an additional 12 cr, or 24 cr total (for doctoral students admitted summer 2007 and beyond; doctoral students admitted prior to summer 2007 may register up to 4 times totaling 60 cr))

**TXCL 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**TXCL 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

## Urban and Regional Studies (URS)

### College of Liberal Arts

**URS 1001. Introduction to Urban and Regional Studies.** (3 cr; A-F only. LE 8)

Interdisciplinary introduction to urban and regional issues. Political, historical, socioeconomic, and spatial processes in the United States. Intended for urban and regional studies sophomores and others considering it as a major.

**URS 3097. Internship in Urban and Regional Studies.** (1-6 cr [max 8 cr]; S-N only. Prereq-URS major, jr or sr, #) Scheduled assignments with direct supervision in public agencies or relevant private firms.

**URS 3991. Independent Study in Urban and Regional Studies.** (1-4 cr [max 6 cr]; Stdnt Opt. Prereq-#) For students interested in doing advanced work in urban and regional studies.

## Water Resources Science (WRS)

### Swenson College of Science and Engineering

**WRS 8050. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq-#) Selected topics in water resources science.

**WRS 8060. Directed Studies in Water Resources Science.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq-#) Directed studies in water resources science.

**WRS 8095. Plan B Project.** (3 cr; S-N or Aud. Prereq-#) Satisfies Plan B project requirement. May appear on master's program, but does not count toward credit minimum in major. Project topic arranged between student and adviser. Written report required.

**WRS 8100. Interdisciplinary Seminar in Water Resources.** (1-3 cr [max 3 cr]; Stdnt Opt) Seminar in water resources science.

**WRS 8333. FTE: Master's.** (1 cr; No grade. Prereq-Master s student, adviser and DGS consent)

**WRS 8444. FTE: Doctoral.** (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

**WRS 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. Prereq-Max 6 cr per semester or summer; doctoral student who has not passed prelim oral; no required consent for the first two registrations up to 12 cr; departmental consent for the third and fourth registrations up to an additional 12 cr, or 24 cr total [for doctoral students admitted summer 2007 and beyond; doctoral students admitted prior to summer 2007 may register up to 4 times totaling 60 cr])

**WRS 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**WRS 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

## Women's Studies (WS)

### College of Liberal Arts

**WS 1000. Introduction to Women's Studies.** (3 cr; A-F or Aud. LECD 07)

Women's studies as an interdisciplinary field of study; overview of the many issues related to current and changing role and status of women. International perspectives.

**WS 2101. Women, Race, and Class.** (3 cr; A-F or Aud. LECD 08)

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. Cross-cultural perspectives.

**WS 3000. Transnational Perspectives on Feminism.** (3 cr; A-F or Aud. Prereq-1000 or 2101 or #)

Focuses on feminist theories and research, and feminist non-governmental organizations in a transnational perspective. Examination of feminist movements worldwide.

**WS 3001. Third World Women.** (3 cr; A-F or Aud. Prereq-1000 or 2101 or #)

A critical examination of how major social-economic, political and historical factors such as colonialism and imperialism affected and continue to structure women's lives in postcolonial cultures. Examines and compares how Third World women, and women of color in the U.S., as active and resilient social actors resisted and continue to resist all forms of oppression.

**WS 3002. Latin American Women: Culture and Politics.** (3 cr; A-F or Aud. Prereq-1000 or 2101 or #)

Examination of contemporary economic and socio-political issues affecting Latin American women.

**WS 3100. Feminist Theory.** (4 cr; A-F or Aud. Prereq-1000, 45 cr or #)

Historical and conceptual examination and analysis of central ideas and problems within several feminist theories.

**WS 3150. Women-Identified Culture.** (3 cr; A-F or Aud)

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.** (3 cr; A-F or Aud)

Women's self-concepts as expressed in autobiographical writings. Meanings women give their lives as women; impact of race and class; choices for artistic, political, intellectual, and/or private lives. Autobiographical techniques and style.

**WS 3250. Women, Peace and War.** (3 cr; A-F or Aud. Prereq-1000)

A feminist analysis of war and peace; women's role in warfare and the effects of war on women; feminism and peace; women's efforts at peacemaking.

