Course Numbers, Symbols, and Abbreviations

The courses in this catalog are not offered every semester. For a listing of courses offered in a particular semester, consult the Class Schedule at http://onestop.umn.edu/onestop/registration.html.

Course Numbers—Courses numbered from 5000 to 5999 (listed as 5xxx if individual course number is unspecified) are primarily for graduate students, but are also open to third or fourth year undergraduate students. (5xxx courses in the School of Dentistry and in some clinical departments of the Medical School may not be applied to graduate programs.) Courses numbered 8000 or above (8xxx) are open to graduate students only.

Courses at the 6000 (6xxx) and 7000 (7xxx) levels are for postbaccalaureate students in professional degree programs not offered through the Graduate School. Courses numbered at the 4000 (4xxx) level are primarily for undergraduate students in their fourth year of study. 4xxx, 6xxx, and 7xxx courses may be applied toward a Graduate School degree with approval by the student’s major field and if the course is taught by a member of the graduate faculty or an individual authorized by the program to teach at the graduate level. For course descriptions for 4xxx, 6xxx, and 7xxx courses, consult the list of University courses at http://onestop2.umn.edu/courses/index.html.

Courses at the 1000 (1xxx), 2000 (2xxx), and 3000 (3xxx) levels are for undergraduates and may not be applied to graduate programs. Courses numbered 0000 to 0999 do not carry credit.

Course Designators—In conjunction with course numbers, departments and programs are identified by a 2-, 3-, or 4- letter prefix known as a designator (e.g., CE for Civil Engineering, POL for Political Science, WOST for Women’s Studies). When no course designator precedes the number of a course listed as a prerequisite, that prerequisite course is in the same discipline as the course being described.

Course Symbols and Abbreviations—The following abbreviations and symbols are used throughout the course descriptions of most University catalogs to denote common and recurring items of information.

Prereq ......................... Course prerequisites.

cr ............................... Credit.

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

! ............................... Work for this course will extend past the end of the term. A grade of K will be assigned to indicate that the course is still in progress.

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

* ............................... 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 the instructor is required for registration.

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

@ ............................... Approval of the college offering the course is required for registration.

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

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

W ............................... Following a course number, the W indicates the course is writing intensive.

A-F, S-N, NGA ............... Grading options. NGA means “no grade associated.” If no grading option is listed, the course may be taken either A-F or S-N. For more information about grading, see page 14.

Course Listing Sample

Xology (Xolo)

Xology and Diometrics

College of Liberal Education

Xolo 5101. Methods in Xology. (3-4 cr [max 8 cr]; A-F only. §3101. Prereq-3578 or #)

Historical, numerical, sociological, and Freudian methods of research in xology with applications to contemporary problems.

Credit will not be granted if credit has been received for the course listed after this symbol.
Accounting (ACCT)

Department of Accounting

Curtis L. Carlson School of Management

ACCT 5100. Corporate Financial Reporting. (4 cr; A-F or Aud. Prereq—mgmt student, non-accounting major)
Overview of asset/liability valuation and income measurement. Focus on how economic events are reported in the financial statements. Examines accounting theory and the accounting standard-setting process.

ACCT 5101. Intermediate Accounting I. (4 cr; A-F or Aud. Prereq—[5101 or 5105 or 5107 or 5109] or 6300)
Valuation, measurement, and reporting issues related to selected assets/liabilities of a firm. Theory underlying accounting issues. Applying accounting principles.

ACCT 5102. Intermediate Accounting II. (4 cr; A-F or Aud. Prereq—5101 [mgmt or grad mgmt student])
Basic valuation problems encountered in financial reporting. Focuses on valuation of liabilities. Accounting for leases, pensions, and deferred taxes. Introduces consolidated financial statements.

ACCT 5125. Auditing Principles and Procedures. (4 cr; A-F or Aud. Prereq—[3101 or 5101 or 5105 or 5109] or 6300) [acct major or grad mgmt student]
Concepts of auditing internal control/financial statements in accordance with generally accepted auditing/professional standards established by Public Company Oversight Board (PCAOB) and American Institute of Certified Public Accountants (AICPA).

ACCT 5126. Internal Auditing. (2 cr; A-F or Aud. Prereq—5125)
Financial/operational auditing. Standards. Managing the function.

ACCT 5135. Fundamentals of Federal Income Tax. (4 cr; A-F or Aud. Prereq—[3050 or 5101 or 5105 or 5109] or 6300) [mgmt or grad mgmt student]
U.S. federal system of taxation. Concepts of gross income, deductions, credits. Analysis of structure of Internal Revenue Code, its provisions with respect to specific areas of law. Interrelationships between legislative, judicial, and administrative authority. Methods, tools, and techniques to conduct tax research.

ACCT 5160. Financial Statement Analysis. (2 cr; A-F or Aud. Prereq—[5106 or 5107 or 5101 or 5109] or 6300) [accounting or finance major]
Interpretation/analysis of financial statements. Introduces basic techniques of financial statement analysis and applies them in different settings (e.g., investment/credit decisions).

ACCT 5180. Consolidations and Advanced Reporting. (2 cr; A-F or Aud. Prereq—5102 or 5107 or 5109) [mgmt or grad mgmt student]
Theory underlying the preparation of consolidated financial statements, as well as the mechanical computations needed to prepare the statements themselves.

ACCT 5236. Introduction to Taxation of Business. (2 cr; A-F or Aud. Prereq—5155, acct major)
Introduction to the income tax laws governing the taxation of corporations, partnerships, limited liability companies, limited liability partnerships, and S corporations. Students will also increase their knowledge and skills related to tax research by writing research membranes.

ACCT 5237. Foreign National Tax Consulting. (2 cr; S-N only. Prereq—5135, accounting major) Tax return preparation/consulting experience. Partnership, including international tax. M NTA State Department of Revenue to provide free tax help to foreign national students, researchers, and visiting professors. Students preparing tax returns for nonresident aliens use commercial tax preparation software.

ACCT 5321. Accounting Information Systems. (2 cr; Stdnt Opt. Prereq—5101/5109 or 5100/5109) Applications of electronic data processing systems in accounting, including modeling, financial planning, auditing, and data security. Analysis/design of accounting information systems.

ACCT 5328. Special Topics in Financial Reporting. (2 cr; A-F or Aud. Prereq—5102, [mgmt or grad mgmt student]) Covers areas of financial reporting frequently covered on the CPA exam, including partnerships, foreign operations, and accounting for government and nonprofit organizations.

ACCT 5310. International Accounting. (2 cr; A-F or Aud. Prereq—5101 or 5102 or 5105 or 5107 or 5109) Macroeconomic concepts of international economics. Trade, international markets for capital, role of accounting. Accounting policies/approaches among nations. Financial statements produced in other countries.

ACCT 5320. Current Topics in Accounting. (2 cr; S-N only)
Topics vary.

ACCT 5420. MAcc directed study. (0-4 cr [max 4 cr]; A-F or Aud. Prereq—MAcc student) Internship or directed study in Master of Accountancy degree program.

ACCT 6001. Internal Control. (4 cr; A-F only. Prereq—MAcc grad major)


ACCT 8007. International Accounting. (2 cr; A-F or Aud. Prereq—MAcc student) Rapid changes in environment of international business, how they impact regulation of financial accounting. Cause/history of international differences in design of financial accounting/reporting systems, current efforts to harmonize them into worldwide system. Role/impact of currency translation on financial statements.

ACCT 8008. Empirical Research: Accounting Choices. (2 cr; A-F only. Prereq—Bus Admin PhD student or #) Emphasis on major adult development theorists, theories, and current applications. Transformative learning, self-directed learning, experiential learning, and cooperative learning provide theoretical framework for exploring physiological, psychological, sociological, and cultural aspects of adult development through the life span.


ACCT 8301. Special Topics in Financial Reporting. (2 cr; A-F or Aud. Prereq—[5102 or 5105 or 5109] or 6300 or 7102) Applications of COSO Internal Control - Integrated Framework and Enterprise Risk Management - Integrated Framework.

ACCT 8302. Macroeconomic concepts of international economics. Trade, international markets for capital, role of accounting. Accounting policies/approaches among nations. Financial statements produced in other countries.
Course Descriptions

ADED 5201. Introduction to Adult Literacy. (3 cr; Stdnt Opt)


ADED 5203. Methods of Teaching Adult Literacy. (3 cr; A-F or Aud)

ADED 5211. Introduction to the Undereducated Adult. (1 cr; A-F or Aud)
Definitions of literacy in workplace, community, and family. Issues: poverty/welfare, ethnicity, cultural diversity, social class, language/learning, immigrants.

ADED 5212. Introduction to Adult Literacy in the Workplace. (3 cr; A-F or Aud. Prereq--5211) Review workplace literacy programs, funding, program planning, and needs assessment. Recruiting/recruiting workers. Role of employers and the unions. Writing for low literacy employees.

ADED 5213. Introduction to Adult Literacy in the Community. (3 cr; A-F or Aud. Prereq--5211) Reviews role of the community programs in the United States in literacy building, the family in developing literacy skills, correctional education in reintegrating offenders back into community. Integrating people with disabilities through community literacy programs. Literacy/development in developing countries. Reaching/recruiting indigenous, migrant, and immigrant groups. Social action approaches to literacy education.

ADED 5224. Formal Assessment of Adult Literacy. (1 cr; A-F or Aud. Prereq--5211) Assessment of adult English/literacy skills needed for work, family, community, and continuing education. Formal testing policy, techniques, standardized tests. Underlying assumptions about testing, cultural bias, and interpretation of formal tests. Test preparation programs.

ADED 5225. Informal Assessment of Adult Literacy. (1 cr; A-F or Aud. Prereq--5211) Informal assessment of adult English/literacy skills for work, family, community, and further education. Informal testing techniques, setting educational goals, formal versus informal assessment.

ADED 5226. Advanced Assessment of Adult Literacy. (1 cr; A-F or Aud. Prereq--5211, 5224, 5225) Applications and case studies. Educational planning for work, family, and community.

ADED 5233. Methods of Teaching Beginning Adult Literacy. (1 cr; A-F or Aud. Prereq--5211) Learning English and literacy as an adult: initial approaches to teaching reading, writing, and communications skills. Theories of learning and curriculum design. Technology as a teaching tool: teaching students with disabilities or with cultural/gender differences.


ADED 5235. Methods of Teaching Advanced Adult Literacy. (1 cr; A-F or Aud. Prereq--5211, 5234) Advanced approaches to teaching reading, writing, and communication skills. Preparing students for college and continuing education. Reading/study skills. English in workplace and on Internet. Problem solving, analytical thinking. Technology as teaching tool. Evaluating commercial material/software.

ADED 5302. Continuing Education for Professionals. (3 cr; Stdnt Opt) Analysis of philosophies, issues, policies, trends, professional needs and statutory requirements in continuing professional education programs. Role of the program director and organization.

ADED 5303. Working with Volunteers in Community Settings. (3 cr; Stdnt Opt) Uses collaborative, experiential methods to address fundamental issues and practices in volunteer development. Explores personal philosophies, staffing, and key issues and trends in the administration of volunteer programs.

ADED 5700. Special Topics in Adult Education. (1-8 cr [max 12 cr]; Stdnt Opt) Exploration of issues, methods, and knowledge in areas of adult education. Content varies.

Adult Psychiatry (ADPY)

Department of Psychiatry

Medical School

ADPY 5515. Neuropsychology: University Hospitals. (3-9 cr [max 9 cr]; O-N or Aud)

ADPY 8205. Special Assignments. (1-16 cr [max 16 cr]; Stdnt Opt)

ADPY 8206. Research. (1-16 cr [max 16 cr]; Stdnt Opt)

ADPY 8249. Clinical Neuropsychopharmacology. (1-15 cr; Stdnt Opt, Prereq-Resident status or 3rd- or 4th-yr med student or 8248 for grad students) The course is designed for a two-day presentation of the course. For the four hours one afternoon, followed by eight hours the next day, to include the following subject matter: introduction to neurotransmitter theory and mechanism of action of psychotropic drugs; evaluation of anxiety states and use of anxiolytic agents; clinical picture of depression, use of antidepressants, and mechanism of drug combinations; schizophrenia diagnosis, use of antipsychotics; mood stabilizers, lithium, electroconvulsive therapy, parkinson's disease, central nervous system, tardive dyskinesia; clinical evaluation of epilepsy and use of anticonvulsants; neurophysiology of sleep, suppression of hypothalamus and sedatives, and significance of over-the-counter sleep aids; use of anxiolytics, over-the-counter antihistamines, and opiate analogs; geriatric psychopharmacology; classification of drug side effects and principles of drug interaction; abused drugs; and endopharmacology.

ADPY 8970. Directed Studies. (1-24 cr [max 24 cr]; Stdnt Opt)
AEM 5501. Continuum Mechanics. (3 cr; Stdnt Opt. Prereq-IT upper div or grad, 3051, Math 2263 or equiv or #) Concepts common to all continuous media; elements of tensor analysis; motion, deformation, vorticity; material derivatives; mass, continuity equation; balance of linear, angular momentum; geometric characterization of stress; constitutive equations.

AEM 5503. Theory of Elasticity. (3 cr; A-F or Aud. Prereq-4501 or equiv, Math 2265 or equiv or #) Introduction to the theory of elasticity, with emphasis on linear elasticity. Linear and nonlinear strain measures, boundary-value problem for linear elasticity, plane problems in linear elasticity, three dimensional problems in linear elasticity. Topics from nonlinear elasticity, micromechanics, contact problems, fracture mechanics.

AEM 5651. Aeroelasticity. (3 cr; A-F or Aud. Prereq-4202, 4301, [grad student or IT upper div]) Static aeroelastic phenomena, torsional divergence of a lifting surface, control surface reversal. Aeroelastic flutter, unsteady aerodynamics. Problems of gust response, buffeting. Design project.

AEM 8000. Seminar: Aerospace Engineering and Mechanics. (1 cr [max 4 cr]; S-N or Aud. Prereq-DGS consent)

AEM 8201. Fluid Mechanics I. (3 cr; Stdnt Opt. Prereq-4201 or equiv, Math 2263 or equiv) Mathematical and physical principles governing the motion of fluids. Kinematic, dynamic, and thermodynamic properties of fluids; stress and deformation; equations of motion; analysis of rotational and irrotational inviscid incompressible flow; two-dimensional and three-dimensional potential flow.

AEM 8202. Fluid Mechanics II. (3 cr; Stdnt Opt. Prereq-8201) Analysis of incompressible viscous flow; creeping flows; boundary layer flow.


AEM 8212. Theory of Turbulence II. (3 cr; Stdnt Opt. Prereq-8211) Prandtl’s mixing length theory applied to classical boundary layer, pipe, jet, and wake flows; prediction methods used at Stanford Conference; law of wall; law of wake; K-epsilon method.


AEM 8221. Rheological Fluid Mechanics. (3 cr; Stdnt Opt. Prereq-8201 or 5501 or #) Methods of solution for flows of simple fluids with general constitutive equations. Topics from viscometric flow, extensional flow, perturbations of the rest state with steady and unsteady flow, secondary flow.

AEM 8231. Molecular Gas Dynamics. (3 cr; Stdnt Opt. ME 5361, Prereq-[4201 or equiv], [4203 or equiv], [ME 5224 or equiv]) Kinetic theory of gases, Boltzmann equation, Maxwell-Boltzmann distribution, collisions, transport properties. Introduction to quantum mechanics. Statistical thermodynamics, classical/quantum statistics. Partition functions and thermodynamic properties. Irreversible thermodynamics.

AEM 8241. Perturbation Methods in Fluid Mechanics. (3 cr; Stdnt Opt. Prereq-8202 or #) Method of matched asymptotic expansions presented through simple examples and applied to viscou flow at high and low Reynolds numbers and other problems in fluid mechanics and applied mathematics.

AEM 8251. Finite-Volume Methods in Computational Fluid Dynamics. (3 cr; Stdnt Opt. Prereq-4201 or 8201 or equiv, CSci 1107 or equiv) Development of finite-volume computational methods for solution of compressible Navier-Stokes equations. Accuracy, consistency, and stability of numerical methods; high-resolution upwind shock-capturing schemes; treatment of boundary conditions; explicit and implicit formulations; considerations for high performance computers; recent developments and advanced topics.

AEM 8253. Computational Methods in Fluid Mechanics. (3 cr; A-F or Aud. Prereq-4201 or #) Theory of kinematic, hyperbolic, and dispersive waves, with application to traffic flow, gas dynamics, and water waves.

AEM 8271. Experimental Methods in Fluid Mechanics. (3 cr; Stdnt Opt. Prereq-5501 or #) Overview of computer organization, including external communications and A/D, D/A conversion. Measurement techniques, such as pressure measurements and hot-wire and laser Doppler anemometry; theory and uncertainty; computer control of experiments.

AEM 8295. Selected Topics in Fluid Mechanics. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq-8201) Includes individual student projects completed under guidance of a faculty sponsor.


AEM 8444. FTE: Doctoral. (1 cr; No grade. Prereq_Doctoral student, adviser and DGS consent)

AEM 8495. Advanced Topics in Aerospace Systems. (1-4 cr [max 8 cr]; A-F or Aud. Prereq-#) Individual student projects completed under guidance of a faculty sponsor.

AEM 8500. Research Seminar in Mechanics of Materials. (1-3 cr [max 12 cr]; A-F or Aud. Prereq-#) Seminars given by students, faculty, and visitors on topics drawn from current research.

AEM 8511. Advanced Topics in Continuum Mechanics. (3 cr [max 6 cr]; A-F or Aud. Prereq-5501 or #) Constitutive equations; invariance and thermodynamic restrictions. Nonlinear elasticity theory; exact solutions, minimization, stability, Non-Newtonian fluids; viscometric flows, viscometric functions, normal stress. Other topics may include reactive and/or nonreactive mixtures, nonlinear plasticity, and deformable electromagnetic continua.

AEM 8521. Advanced Topics in Elasticity. (3 cr; A-F or Aud. Prereq-5503) Contact stresses, finite deformations, and other topics.

AEM 8523. Elastodynamics. (3 cr; A-F or Aud. Prereq-4581 or 5501 or #) Waves and vibrations in rods, beams, and plates; dispersion; volume and surface waves; reflection; energy theorems; vibrations of bounded media and relation to technical theories; elements of nonlinear waves, inelastic waves, and stability of motion of elastic systems.


AEM 8531. Fracture Mechanics. (3 cr; A-F or Aud. Prereq-5501 or #) Theories of mechanical breakdown. Kinetic rate theories and instability considerations; formation of equilibrium cracks and circular crack propagation under pulse; statistical aspects of strength and fracture of micromolecular systems; time and temperature dependency in fracture problems and instability of compressed material systems.


AFRO 5865. Proseminar: African-American History. (3 cr; Stdnt Opt. Prereq–#) Examination of issues including slavery, Reconstruction, the Great Depression, and civil rights movement using cultural and intellectual history and autobiography/biography. Focuses on dynamics of race, gender, class, sexuality, and religion.

AFRO 5866. Afro-American Studies (AFRO)

AFRO 5876. Approaches to African Development. (3 cr; Stdnt Opt) Study, critical analysis, and comparison of primary documents relevant to African development.

AFRO 5910. Topics in African American and African Studies. (1-3 cr; max 9 cr; Stdnt Opt) Topics specified in Class Schedule.

AFRO 5993. Directed Study. (1-3 cr; max 3 cr; Stdnt Opt. Prereq–#) Guided individual reading/study for qualified seniors and graduate students.
AFRE 8202. Seminar: Intellectual History of Race. (3 cr; Stdnt Opt) Shifting and changing meanings of “race” from the “Age of Contest” to the present. Starting from the proposition that race is not a fixed or stable category of social thought or being, the seminar seeks to ascertain how and why Western ideas about race have changed.