**WS 3300. Women and Spirituality.** (3 cr; A-F or Aud. Prereq-1000 or 2101 or #)

Spirituality in relation to women, theoretical and experiential. Contemporary and historical issues and practices.

**WS 3301. Women and Religion.** (3 cr; A-F only. Prereq-1000)

Examination of women's roles and experiences within a variety of religions in the world; religious and theological doctrine as it applies to women; examination of various religions as patriarchal institutions as well as sources of meaning and liberation in women's lives.

**WS 3350. Women and the Law.** (3 cr; A-F or Aud. Prereq-1000 or 2101 or #)

Ways women's lives and gender relationships are influenced by laws and the judicial system; how the system can become more responsive to women's experience.

**WS 3400. Women and Film.** (3 cr; A-F or Aud)

American and foreign films screened, analyzed, and reviewed from a feminist perspective. Role of women in history, economics, and politics of filmmaking.

**WS 3450. Motherhood and Mothering: Institution and Experience.** (3 cr; A-F only. Prereq-1000 or 2101 or #)

An examination of the institution, experience, and practices of motherhood and mothering, including the social, legal, medical, cultural, and economic factors shaping motherhood in the U.S. and elsewhere, and feminist analyses of the experience and practice of mothering across cultures.

**WS 3595. Special Topics: (Various Titles to be Assigned).** (1-4 cr [max 9 cr]; A-F or Aud. Prereq-1000 or #)

Topics that fall outside current women's studies courses. Topic announced before course offered.

**WS 3600. Ecofeminist Theories and Practices.** (3 cr; A-F or Aud. Prereq-1000 or #)

Theories of ecofeminism; ecofeminist analysis applied to contemporary global ethical, social and environmental issues.

**WS 3750. Voices of African Women.** (3 cr; A-F or Aud. Prereq-1000 or 2101 or #)

Critical examination of African women's daily lives. Exploration of the impact of global, historic, economic and political forces, and the challenges of universalizing Western feminism as a panacea to African women's problems. Using "African eyes" through African voices in text and film, African women will be studied not as universal victims, but as differentiated by class, ethnicity, religion, age, sexuality, rural/urban residence, levels of education and marital status.

**WS 3775. Tangled Routes: Women, Globalization and Food.** (3 cr; Stdnt Opt. Prereq-1000 or 2101 or #)

Critical feminist examination of the impact of globalization and economic restructuring on the tangled roots and routes of women's work in the food chain in both the first contamination of the environment and sustainable agriculture.

**WS 3891. Independent Study.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq-1000, 3100, 15 cr WS or WS-related courses, #)

Directed readings, research, and/or projects on topics of interest to the student.

**WS 3896. International Fieldwork in Women's Studies.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq-1000, #)

Travel abroad with an instructor. Live with local families and learn about local women's lives through field work involving community visits, presentations by grassroots women, community-service work, reading, and follow-up writing and discussion. Repeatable once, in two different geographical areas.

**WS 3897. Internship.** (1-9 cr [max 9 cr]; S-N or Aud. Prereq-1000, 2101, 3100, 15 cr WS or WS-related courses, WS major or minor, 53 cr, #)

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 4000. Seminar.** (4 cr; A-F or Aud. Prereq-1000, 2101, 3100, 15 cr WS or WS-related courses, WS major or minor, or #)

Major issues, concepts, and questions addressed by feminist scholarship; context of feminist inquiry.

**WS 5595. Special Topics: (Various Titles to Be Assigned).** (3 cr; A-F or Aud. Prereq-1000, 2101, 3100, 90 cr or grad student or #)

Advanced study. Topic announced before course offered.

**WS 5897. Teaching Internship in Women's Studies.** (1-2 cr [max 4 cr]; S-N or Aud. Prereq-1000, 2101, 90cr, WS major, #; no Grad School credit)

Practical experience assisting in teaching in Department of Women's Studies. Before interning for a course, students must obtain a grade of at least B+ in the course.