AFRE 8554. Seminar: Gender, Race, Nation, and Policy--Perspectives from Within the African Diaspora. (3 cr; Stdnt Opt. Prereq--#) Interdisciplinary analysis of U.S. domestic and foreign policies as they affect Africans and peoples of African descent throughout the Diaspora. Intersections of gender, race, nation, and class.

AFRO 8590. Figures in Contemporary Black Fiction. (3 cr [max 9 cr]; Stdnt Opt) Each term focuses on works of an individual writer, such as Toni Morrison, Paule Marshall, and Jamaica Kincaid. Critical studies.

AFRO 8802. Seminar: Orientalism. (3 cr; Stdnt Opt) Recent arguments related to Orientalism as a trend in modern literary and cultural criticism.

AFRO 8910. Topics in Studies of Africa and the African Diaspora. (3 cr [max 9 cr]; Stdnt Opt) Topics specified in [Class Schedule].

Agricultural, Food, and Environmental Education (AFEE)

Department of Work and Human Resource Education

College of Education and Human Development

AFEE 5111W. Agricultural Education: Methods of Teaching. (4 cr; Stdnt Opt) Use of teaching resources; principles of teaching and learning; problem-solving techniques, lesson plan construction for large group, small group and individual investigations; student management; and assessment.

AFEE 5112. Agricultural Education Program Organization and Curriculum for Youth. (3 cr; Stdnt Opt) Development of community school program in agriculture, agribusiness, and environmental science. Program to meet graduation outcomes and determine student needs.

AFEE 5113. Adult Agricultural Education Program Development and Technology. (3 cr; A-F or Aud) Organization and implementation of education programs for farmers, farm managers, and agribusiness personnel using community and environmental resources, agricultural and instructional technology, and management information systems to attain family and business goals.

AFEE 5114. Agricultural Education Teaching Seminar. (1 cr; Stdnt Opt) Reflective learning on teacher preparation experience; identify issues and problems facing the discipline; needs for continual preparation and program adjustment.


AFEE 5118. Strategies for Managing and Advising the FFA Organization. (2 cr; A-F or Aud. Prereq--Agricultural education major or #) Principles/techniques to advise an FFA chapter. Historical/philosophical basis of FFA, organization/structure. Integration with classroom instruction, public relations, recruitment, and administration of FFA chapters.

AFEE 5200. Special Topics in Agriculture Education and Extension. (1-3 cr [max 12 cr]; Stdnt Opt) Content varies by offering.

AFEE 5231. Agricultural Education Curriculum K-12. (2 cr; A-F or Aud) Philosophy, organization, and administration of instruction in agricultural education programs at the elementary, middle, and high school levels.

AFEE 5233. Advanced Procedures in Teaching Agricultural Education. (2 cr; A-F or Aud) New developments in methodology; assessment of innovations and procedures; consideration of various levels of instruction.

AFEE 5235. Advanced Supervised Agricultural Experience Programs. (2 cr; Stdnt Opt) The organization and administration of agricultural experiment programs for middle and secondary levels teachers: career exploration, improvement projects, experiments, placement in production/business/community settings, entrepreneurship. Current state and national programs and resource material.


AFEE 5239. Program Organization and Management in Agricultural Education. (2 cr; Stdnt Opt) Analysis of organization, management, and assessment of agricultural education programs at the middle, high school, and adult levels.

AFEE 5280. Current Issues for the Beginning Agricultural Education Teacher. (1-3 cr [max 3 cr]; Stdnt Opt) Reflection, analysis on current problems and issues confronting beginning teachers of agricultural education. Issues in teaching methods, classroom and program management, discipline, curriculum, FFA and SAE development, school-to-work relationships.


AFEE 5296. Professional Experience Practicum in Agricultural Education and Extension. (1-4 cr [max 4 cr]; Stdnt Opt) Observation, study, and experience in agricultural business and industry; identification of educational problems observed in the agricultural industry; evaluation of personal experience.

AFEE 5331. History, Philosophy, and Systems of Extension. (3 cr; A-F or Aud) History and philosophy of extension; modification and adaptation to worldwide methods and approved practices; extension methodologies; innovative approaches; systems appropriate to development environments.

AFEE 5361. World Development Problems. (3 cr; A-F or Aud) Introduction to development problems throughout the world. Development in Third World countries. Examples of First World development problems. Interdisciplinary focus on population, health and disease, education, agriculture, industry, finance, politics, and human rights.

AFEE 5371. Farming Systems Research and Extension. (3 cr; A-F or Aud) Introduction to the theory and practice of linking farming systems, research, and extension. An interdisciplinary and holistic approach to rural development for individuals and communities throughout the world.


AFEE 5407. Application of Advanced Farm Financial Analysis Tools and Methods. (1 cr; Stdnt Opt) Use of advanced farm financial analysis tools/methodology to analyze financial performance of actual farm businesses. Case farms are used to apply whole entity financial analysis tools/concepts and enterprise analysis methodologies.

AFEE 5409. Seminar: Teaching Strategic Farm Business Planning. (1 cr [max 4 cr]; A-F or Aud) Teaching strategic business planning to farm managers and agricultural professionals. Philosophy of strategic management, components of a strategic business plan. Materials/tools to apply strategic farm business planning in educational programs. Students apply strategic planning methods/concepts to case farm businesses.

AFEE 5411. Seminar: Farm Financial Planning Teaching Tools and Methods. (1 cr [max 4 cr]; A-F or Aud) Preparation to teach farm financial planning to farm managers and agricultural professionals. Principles/concepts of long range financial planning and short range cash flow planning. Farm planning software tools, case farm situations, practical farm planning experience.

AFEE 5413. Seminar: Teaching Effective Use of Commodity Marketing Tools. (1 cr [max 4 cr]; A-F or Aud) Teaching commodity marketing tools to farm managers and agricultural professionals. Commodity marketing tools, including cash forward contracts, futures, and options, and how to use them to enhance price and protect income. How to choose marketing tools, given financial/marketing conditions.

AFEE 5415. Seminar: Teaching Commodity Marketing Strategies. (1 cr [max 4 cr]; A-F or Aud) Teaching commodity market planning to farm managers and agricultural professionals. Development of marketing plans to enhance price and protect income. Introduction to tools to simulate implementation of plans against actual price scenarios.

AFEE 5993. Directed Study in Agricultural Education and Extension. (1-9 cr [max 9 cr]; Stdnt Opt) Topics may be chosen to permit study of areas within education or to supplement areas of inquiry not provided in the regular course structure.
**Course Descriptions**

**AEEE 5995. Integrating Paper--Master of Education: Agricultural and Extension Education** (3 cr; A-F or Aud) Students prepare paper dealing with issues in agricultural education applied to professional responsibilities.

**AEEE 8090. Seminar: Agricultural Education and Extension** (0-3 cr [max 6 cr]; Stdt Opt. Prereq--AgEd grad student) (A-F or Aud) Topics on various aspects of agricultural education. Prepare, present, and critique a report.

**AEEE 8094. Research in Agricultural Education and Extension** (1-6 cr [max 6 cr]; A-F or Aud. Prereq--AgEd student doing Plan B research, %) Select problems, prepare bibliographies, analyze and interpret data, and prepare manuscripts on studies.

**Agronomy and Plant Genetics (AGRO)**

**Department of Agronomy and Plant Genetics**

**College of Food, Agricultural and Natural Resource Sciences**

**AGRO 5021. Introduction to Plant Breeding** (3 cr; Stdt Opt. Prereq--GBS 3022 or equiv, background in plant science) For majors not specializing in plant breeding. How genetics is applied to plant improvement. Emphasizes sustainable-production scenarios.

**AGRO 5211. Applied Experimental Design** (4 cr; Stdt Opt. =ENT 5121, Prereq--Stat 5301 or equiv or #) Principles of sampling methodologies, experimental design, and statistical analyses. Methods/procedures in generating scientific hypotheses. Organizing, initiating, conducting, and analyzing scientific experiments using experimental designs and statistical procedures.

**AGRO 5311. Student Organic Farm Planning, Growing, and Marketing** (3 cr; Stdt Opt. =AGRO 3131, HORT 5131, Prereq--[1101, 1103, BIOL 1001, BIOL 1009, HORT 1001] or #) Students plan/implement cropping/marketing strategies for organic produce/flowers from Student Organic Farm on St. Paul campus.

**AGRO 5311. Research Methods in Crop Improvement and Production** (1 cr; S-N or Aud. Prereq--applied plant sciences grad) Demonstrations and discussions of techniques in crop improvement and/or production research. Presentations integrate biotechnology with traditional breeding methods; production sessions emphasize ecologically sound cropping systems.

**AGRO 5321. Ecology of Agricultural Systems** (3 cr; A-F or Aud. =ENT 5121, Prereq--[3101, 3103, BIOL 1001, BIOL 1009, HORT 1001] or #) Introduction to plants and their reactions and responses to water, climate, and soil factors. Emphasizes development of research related to crop improvement.

**AGRO 8201. Plant Breeding Principles I** (3 cr; A-F or Aud. =HORT 8201, Prereq--Stat 5301 or equiv) Principles and current methods involved in breeding agronomic and horticultural crops. Use of genotype/environment data to increase genetic gain, population improvement, parent breeding, alternative selection strategies, breeding for special traits, and new approaches.


**AGRO 8241. Molecular and Cellular Genetics of Plant Improvement** (3 cr; Stdt Opt. Prereq--GBS 5034 or equiv or #) Principles of genetic modification of higher plants by application of molecular and cellular biotechnology approaches. Gene isolation and transfer, tissue culture manipulations, organelle genetics, molecular markers and mapping, and discussions and lab demonstrations on current research on genetic mechanisms related to crop improvement.

**AGRO 8270. Graduate Seminar** (1 cr; A-F or Aud. =HORT 8270) Prereq--Grad major in applied plant sci or agr or ent or hort or plnt brdg or plnt path or soil or #) Reports/discussions of problems and investigational work.

**AGRO 8280. Current Topics in Applied Plant Sciences** (1 cr; S-N or Aud. Prereq--Grad major in agr or applied plant sciences or ent or hort or plant brdg or plant path or soil or #) Topics presented by faculty or visiting scientists.

**AGRO 8305. Physiological Ecology of Plants in Natural and Managed Ecosystems** (4 cr; A-F or Aud. =HORT 8305, Prereq--BGC 3021, [BIOL 1001 or BIOL 1002], BIOL 1009) Introduces to plants and their reactions and responses in managed and natural ecosystems, including carbon and nitrogen allocation, root biology, microbial interaction, secondary metabolism, and plant response to biotic and abiotic stress.

**AGRO 8505. Advanced Perspectives in Weed Science** (2 cr; A-F or Aud. Prereq--Grad major in agr or applied plant sciences or ent or hort or plant brdg or plant path or soil or #) Topics concerning the biochemistry and sustainability of chemical and biological weed control methods. Lecture and student-directed discussion.

**AGRO 8605. Advanced Management of Agroecosystems** (3 cr; Stdt Opt. Prereq--4005 or #) Problem-based learning approach to developing a holistic approach to agroecosystem-based crop management. Field trips combined with classroom discussion and decision-focused case studies. Students conduct research and develop a decision case.

**AGRO 8900. Advanced Discussions** (1-3 cr [max 12 cr]; S-N or Aud. =HORT 8900) Prereq--# Special workshops or courses on applied plant sciences.

**Akkadian (AKKA)**

**Department of Classical and Near Eastern Studies**

**College of Liberal Arts**

**AKKA 5011. Elementary Akkadian I** (3 cr; Stdt Opt. Prereq--Adv undergrads with # or grad) Introduction to cuneiform script. Basics of Old Babylonian morphology and syntax. Written drills, readings from Hammurabi laws, foundation inscriptions, annals, religious and epic literature.


**AKKA 5300. Readings in Akkadian** (3 cr [max 18 cr]; Stdt Opt. Prereq--5011, 5022) Survey of Akkadian literature, including literary, legal, historiographical, and sacred texts. Topics specified in Class Schedule.

**American Indian Studies (AMIN)**

**Department of American Indian Studies**

**College of Liberal Arts**

**AMIN 5107. The Structure of Anishinabemowin, the Ojibwe Language** (3 cr; A-F or Aud. =AMIN 3107, Prereq--5107 or #) Analysis of grammatical structures of Anishinabemowin.

**AMIN 5108. History of Anishinabemowin, the Ojibwe Language** (3 cr; A-F or Aud. =AMIN 3109, Prereq--5107 or #) Historical development of Anishinabemowin.

**AMIN 5109. Anishinabe Literature** (3 cr; A-F or Aud. =AMIN 3109, Prereq--5107 or #) Readings in Anishinabe oral literature.

**AMIN 5141. American Indian Language Planning** (3 cr; A-F or Aud. =AMIN 3141, Prereq--5107 or 3132 or #) Planning for maintenance/revitalization of North American indigenous languages. Condition/status of languages. Documentation, cultivation, literacy, education.


**AMIN 5303. American Indians and Photography** (3 cr; Stdt Opt. =AMIN 5303) Historical/comparative overview of photos in which American Indian people are central subjects. Primary features of images in American Indian photos. Relationships among those involved in making/viewing photos. Ways in which photos are interpreted. Relation of photos to social contexts in which they are produced and to images those who stand behind their making.

**AMIN 5402. American Indians and the Cinema** (3 cr; A-F or Aud) Representations of American Indians in film, historically/contemporarily. What such representations assert about Native experience and cultural viability. What they reflect about particular relationships of power.
AMIN 5407. Craft and Conventions of American Indian Ethnohistory. (3 cr; A-F only)
Conventions and paradigmatic approaches scholars follow to represent/interpret written documents and oral traditions in constructing their narratives. Craft of ethnohistory: techniques, methods, styles of criticism.

AMIN 5409. American Indian Women: Ethnographic and Ethnohistorical Perspectives. (3 cr; Stdt Opt. = AMIN 5409, GWSS 5402)
Comparative survey of ethnographic/ethnohistorical writings by/about American Indian women.

AMIN 5890. Problems in American Indian History. (3 cr; Stdt Opt. = HIST 5890. Prereq. #)
Intensive consideration of topics in American Indian history. Possible topics include social history, Indian history of particular regions, political systems, education, and American Indian policy.

AMIN 5920. Topics in American Indian Studies. (3 cr [max 12 cr]; A-F or Aud)
Various topics in American Indian studies, depending upon instructor/semester.

American Sign Language (ASL)
Department of Educational Psychology
College of Education and Human Development
ASL 5442. Classroom Communication Through ASL. (1-2 cr [max 5 cr]; S-N or Aud. Prereq—Fluency in ASL, # required)
American Sign Language (ASL) form/function, vocabulary production, grammatical features needed by professionals working with children, storytelling strategies, technical sign language for classroom teachers. Content progresses in repeated segments.

American Studies (AMST)
Department of American Studies
College of Liberal Arts
AMST 5402. American Indians in the Cinema. (3 cr; Stdt Opt)
Representations of American Indians in film, historically/contemporarily. What such representations assert about Native experience and cultural viability. What they reflect about particular relationships of power.

AMST 5920. Topics in American Studies. (1-4 cr [max 9 cr]; S-N or Aud. Prereq—# required)
Topics specified in Class Schedule.

AMST 8201. Historical Foundations of American Studies. (3 cr; Stdt Opt. Prereq—grad AmSt major)
Exposition of American studies as a field of inquiry, including its history, major theoretical framework, and interdisciplinary methodologies.

AMST 8202. Theoretical Foundations and Current Practice in American Studies. (3 cr; Stdt Opt. Prereq—grad AmSt major or # or %)
Analysis of central theoretical work in the field and survey of key methodologies.

Culture of Cold War, its legacy. How it affected/reflected domestic politics, public policies, civic life, gender expectations, sexuality, class relations, racial justice, and civil rights. Impact of domestic anti-communism and of American cultural politics abroad.

Student produces a research paper on history/culture of Cold War era as it developed in United States after World War II. Research projects build upon readings from 8231.

AMST 8239. Gender, Race, Class, Ethnicity, and Sexuality in the United States: Readings. (3 cr; Stdt Opt)
Social, cultural, and artistic modes of self-expression. Intellectual analysis of people in the United States identified as female or male or as members of groups defined by race, ethnicity, class, or sexual orientation.

AMST 8240. Gender, Race, Class, Ethnicity, and Sexuality in the United States: Topical Development. (3 cr [max 9 cr]; Stdt Opt. Prereq. #)
Social, cultural, and artistic modes of self-expression and intellectual analysis of people in the United States identified as female or male and/or as members of group defined by race, ethnicity, class, or sexual orientation.

AMST 8249. Popular Culture and Politics in the 20th Century: Readings. (3 cr; Stdt Opt)
Popular arts in their political/social context. Issues of race, gender, class, and nationalism.

AMST 8250. Popular Culture and Politics in the 20th Century: Research Strategies. (3 cr; Stdt Opt. Prereq—8249 or #)
Popular arts in their political/social context. Focuses on issues of race, gender, class, and nationalism.

AMST 8259. Literature, History, and Culture: Research Strategies. (3 cr; Stdt Opt. Prereq. #)
Interdisciplinary study of connections between literary expression and history, particularly as they articulate themes in American culture.

AMST 8260. Literature, History, and Culture: Topical Development. (3 cr; Stdt Opt. Prereq. #)
Interdisciplinary study of connections between literary expression and history, particularly as they articulate themes in American culture.

AMST 8288. Working in the Global Economy: Readings. (3 cr; Stdt Opt)
Debates about global economy’s consequences for American culture/character. Effects of global capitalism on factory work, service sector, pink-collar, and factory work in multinational corporations and professional/managerial positions inside/outside U.S. borders. How work is lived through race, class, gender, and nation.

AMST 8289. Ethnographic Research Methods: Research Strategies in American Studies. (3 cr; Stdt Opt. Prereq—8288 or #)
Students conduct an empirical research project, write a final paper. Assumptions/practices of positivism, reflexive science, and feminist methodology. Issues surrounding politics/ethics of feminist research. Dilemmas in practice of fieldwork, oral histories, reading, and writing.

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

AMST 8401. Practicum in American Studies. (3 cr; S-N or Aud. Prereq. #)
Training in teaching undergraduate courses in American studies.

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

AMST 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

AMST 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])

AMST 8801. Dissertation Seminar. (3 cr; S-N or Aud. Prereq—AmSt doctoral student beginning dissertation work)
Conceptualizing the research problem for the dissertation and structuring the process of writing a chapter of it.

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

AMST 8920. Topics in American Studies. (3 cr [max 9 cr]; Stdt Opt)
Topics specified in Class Schedule.

AMST 8970. Independent Study in American Studies. (1-9 cr [max 9 cr]; Stdt Opt. Prereq.—# or %)
Independent study of interdisciplinary aspects of American civilization under guidance of faculty members of various departments.

Anesthesiology (ANES)
Department of Anesthesiology
Medical School
ANES 5587. Adv Clinical Physiology I for Nurse Anesthetists. (3 cr; A-F or Aud)
Cellular mechanisms underlying systems physiology. Cellular physiology, physiology of excitable tissues, renal physiology, cardiovascular physiology, hemostasis.

ANES 5588. Advanced Clinical Physiology II for Nurse Anesthetists. (3 cr; A-F or Aud. Prereq—Advanced Clinical Physiology I for Nurse Anesthetists)
Respiratory physiology, acid-base physiology, gastrointestinal physiology, metabolism, endocrinology, reproductive physiology, physiology of pregnancy/labor.