## Course Descriptions

**WS 5991. Independent Study.** (1-4 cr [max 4 cr]; A-F or Aud. Prereq=1000, 3100, 15 cr WS or WS related courses or grad student, #)

Readings, research, and/or projects on topics of interest to graduate students concerning women and women's issues.

## Writing Studies (WRIT)

College of Liberal Arts

**WRIT 1017. Freshman Seminar: Honors: The Rhetoric of Popular Culture.** (3 cr; A-F or Aud. =WRIT 1007.

Prereq=Freshman, fewer than 30 cr, honors student LE 8) Students will reflect on the ways they are products of popular culture, in that the ways their thoughts, feelings and actions are in some sense constructed in response to the popular culture that surrounds them.

**WRIT 1120. College Writing.** (3 cr; A-F or Aud. Prereq=[Comp 1120], Students speaking English as a second language must have TOEFL score of 550 LE 1) Instruction and practice in writing argumentative prose for academic situations with integrated computer lab. Emphasis on academic research, documentation, and the writing process.

**WRIT 1506. Literacy, Technology and Society.** (3 cr; A-F or Aud. Prereq=[Comp 1506] LE 7) Historical survey of cultures without writing systems and cultures with writing systems and then later with printing, telegraph, radio, telephone, television, computers as well as other forms of technology. Survey of attitudes toward technology from Thoreau to Gandhi and beyond.

**WRIT 2506. Introduction to Writing Studies.** (3 cr; A-F or Aud. Prereq=1120)

Considers writing itself as both a practice and an object of study. Drawing on composition, journalism, linguistics, literary studies, and rhetoric, the course offers a survey of historical, critical, and theoretical issues in writing studies. Writing assignments ask students to apply a writing studies framework to produce and analyze specific texts.

**WRIT 3100. Advanced Writing: Language and Literature.** (3 cr; A-F or Aud. Prereq=[Comp 3100], 1120, min 60 cr) Study and practice of reading and writing about literature—poetry, fiction, drama, and creative non-fiction. Seeks to advance critical reading and analytical skills as a means to improving a student's proficiency in the conventions of academic and professional discourses, including grammar, style, organization, argumentation, and documentation. Addresses career documents, proposals, and grant writing.

**WRIT 3110. Advanced Writing: Arts and Letters.** (3 cr; A-F or Aud. Prereq=[Comp 3110], 1120, min 60 cr) Study and practice of writing tasks appropriate for the arts and letters. Seeks to advance research and critical thinking skills as well as skills in applying conventions of grammar, style, argumentation, and documentation. In addition, the course addresses professional writing for the arts, including reviews, proposals, grant writing, and career documents.

**WRIT 3121. Advanced Writing: Business and Organizations.** (3 cr; A-F or Aud. Prereq=[Comp 3121], 1120, min 60 cr) Study and practice of writing tasks in business and organizations, including oral presentations. Exploration of rhetorical situations in professional practice, including research methods, document design, editing, effective collaboration, and ethical issues in the production of professional documents, such as instructions, proposals, short and long reports, and career documents.

**WRIT 3130. Advanced Writing: Engineering.** (3 cr; A-F or Aud. Prereq=[Comp 3130], 1120, min 60 cr) Study and practice of writing tasks in engineering, including oral presentations. Exploration of rhetorical situations in professional practice, including research methods, document design, editing, effective collaboration, and ethical issues in the production of professional documents, such as instructions, lab reports, proposals, short and long reports, and career documents.

**WRIT 3140. Advanced Writing: Human Services.** (3 cr; A-F or Aud. Prereq=[Comp 3140], 1120, min 60 cr) Study and practice of writing tasks in education as well as other fields related to the human service professions. Designed to prepare students to master their use of Edited Standard Written English while producing professional documents, including a major research project with an oral presentation. Assignments focus on audience, purpose, and the process of writing as they relate to the workplace.

**WRIT 3150. Advanced Writing: Science.** (3 cr; A-F or Aud. Prereq=[Comp 3150], 1120, min 60 cr) Study and practice of writing tasks in science, including oral presentations. Exploration of rhetorical situations in professional practice, including research methods, document design, editing, effective collaboration, and ethical issues in the production of professional documents, such as instructions, lab reports, proposals, short and long reports, and career documents.