ANES 5666. Chemistry and Physics for Nurse Anesthetists. (3 cr; A-F or Aud. Prereq—General Chemistry or #)
Chemical equilibrium, organic chemistry, physics of fluids/gases, anesthetic applications.

ANES 8269. Research in Anesthesia. (1 cr; Stdt Opt)

Animal Science (ANSC)
Department of Animal Science
College of Food, Agricultural and Natural Resource Sciences
ANSC 5099. Special Workshop in Animal Science. (1-6 cr [max 12 cr]; A-F or Aud. Prereq.—#)
Topics vary. See Class Schedule or department. Topics may use guest lectures/experts.
Course Descriptions

ANSC 5200. Statistical Genetics and Genomics. (4 cr; Stdnt Opt. = CMB 5200. Prereq: [Stat 5201 or equiv]; [Biol 4003 or equiv])
Linkage analysis for mapping genes with codominance, dominance, imprinting inheritance modes, linkage/transmission disequilibrium. Radiation hybrid mapping. Parentage testing. Testing/estimation of candidate gene effects. Experimental designs, statistical analysis for mapping quantitative trait loci (QTL) with additive, dominance, and epistasis effects, and for gene expression studies using microarrays. QTL analysis of gene expression data for mapping transcriptional regulation factors.

ANSC 5700. Cell Physiology. (4 cr; A-F only. Prereq: [Two semesters of physics/chemistry, calculus, one semester of systems-level physiology or #])
Control mechanisms in maintaining homeostasis with respect to critical cell functions. Regulation of pH, volume, nutrient transport, intracellular electrolyte composition, membrane potential. Aspects of intercellular communication.

ANSC 8111. Genetic Improvement of Animals. (3 cr; Stdnt Opt. Prereq: #)
Application of population genetics to livestock breeding; selection theory and practice; basis of relationships and covariances among relatives; and selection based on multiple sources of information.

ANSC 8121. Linear Model Methods. (3 cr; Stdnt Opt. Prereq-Stat 5021)
Techniques and statistical tools for analysis of data. Matrix manipulation, least-squares procedures, correction for environmental factors, estimation of components of variance, and standard errors of estimates.

Basic theory and current methodologies of molecular biology and recombinant DNA technology. Lab work includes DNA and RNA hybridization, gene transfer, and polymerase chain reaction techniques. Primarily for students with limited exposure to molecular biology.

ANSC 8134. Ethical Conduct of Animal Research. (3 cr; A-F or Aud. = CMB 8134, VMED 8134. Prereq-Grad student or prof school student or #)
Ethical considerations in use of animal subjects in agricultural, veterinary, and biomedical research. Federal, state, and University guidelines relating to proper conduct for acquisition/use of animals for laboratory, observational, epidemiological, and clinical research. Regulatory requirements, bases for what is deemed proper conduct. Societal impact on scientific investigations utilizing animal subjects.

ANSC 8411. Animal Bioenergetics. (3 cr; A-F or Aud. Prereq-BioC 4351 recommended, #)
Integrated systems approach to energy metabolism of animals. Application of classical techniques of calorimetry and comparative slaughter, development of systems for expressing energy content of feeds, and techniques for measuring whole body and organ metabolism of specific nutrients. Offered alternate years.

ANSC 8312. Protein Metabolism. (3 cr; A-F or Aud. Prereq-BioC 4351)
Basic and applied concepts of protein metabolism in farm animals.

ANSC 8320. Concepts and Developments in Nutritional Physiology. (3 cr [max 6 cr]; A-F or Aud. Prereq-#)
Review and critical evaluation of pertinent scientific literature.

ANSC 8330. Concepts and Developments in Animal Nutrition. (1-2 cr [max 2 cr]; A-F or Aud. Prereq-#)
Review, critical evaluation of recent research reports.

ANSC 8344. Mechanisms of Hormone Action. (2 cr; Stdnt Opt. = Course in biochemistry or cell biology or #)
Major signal transduction, apoptosis. Topics incorporate pharmacology, biochemistry, and cell biology of hormone action in relevant physiological systems. Lectures on basic principles. Specialized lectures. Discussion of primary literature.

ANSC 8394. Research in Animal Nutrition. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq-#)
Research in selected areas: topics and animal species determined by consultation.

ANSC 8411. Physiology of Reproduction. (3 cr; A-F or Aud. Prereq=Course in biochemistry or cell biology or #)
Emphasis is on gametogenesis, conception, and implantation.

ANSC 8421. Physiology of Fertilization and Gestation. (3 cr; Stdnt Opt. Prereq=3305 or equiv)
Physiological events occurring during gametogenesis; capacitation and fertilization; period of the embryo; period of the fetus; and parturition.

ANSC 8431. Immunoreproduction. (3 cr; Stdnt Opt. Prereq=3305 or equiv)
Blood groups and polymorphic proteins affecting reproduction; immunoglobulin formation; antigens of semen, ova, and genital secretions; immunopathology; maternal-fetal incompatibility; and antibodies to hormones.

ANSC 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

ANSC 8510. Graduate Seminar. (1-2 cr [max 12 cr]; S-N or Aud. Prereq=#)
Student presentations of literature, proposals, and research results; instructional guidelines and performance evaluation; preparation of visual material.

ANSC 8594. Research in Animal Science. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq-#)
Research including experimental studies in disciplines associated with animal production and research, with emphasis on interdisciplinary studies.

ANTH 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

ANTH 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])

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

Anthropology (ANTH)
Department of Anthropology
College of Liberal Arts

ANTH 5008. Advanced Flintknapping. (3 cr; A-F or Aud. Prereq-[3005 or 5269] or #)
Hands-on training in techniques of advanced stone tool production, artifact reproduction, and lithic experimental design for academic/artistic purposes.

ANTH 5015W. Biology, Evolution, and Cultural Development of Language. (3 cr; Stdnt Opt. = ANTH 5015W)

ANTH 5021W. Anthropology of the Middle East. (3 cr; Stdnt Opt. = ANTH 5021W)
Anthropological field methods of analyzing/interpreting Middle Eastern cultures/societies.

ANTH 5025W. Cultural Semantics. (3 cr; Stdnt Opt)
Understanding cultures and cognitive classification systems through lexical semantics.

ANTH 5027W. Origins of European Civilization. (3 cr; Stdnt Opt. = ANTH 5027W)
Early development of European society, from Old Stone Age to Roman period. Principle transformations of European culture with introduction of agriculture, development of metallurgy and trade, and emergence of towns and cities.

ANTH 5029. Philosophical Anthropology. (3 cr; A-F or Aud. Prereq-sr or grad or #)
Advanced survey of traditional problems associated with broad-ranging views on human nature and culture. Specific arguments of relativists, behavioralists, phenomenologists, and others in relation to social life. Structuralist and post-structuralist approaches.

ANTH 5031. Ethnographies of Science. (3 cr; A-F only. Prereq-Sr or grad student or #)
Ethnographic, historical, and sociological accounts of scientific practice. How facts are constructed/negotiated. Social, cultural, and political influences on scientific methods. How scientific projects articulate with hierarchies of race/gender. International differences in scientific practice.
ANTH 5033. Feminist Anthropology. (3 cr; Stdnt Opt. Prereq-PRG 3047 or grad or #) Advanced introduction to the development of feminist theory in anthropology. Theoretical and methodological shifts in feminist anthropology and ethnography. Feminist ethnography within the discipline of anthropology; current debates concerning the reading and writing of ethnography.

ANTH 5041. Ecological Anthropology. (3 cr; Stdnt Opt. +ANTH 3041, ANTH 8213, Prereq-grad or #) Concepts, theories, and methods of ecological anthropology (cultural ecology) show how humans interact with the biophysical environment. Compare biological and cultural interactions with the environment; examine adaptive strategies cross-culturally.

ANTH 5043. Colonialism and Culture. (3 cr; A-F or Aud + GLOS 5643) Making of culture as colonial/anthropological object of knowledge. Relationship between colonial knowledge/formation of academic disciplines (especially anthropology). Colonial/postcolonial transformations of colony, nation, and metropole.

ANTH 5045. Urban Anthropology. (3 cr; Stdnt Opt. Prereq-4005 or grad or #) Anthropological approaches to urban life in Western and non-Western settings. Topics include social networks and voluntary organizations; class, ethnicity, gender and power; migration and immigration; urban labor and economics; and urban “problems.”

ANTH 5126. Anthropology of Learning. (3 cr; Stdnt Opt. +EDPA 5126) Cross-cultural perspectives in examining educational patterns, and the implicit and explicit cultural assumptions underlying them; methods and approaches to cross-cultural studies in education.

ANTH 5221. Anthropology of Material Culture. (3 cr; A-F or Aud) Material culture as a social creation, studied from multiple perspectives (e.g., social anthropology, archaeology, primatology). Conceptions of how humans articulate with material world they construct.


ANTH 5269. Analysis of Stone Tool Technology. (4 cr; A-F or Aud. Prereq-1001 or 3001 or #) Practical lab experience. How to analyze archaeological collections of stone tools to learn about human technological behavior in past. Students analyze archaeological/experimental collections, make stone tools themselves.


ANTH 5401. The Human Fossil Record. (3 cr; A-F only + ANTH 3401, Prereq-1001 or #) Fossil evidence and paleoanthropologists use to reconstruct human evolutionary history. Taxonomy, phylogeny, behavior, ecology, tool use, land use, and biogeography. Examination of fossil casts, readings from primary/secondary professional sources.

ANTH 5403. Quantitative Methods in Biological Anthropology. (3 cr; A-F only. Prereq-Basic univariate statistics course or #) Quantitative methods used by biological anthropologists. Applying these methods to real anthropological data. Lectures, complementary sessions in computer lab.


ANTH 5422. Anthropologies of Citizenship and Nationalism. (3 cr; A-F only. Prereq-3xxx course in [anthropology or related discipline]) Why/how citizenship and nationalism have been constructed over time as a force of cultural identity/belonging in contexts of power and difference. Discussion of citizenship theory. Defining an anthropological approach to citizenship.


ANTH 5446. Archaeology of Representation as Communication. (3 cr; A-F only) Seminar. Uses of paintings, sculptures, drawings, and photographs as means of communication, from earliest representations of 30,000 years ago to present day.

ANTH 5525. Understanding Cultures for Social Science Professionals. (3 cr; A-F only) Culture in a globalized world. How anthropological concept of culture can help social service professionals understand and engage with people from diverse backgrounds.

ANTH 5980. Topics in Anthropology. (3 cr; max 6 cr; Stdnt Opt) Topics specified in Class Schedule.

ANTH 5990. Topics in Archaeology. (3 cr; max 9 cr; A-F or Aud. Prereq-#) Topics specified in Class Schedule.

ANTH 8001. Ethnography, Theory, History. (5 cr; A-F or Aud) Introduction to foundational concepts, methods, and ethnographic work. Emphasizes theories that have shaped 20th-century thinking in cultural anthropology. Connection of these theories to fieldwork and contemporary issues.


ANTH 8005. Linguistic Anthropology. (3 cr; Stdnt Opt) Introduction to literature of anthropological linguistics.

ANTH 8120. Problems in Culture Change and Applied Anthropology. (3-6 cr; max 6 cr; Stdnt Opt) Comparative studies of change in cultural systems. Impact of global processes on local cultures. Roles of anthropology and anthropologists in policy, planning, implementation, and evaluation.

ANTH 8201. Humans and Nonhumans: Hybrids and Collectives. (3 cr; Stdnt Opt) Social life as consisting of relationships not only among human beings, but also between humans and nonhumans: animals, plants, environments, technologies, etc. Focuses on figure of hybrid, its role in formations of collective life.

ANTH 8203. Research Methods in Social and Cultural Anthropology. (3 cr; Stdnt Opt. Prereq-Grad anth major or #) Classic and current issues in research methodology, including positivist, interpretivist, feminist, and postmodernist frameworks. Methodology, in the broadest sense of the concept, is evaluated. Students conduct three research exercises and set up an ethnographic research project.

ANTH 8205. Economic Anthropology. (3 cr; Stdnt Opt. +ANTH 4055) Theoretical foundations of economic anthropology examined through critical readings of traditional, classical, and contemporary authors. Ethnographic puzzles of material life and issues of ecological degradation, development, market expansion, gender, and transglobal processes.

ANTH 8207. Political and Social Anthropology. (3 cr; Stdnt Opt) Western concepts of politics, power, authority, society, state, and law. Cross-cultural approaches to these concepts in historical perspective. Major theoretical frameworks and current problems and positions in social and political anthropology. Ethnographic classics and new directions.

ANTH 8209. Psychological Anthropology. (3 cr; Stdnt Opt. +ANTH 4021) Self, emotion, cognitive processes, and child development in cross-cultural perspective.


ANTH 8213. Ecological Anthropology. (3 cr; Stdnt Opt. +ANTH 3041, ANTH 5041) Seminar on method, theory, and key problems in ecological anthropology. Emphasizes approaches in light of human practices, interactions between culture and the environment, global environmental change, and our understanding of human dimensions of ecosystem-based management.

ANTH 8215. Anthropology of Gender. (3 cr; Stdnt Opt. Prereq-Grad anth major or #) Comparative, cross-cultural approach to gender. Focuses on various theories (e.g., feminist, postmodernist, psychoanalytic) of power, gender, authority, and femininity and masculinity. Gender ambiguity and issues of sexuality.

ANTH 8219. Grant Writing. (2 cr; Stdnt Opt. Prereq-Grad anth majors preparing to submit research grant proposals next academic yr) Students draft a research proposal in their area of interest. Seminar involves reading and evaluating proposals, learning about funding and process of submitting proposals, nuts of bolts of composing a proposal, and ethics of research in anthropology.

ANTH 8211. Nature, Culture, and the Body. (3 cr; Stdnt Opt.)

The body as a site for thinking through issues of power, modernity, subjectivity, citizenship, race, sex, gender, sexuality, and life/death. The body in relation to classic concerns in anthropology about production of nature/culture, sex, gender, kinship, and social practice.

ANTH 8250. Development and Management of Anthropological Research Projects. (1 cr [max 4 cr]; A-F or Aud. Prereq-Anth grad student or #) Training seminar on research development, coordination, grant management, field/labatory research management, and fundraising.


ANTH 8333. FTE: Masters. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

ANTH 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

ANTH 8510. Topics in Archaeology. (3-9 cr [max 9 cr]; Stdnt Opt) Seminar examines particular aspects of archaeological methods and/or theory. Topics vary according to student and faculty interests.

ANTH 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

ANTH 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])

ANTH 8810. Topics in Sociocultural Anthropology. (3-9 cr [max 9 cr]; Stdnt Opt) Seminar examines particular aspects of method and/or theory. Topics vary according to student and faculty interests.

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

ANTH 8911. Independent Study. (1-18 cr [max 18 cr]; Stdnt Opt. Prereq—#) Under special circumstances and with instructor approval, qualified students may register for a listed course on a tutorial basis.

ANTH 8992. Directed Reading. (1-18 cr [max 18 cr]; Stdnt Opt. Prereq—#)

ANTH 8993. Directed Study. (1-18 cr [max 18 cr]; Stdnt Opt. Prereq—#)

ANTH 8994. Directed Research. (1-18 cr [max 18 cr]; Stdnt Opt. Prereq—#)

Applied Economics (APEC)

Department of Applied Economics

College of Food, Agricultural and Natural Resource Sciences


APEC 5151. Applied Microeconomics: Firm and Household. (3 cr; Stdnt Opt. Prereq-3001 or Math 1271 or Math 2243 or equiv or grad student or #) Quantitative techniques for analysis of economic problems of firms and households. Links between quantitative tools and economic analysis Regressions analysis, mathematical programming, and present value analysis.

APEC 5152. Applied Macroeconomics: Income and Employment. (3 cr; Stdnt Opt. Prereq-3001 or Math 1271 or Math 2243 or equiv or grad student or #) Static general equilibrium open economy models and simple business cycle models that examine economic growth, business cycles, and fiscal and monetary policy. Input-output analysis and large scale econometric models. Sources/properties of economy and sector-wide data. Empirical applications.


APEC 5541. Public Finance. (3 cr; A-F or Aud. Prereq-3001 or Econ 3101 or PA 5021) Which services should the public sector provide? Which level of government should provide them? How should governments fund those services? Which types of taxes should be levied and on whom? Applying economic theory/analysis to spending, revenue, and tax policy issues facing governments.


APEC 5551. Economics of Natural Resource and Environmental Policy. (3 cr; Stdnt Opt. Prereq-[[5001 or Econ 3101], LE61 or Econ 361 or NRES 3261W] or #) Economic analyses, including project evaluation of current natural resource/environmental issues. Emphasizes intertemporal use of natural resources, optimal use of wildlife, natural resource scarcity/adequacy, environmental quality, and mechanisms for pollution control and their implications for public policy.

APEC 5711. U.S. Agricultural and Environmental Policy. (3 cr; Stdnt Opt. Prereq-3001 or Econ 3101) U.S. agricultural policy in an open world economy; role of private markets and government in regulating supply and demand; income vs. price support, supply controls, environmental constraints, and export protectionism; functioning of markets; roles of public interest groups and future of American agricultural policy.

APEC 5721. Economics of Science and Technology Policy. (3 cr; Stdnt Opt. Prereq-[[5151 or &5151], PA 5022] or #) Economics of technical change, research, and technology. Productivity. Methods for evaluating impacts of R&D. Intellectual property rights.


APEC 5811. Cooperative Organization. (3 cr; Stdnt Opt. Prereq-3001 or Econ 3101 or PA 5021 or #) Application of economic analysis to cooperative form of organization. Producer/consumer cooperatives used to examine economic issues such as changing market organization, financing, management incentives, taxation, and antitrust regulations. Cooperatives as a tool for economic development.

APEC 5891. Independent Study: Advanced Topics in Farm and Agribusiness Management. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq—#) Special topics or individual work suited to the needs of particular groups of students.
**Course Descriptions**

**Applied Plant Sciences (APSC)**

**College of Food, Agricultural and Natural Resource Sciences**

APSC 8123, Research Ethics in the Plant and Environmental Sciences. (5 cr; S-N or Aud. +PLPA 8123, SOIL 8123, Prereq-Grad student) Ethics training to graduate students enrolled in plant/ environmental graduate research programs and fulfill requirement for training in responsible conduct of research. Course meets during first seven weeks of spring semester.

APSC 8335, FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

APSC 8444, FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

APSC 8666, Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 1 cr for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

APSC 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])

APSC 8888, Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

**Arabic (ARAB)**

**Department of African American and African Studies**

**College of Liberal Arts**

ARAB 5001. Research Methods in Arabic Studies. (3 cr; Stdnt Opt) Skills and techniques required to deal with medieval and modern works in Arabic literature and Islam. A survey of the most important research bibliographies in Arabic and Islamic studies. Bibliographic references in English and, when appropriate, Arabic.


ARAB 5010. Advanced Arabic I. (3 cr [max 4 cr]; Stdnt Opt. Prereq-5010 or equiv or #) Advanced readings in classical and modern Arabic. Compositions based on texts.


ARAB 5491. Classical Islamic Civilization. (3 cr; Stdnt Opt. +ARAB 5491, HIST 5491, MELC 5491) Islamic legacy in the classical age (800-1400), including medical/natural sciences, mathematics, philology, literature, and their transmission to Europe.

ARAB 5501. Modern Arabic Poetry in Translation. (3 cr; Stdnt Opt) Free verse movement and its major trends: post-romantic, social realist, symbolist, resistance, prose poem. Emphasizes leading poets such as al-Mala’ika, al-Sayyab, al-Bayati, and Adonis. Theoretical/critical essays. All readings in English.