**WRIT 3160. Advanced Writing: Social Sciences.** (3 cr; A-F or Aud. Prereq=[Comp 3160], 1120, min 60 cr) Study and practice of writing for those whose professional interests are in sociology, anthropology, geography, criminology, psychology, women's studies, history, political science, and similar fields. Assignments center on producing documents encountered in the workplace, such as career documents, proposals, research projects, oral presentations, observational studies, and position papers.

**WRIT 3180. Honors: Advanced Writing.** (3 cr; A-F only. Prereq=[Comp 3180], min 60 cr, UMD Honors Program, or #) Develops research, critical thinking, and collaborative writing strategies as well as rhetorical skills to draft documents in multiple genres for multiple audiences. This includes professional correspondence and reports, research proposals, literature reviews, oral presentations and related documents for the honors project.

**WRIT 4100. Introduction to Grant Writing and Project Planning.** (3 cr; A-F or Aud. Prereq=1120, min 60 cr, no Grad School cr) Introduction to basic grant writing principles, including common types of grants, project planning, locating and researching funders, and writing effective narratives, preparing budgets, and evaluating program outcomes. Course utilizes lectures, discussion, group work, and guest speakers.

**WRIT 4197. Internship in Writing.** (1-3 cr [max 3 cr]; S-N only. Prereq=#, no Grad School cr) Practical writing experience with a media organization, publisher, business, or government agency.

**WRIT 4200. Writing and Cultures.** (3 cr; A-F only. Prereq=1120 or equivalent) Through historical, theoretical and applied lenses, examines the dialectic between writing and culture, that is, how writing shapes culture and, conversely, how culture shapes writing. Specific concepts (access, agency, community, identity and power) relevant to understanding how cultures and the social relations that constitute them are constructed and maintained will be examined in detail.

**WRIT 4220. Document Design and Graphics.** (3 cr; A-F or Aud. Prereq=1120, min 60 cr, no Grad School cr) Principles and practice of using computer programs to design, create, and print documents that effectively integrate verbal and graphic texts.

**WRIT 4230. Web Design and Digital Culture.** (3 cr; A-F or Aud. Prereq=Min 60 cr, no Grad School cr) Practice in the aesthetic, cultural, and rhetorical uses of Web-design techniques, including discussion and writing about the theoretical and historical contexts of digital culture.

**WRIT 4250. New Media Writing.** (3 cr; A-F or Aud. Prereq=No Grad School cr) Combines the theory and production of new media writing—digital, verbal practices in converged media—through the application of readings and discussion to five projects that progress from written, print-based genres to new-media presentation.

**WRIT 4260. Visual Rhetoric and Culture.** (3 cr; A-F only. =WRIT 5260. Prereq=No Grad School cr) In addition to teaching the mechanics of graphic production, this class draws widely on the disciplines of digital design, statistics, narrative literature, engineering, and technical writing to enable students to conceive, produce, and write about visual texts critically and effectively.

**WRIT 4290. Advanced Web Design and Digital Culture.** (3 cr; A-F or Aud. Prereq=4230, no Grad School cr) Provides students with instruction and practice in creating increased functionality and interactivity in Web-based projects, and with the conceptual tools and cultural contexts needed to manage and direct rhetorical initiatives in digital environments.

**WRIT 4300. Research Methods for the Study of Writing.** (3 cr; A-F or Aud. Prereq=1120, min 60 cr, no Grad School cr) Provides students with instruction and practice in critiquing research, generating research questions, designing research projects, and reporting research results in the study of writing.

**WRIT 4506. Capstone Course: Senior Portfolio Preparation.** (1 cr; S-N or Aud. Prereq=Min 90 cr, writing studies major) Required capstone course for all writing studies majors. Portfolios for multiple purposes will be prepared under the guidance of the student's adviser.

**WRIT 4591. Independent Study.** (3 cr; A-F or Aud. Prereq=#, no Grad School cr) Students choose projects with their instructor.