ARAB 5503. Arabic Drama in Translation. (3 cr; Stdnt Opt) Emergence and development of drama as a European-inspired genre in Arabic literature. Emphasizes major trends and playwrights. All readings in English.

ARAB 5505. Survey of the Middle East. (3 cr; Stdnt Opt. +ARAB 5505, HIST 5505, MELC 5505) Peoples, lands, and cultures of the Middle East. Historical survey from earliest civilizations to the present.


ARAB 5542. Medieval Islam. (3 cr; Stdnt Opt. +HIST 5542, MELC 5542) Islamic dynasties, Mamulks and Mongols, and Crusaders and Assassins. Abbasid Caliphate’s disintegration and rise of Seldjuk Turks.

ARAB 5543. Arabs Under Mamluks and Ottomans: 1300-1920. (3 cr; Stdnt Opt. +ARAB 5543, HIST 5543, MELC 5543) Struggle against Crusaders and Mongols. Disintegration and reemergence under Muhammad Ali of Egypt; dynamic struggles in Syria; rise of Young Turks; Arab revolt.

ARAB 5544. Arab World 1920 to the Present. (3 cr [max 4 cr]; Stdnt Opt. +ARAB 5544, HIST 5544, MELC 5544) Struggle in the Arab world for independence and its course since independence. Emphasis on development, political stability and unity; political structures; the Arab-Israeli conflict.


ARAB 5900. Topics in Arabic Literature and Culture. (5 cr [max 9 cr]; Stdnt Opt. Prereq-5900 or #) Readings and discussion of selected works in Arabic. Topics specified in Class Schedule.


ARAB 8333, FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

**Aramaic (ARM)**

**Department of Classical and Near Eastern Studies**

**College of Liberal Arts**

ARM 5011. Biblical Aramaic and Old Aramaic Inscriptions. (3 cr; Stdnt Opt. Prereq-1 yr Hebrew or Arabic or #) Biblical Aramaic -- grammar, fluency in reading Biblical Aramaic and Old Aramaic inscriptions.

ARM 5012. Syriac. (3 cr; Stdnt Opt. Prereq-1 yr Hebrew or Arabic or #) Emphasis on fundamentals of grammar and reading Syriac texts fluently.

**School of Architecture**

**College of Design**

ARCH 5101. Architectural Design Studies. (7 cr; S-N only. Prereq-3-5 track for MArch) Principles/methods architecture design. Theories, history, technologies, media, and processes as foundation for critical thinking. Analytic modeling, visual thinking.

ARCH 5110. Architecture as Catalyst. (1-3 cr [max 5 cr]; S-N only. Prereq-M.Arch) Topical workshops on design methods, theories, or emerging practices.

ARCH 5123. Architectural Thesis. (8 cr; A-F or Aud. Prereq-S122, 5241, BA Arch major; students must submit thesis plan in semester before writing thesis) Student’s choice, study and solution of an architectural problem to demonstrate proficiency in all phases of design.


ARCH 5291. Accelerated Undergraduate Architecture Studio I. (9 cr; A-F or Aud. Prereq-#) Selected architectural problems developed by faculty to deepen/enrich ideas introduced in required architectural studio sequence.

ARCH 5292. Accelerated Undergraduate Architecture Studio II. (6 cr; A-F or Aud. Prereq-[5291, accelerated status] or #) Architectural problems. Emphasizes development of structures as integral part of design, site planning, design process.

ARCH 5301. Conceptual Drawing. (3 cr; A-F only. Prereq-M.Arch major or #) Drawing as way of analyzing, exploring, and generating design ideas. Projection systems, diagramming, mapping. Various modes of visual perception. Nonverbal structures.

ARCH 5311. Theory of Architectural Representation. (3 cr; A-F or Aud. +ARCH 4311, Prereq-[5371, 5372, M.Arch] or instr consent) Integration of emerging computer graphics with photography and architectural graphic conventions. Historical, theoretical, and critical issues of representation. Influence of visual media on architectural field.

ARCH 5313. Visual Communication Techniques in Architecture. (3 cr; A-F or Aud. +ARCH 4313, Prereq-M.Arch major or instr consent) Delineation, presentation, and design techniques. Various visual media and methods of investigation.
ARCH 5321. Architecture in Watercolor. (3 cr; A-F or Aud. =ARCH 4321. Prereq–M Arch grad student or #) Watercolor as a tool in design process. Foundation principles, techniques, medium, tools, materials. Color relationships, mixing, composition, applications to design.

ARCH 5350. Topics in Architectural Representation. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–[5321, Arch major or M. Arch major] or #) Selected topics in architectural representation.

ARCH 5361. 3-D Computer Architectural Modeling and Design. (3 cr; A-F or Aud. =ARCH 4361. Prereq–M Arch major) Use of 3D computer modeling for representation in abstract/realistic ways. Computer modeling software. Creation/arrangement of objects, setting up lighting, developing surface materials, creating still renderings/animations. Ways in which computer visualization can be used for design exploration, for feedback during development of ideas, and for realistic representation of fully formed designs.

ARCH 5371. Computer Methods I. (1 cr; S-N or Aud. =LA 5371. Prereq–Concurrent enrollment 8251, M Arch major or #) Introduction to current techniques, computer programs, and their application to architectural computing.

ARCH 5372. Computer Methods II. (1 cr; S-N or Aud. =LA 5372. Prereq–5371, &8252 and M Arch major or #) Current techniques, computer programs, and their application to architectural computing and design.

ARCH 5373. Computer Methods III. (1 cr; S-N or Aud. =LA 5373. Prereq–5372, &8253, M Arch major or #) Advanced techniques, computer programs, and their application to analytical/numerical design computing in design, theory, and technology.

ARCH 5374. Computer Methods IV. (1 cr; Stdnt Opt. Prereq–5373, &8254, M Arch major or #) Advanced computational design in the fields of design, history, theory, representation, and technology.

ARCH 5381. Introduction to Computer Aided Architectural Design. (3 cr; A-F or Aud. Prereq–Arch or BED or M Arch or grad student in LA or #) 2-D drawing, 3-D modeling/animation, printing, plotting. Electronic networking/communications, database management, spreadsheet analysis, land-use analysis, project management.

ARCH 5382. Computer Aided Architectural Design. (3 cr; A-F or Aud. Prereq–5381 or arch grad major or #) 2-D/3-D CAD, image manipulation. Advanced multimedia visualization techniques for design, including solid modeling, photo-realistic imaging, animation, video-editing/recordings.

ARCH 5410. Topics in Architectural History. (5 cr [max 12 cr]; A-F or Aud. Prereq–M Arch major or #) Advanced study in architectural history. Readings, research, seminar reports.

ARCH 5411. Principles of Design Theory. (3 cr; A-F or Aud. Prereq–M Arch major or #) Principles of design and their instrumentation. How and why architecture theory is generated. Types and significance of formal analysis. Theoretical positions and modes of criticism.

ARCH 5421. Architecture and Interpretation: The Cave and the Light. (3 cr; A-F only. =ARCH 4421W. Prereq–[3411, 3412] or #) Historical/hermeneutical investigation of iconography of groups, architectural themes of descent into earth and ascent to light, from earliest strata of human culture to present day.

ARCH 5423. Gothic Architecture. (3 cr; A-F or Aud. =ARCH 4423. Prereq–M Arch major or #) History of architecture and urban design in Western Europe, from 1150 to 1400.

ARCH 5424. Renaissance Architecture. (3 cr; A-F or Aud. =ARCH 4424. Prereq–M Arch major or instr consent) History of architecture and urban design in Italy from 1400 to 1600. Emphasizes major figures (Brunelleschi, Alberti, Bramante, Palladio) and evolution of major cities (Rome, Florence, Venice).

ARCH 5425. Baroque Architecture. (3 cr; A-F or Aud. =ARCH 4425. Prereq–M Arch major or instr consent) Architecture and urban design in Italy from 1600 to 1750. Emphasizes major figures (Bernini, Borromini, Cortona, Guarini) and evolution of major cities (Rome, Turin).


ARCH 5431. Eighteenth-Century Architecture and the Enlightenment. (3 cr; A-F or Aud. =ARCH 4431W. Prereq–M Arch grad student or #) Architecture, urban planning, and garden design in Europe and America from 1650 to 1850.

ARCH 5432. Modern Architecture. (3 cr; A-F or Aud. =ARCH 4432. Prereq–M Arch major or instr consent) Architecture and urban design in Europe and the United States from early 19th century to World War II.

ARCH 5434. Contemporary Architecture. (3 cr; A-F or Aud. =ARCH 4434. Prereq–M Arch major or instr consent) Developments, theories, movements, and trends in architecture and urban design from World War II to present.

ARCH 5439. History of Architectural Theory. (3 cr; A-F or Aud. =ARCH 4439. Prereq–M Arch major or instr consent) History of architectural theory from antiquity to 20th century.

ARCH 5445. Suburbia. (3 cr; A-F only. =ARCH 4445W) Suburbia, from origins in 18th-century England to present. Historical changes and present challenges, especially in America. Ideology, mythology, planning, development, geography, transportation, the family. Specific site/designs. Representations in film, television, popular literature, and music.


ARCH 5450. Topics in Architectural Theory. (1-3 cr [max 9 cr]; A-F or Aud. Prereq–Arch/Arch major or M Arch major or #) Selected topics in architectural theory and criticism.

ARCH 5451. Architecture: Defining the Discipline. (3 cr; A-F or Aud. Prereq–M Arch major or #) Architecture as a discipline: its nature, role, purpose, and meaning discussed within a general, philosophical, and theoretical framework. Investigation and discussion of paradigms defining architectural theory and practice.
Course Descriptions

ARCH 5514. Environmental Technology II: Lighting and Acoustic Design. (3 cr; A-F or Aud. Prereq–M Arch major or #) Principles of daylighting, electric lighting, and acoustic design in architecture. Relationship between luminous and acoustic environments, human comfort and architectural experience. Analytical methods, design process, and modeling of daylighting.