**WRIT 4595. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 3 cr]; A-F or Aud. Prereq=Min 60 cr, no Grad School cr) Intensive study of rhetoric or composition topics not focused on in regular upper-division composition courses or related offerings. Topic announced before course offered.

**WRIT 5100. Introduction to Grant Writing and Project Planning.** (3 cr; A-F or Aud. Prereq=[Comp 5100], Coll Grad or Grad School student) Introduction to basic grant writing principles, including common types of grants, project planning, locating and researching funders, and preparing effective narratives and budgets. Course utilizes lectures, discussion, group work, and guest speakers.

**WRIT 5197. Internship in Writing.** (1-3 cr [max 3 cr]; S-N only. Prereq=#, Coll Grad or Grad School student) Practical writing experience with a media organization, publisher, business, or government agency.

**WRIT 5220. Document Design and Graphics.** (3 cr; A-F or Aud. Prereq—[Comp 5220], max 3 cr may be applied to Grad School prog)

Principles and practice of using computer programs to design, create, and print documents that effectively integrate verbal and graphic texts.

**WRIT 5230. Web Design and Digital Culture.** (3 cr; A-F or Aud. Prereq—[Comp 5230])

Practice in the aesthetic, cultural, and rhetorical uses of Web-design techniques, including discussion and writing about the theoretical and historical contexts of digital culture.

**WRIT 5250. New Media Writing.** (3 cr; A-F or Aud. Prereq—[Comp 5250], Coll Grad or Grad School student)  
Combines the theory and production of new media writing—digital, verbal practices in converged media—through the application of readings and discussion to five projects that progress from written, print-based genres to new-media presentation.

**WRIT 5260. Visual Rhetoric and Culture.** (3 cr; A-F only. =WRIT 4260)

In addition to teaching the mechanics of graphic production, this class draws widely on the disciplines of digital design, statistics, narrative literature, engineering, and technical writing to enable students to conceive, produce, and write about visual texts critically and effectively.

**WRIT 5290. Advanced Web Design and Digital Culture.** (3 cr; A-F or Aud. Prereq—[Comp 5290], 5230, Coll Grad or Grad School student)

Provides students with instruction and practice in creating increased functionality and interactivity in Web-based projects, and with the conceptual tools and cultural contexts needed to manage and direct rhetorical initiatives in digital environments.

**WRIT 5300. Research Methods for the Study of Writing.** (3 cr; A-F or Aud. Prereq—[Comp 5300], Coll Grad or Grad School student)

Provides students with instruction and practice in critiquing research, generating research questions, designing research projects, and reporting research results in the study of writing.

**WRIT 5591. Independent Study.** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—[Comp 5991], max 3 cr may be applied to Grad School prog, #)

Students choose projects with their instructor.

**WRIT 5595. Special Topics: (Various Titles to be Assigned).** (1-3 cr [max 6 cr]; A-F or Aud. Prereq—[Comp 5995], Coll Grad or Grad School student)

Intensive study of rhetoric or composition topics not focused on in regular upper-division composition courses or related offerings. Topic announced before course offered.

**WRIT 8500. Graduate Seminar.** (3-6 cr [max 6 cr]; A-F or Aud. Prereq—[Comp 8500])

Varying topics appropriate to study of composition, English, language, and rhetoric.

**WRIT 8902. Teaching College Writing.** (3 cr; A-F only. Prereq—[COMP 8902], required for tchg assts in Writ and Engl Depts, #)

Analyze theoretical works and study pedagogical principals and practices related to teaching academic writing in college, including methods, materials, and objectives. Includes a major research project as well as oral presentations and/or teaching demonstrations.

**WRIT 8910. Practicum in Teaching Writing.** (3 cr; A-F or Aud. Prereq—[Engl 8910, Comp 8910], #)

Teaching, tutoring, and assisting in composition courses; experience in preparation of materials, microteaching, and grading student work.

**WRIT 8994. Directed Research in Writing Studies.** (1-3 cr [max 3 cr]; A-F or Aud. Prereq—[Comp 8994], 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.