ARCH 5516. Technology Two: Luminous and Thermal Design. (6 cr; A-F only. Prereq–M Arch) Concepts/principles of daylighting, thermal, energy, and systems integration. Architectural/technological implications of lighting and thermal design. Ecological thinking in support of sustainable design decision making.


ARCH 5521. Material Investigation: Concrete. (4 cr; A-F only. Prereq–M Arch or MS) Design projects identify common problems/improvements, investigate alternatives, and develop solutions where concrete is primary building material.

ARCH 5523. Material Investigation: Steel and Glass. (4 cr; A-F only. Prereq–Grad student) Design projects identify common problems and improvements, investigate alternatives and develop solutions where steel and glass are the primary building materials.

ARCH 5525. Design in Masonry. (3 cr; A-F or Aud. Prereq–5510, M Arch major or #) Design principles, construction methods, and document production for masonry structures.

ARCH 5527. Material Investigations: Stone and Water. (4 cr; A-F only. Prereq–M Arch or M.S) Design projects identify common problems/improvements, investigate alternatives, and develop solutions where wood is primary building material.

ARCH 5539. Daylighting and Architecture Design. (3 cr; A-F or Aud. Prereq–5514, M Arch major or #) Role of daylighting in architectural design: principles, strategies, energy and environmental issues, psychology of light, color, and integration of electric lighting. Design projects investigate qualitative and quantitative issues through drawing, physical models, and photometric analysis.

ARCH 5550. Topics in Technology. (1-4 cr [max 12 cr]; A-F only. Prereq–M Arch major) Selected topics in architecture technology, e.g., construction, environmental management, energy performance, lighting, materials.


ARCH 5572. Architectural Structures II: Concrete and Masonry Design. (3 cr; A-F or Aud. Prereq–5571, M Arch major or #) Overview of advanced materials: reinforced fiberglass, structural glass, and structural textile fabrics. Impact of construction technology on architecture and methods of integrating knowledge of structural materials and construction methods into the design process.

ARCH 5611. Design in the Digital Age. (3 cr; A-F or Aud. Prereq–Grad student or upper level undergrad student) Introduction to design, design process. Developing/understanding ways of seeing, thinking, and acting as a designer. Changes in design being wrought by digital technology. Team design project.

ARCH 5621. Professional Practice in Architecture. (3 cr; A-F or Aud. Prereq–M Arch major or #) Legal, ethical, business, and practical requirements of architectural practice. Contemporary and historical models of contract formation, business principles, accounting, project management, design services, and marketing.

ARCH 5631. Legal Contracts in Architecture. (3 cr; A-F or Aud. Prereq–M Arch major or #) Legal subject matter relevant to the work of architects and design professionals.

ARCH 5645. Real Estate Development in Architecture. (3 cr; Stdnt Opt. Prereq–For undergrads BA Arch major; for grad M Arch major or #) Fundamentals of real estate development and investment building. Processes and rules of specialists in development of real estate. Topics include pro forma value and depreciation, tax shelter, feasibility, market analysis, appraisal equity financing, design, construction, leasing, and property management.

ARCH 5650. Topics in Architectural Practice. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–5621, Arch major or #) Topics in architectural practice, methods of design production, marketing, operation, and relationships among clients, architects, and society.

ARCH 5670. Topics in Historic Preservation. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq–Arch or M Arch major or #) Selected topics in the theory, philosophy, research, and methods of architectural historic preservation.

ARCH 5671. Historic Preservation. (3 cr; Stdnt Opt. Prereq–5412 or #) Philosophy, theory, and origins of historic preservation. Historic archaeology and research, descriptive analysis, and documentation of historic buildings. Government’s role in historic preservation, preservation standards and guidelines, preservation and building codes, neighborhood preservation, preservation advocacy, and future directions for historic preservation. Research on architectural and historical aspects of historic sites using primary and secondary resources and on controversial aspects of preservation.


ARCH 5673. Historic Building Research and Documentation. (3 cr; Stdnt Opt. Prereq–5412, 5672 or #) Philosophy, theory, and methods of historic building research, descriptive analysis of buildings, building documentation, historical archaeology, and architectural history.

ARCH 5711. Design Principles of the Urban Landscape. (3 cr; A-F or Aud. Prereq–BED major or M Arch major or LA grad major or grad student or #) Art/design of creating city, neighborhood, and development plans. Public policies, planning tools/processes, and typology models used by design professionals and private/civic institutions to shape physical environment.

ARCH 5721. Proseminar in Metropolitan Design. (3 cr; A-F or Aud. LA 5721. Prereq–[(5711 or equiv), enrollment in CMD prog] or #) Reading seminar. Evolution of the contemporary city. Dynamics that created contemporary urban spatial patterns. Planning/design theories that have guided public interventions in the built environment. Thematic texts, classroom discussions.

ARCH 5750. Topics in Urban Design. (1-4 cr [max 4 cr]; A-F only) Special topics in theory/practice of urban design.

ARCH 5770. Field Studies in Urban Design. (2-6 cr [max 6 cr]; A-F only) Travel study of urbanism through guided field trips and lectures by local experts. Relationship between built environment, land, water, and transit. Planning and development policies. On-site graphic documentation and analysis. Design or written papers.

ARCH 5790. Special Topics in Metropolitan Design. (3 cr [max 6 cr]; A-F or Aud. LA 5790. Prereq–Enrollment in CMD prog or #) Directed study. (1-4 cr [max 8 cr]; A-F or Aud. Prereq–#) Guided individual reading or study.

ARCH 8101. Subjects and Methods in Architecture. (2 cr; S-N or Aud. Prereq–Grad Arch major or #) The discipline of architecture.

ARCH 8250. Graduate Architectural Design I. (9 cr; A-F or Aud. Prereq–M Arch or #) Design projects focus on fundamental issues of space/forms/light/materiality in relation to human habitation. Design as a process of exploration/inquiry. Modes of media representation, their critical impact.

ARCH 8251. Advanced Topics in Design. (1-6 cr [max 6 cr]; S-N or Aud. Prereq–Admitted to 3+2 track for M Arch prog or #) Design studio.

ARCH 8251. Graduate Architectural Design I. (9 cr; A-F or Aud. Prereq–M Arch or #) Design projects focus on fundamental issues of space/forms/light/materiality in relation to human habitation. Design as a process of exploration/inquiry. Modes of media representation, their critical impact.

ARCH 8252. Graduate Architectural Design II. (6 cr; A-F or Aud. Prereq–8251, grad Arch major or #) Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort.

ARCH 8253. Graduate Architectural Design III. (9 cr; A-F or Aud. Prereq–[8251, M Arch] or #) Issues of design process, representation, programming, technology, and urban relations.

ARCH 8254. Technical Applications in Design. (4 cr [max 8 cr]; A-F or Aud. Prereq–[8253, M Arch] or #) Design potential inherent in technical development process of design project. Testing concepts, developing details, integrating building systems. Structural bay enclosure, cost considerations, regulatory compliance, Building-information modeling, analog/digital representations in architecture document production.
ARCH 8255. Graduate Architectural Design V, (6 cr [max 12 cr]; A-F or Aud. Prereq–8254, grad Arch major or #) Fundamental architectural problems involving design as a creative inquiry. Individual/collaborative effort.

ARCH 8295. Directed Graduate Architectural Design, (6 cr; A-F or Aud. Prereq–8251, grad Arch major or #)

ARCH 8299. Master’s Design Project, (10 cr; A-F only, Prereq–Plan C, MArch) Final studio project for Plan C master’s. Measures knowledge of architecture and ability to conduct research for design proposal, communicate in visual/ written representations. Proposal, graphic presentation of project.

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

ARCH 8350. Advanced Topics in Representation, (1-3 cr [max 3 cr]; A-F or Aud. Prereq–Grad Arch major or #) Theory and practice of visual representation in architecture.

ARCH 8450. Topics in Theory, (1-3 cr [max 3 cr]; A-F or Aud. Prereq–5411, grad Arch major or #)

ARCH 8494. Directed Research in Architectural History, (1-3 cr [max 3 cr]; A-F or Aud. Prereq–Grad Arch major or #) Special topics in theory/practice of architecture technologies.

ARCH 8550. Topics in Technology, (1-3 cr [max 3 cr]; A-F or Aud. Prereq–Grad arch major or #) Special topics in theory/practice of architectural technologies.

ARCH 8561. Sustainable Design Theory and Practice, (5 cr; A-F only, Prereq–[5513, grad MS or MArch]) History, theory, and ethics of sustainable design processes/practices. Emphasizes approaches to sustainable architecture. Regional/global ecological issues, design strategies, methods of assessment. Primary architectural/technological implications of sustainable design theory/practice that inform design thinking/research. Sustainable design issues. Research projects, case studies, fieldwork.


ARCH 8566. Materials Performance in Sustainable Building, (3 cr; A-F only. Prereq–[5512, grad MS or March] or #) Building material properties, resource conservation, fabrication/construction processes in production of high performance sustainable building designs. Application of assessment/evaluation tools (LCA, BEE, Athena or LEEED) for IEQ, waste reduction and management with an emphasis on experimental/ analytic methods. Aesthetic/technical solutions that integrate design selection processes, construction methods, commissioning processes, and facility management, maintenance, and decommissioning.

ARCH 8567. Site and Water Issues in Sustainable Design, (3 cr; A-F only. Prereq–[5512, grad MS or MArch student] or #) Site, water and site/building integration aspects of sustainable design. Ecological principles, site analysis. Water/site/building integration strategies, methods and tools integrated with sustainable design issues such as energy, indoor environmental quality, and materials. Research projects, case studies, measurement methods.

ARCH 8569. Topics in Architectural Practice, (1-3 cr [max 3 cr]; A-F or Aud. Prereq–Grad Arch major or #)

ARCH 8750. Topics in Urban Design, (1-3 cr [max 3 cr]; A-F or Aud. Prereq–Grad Arch major or #)

ARCH 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])

Art (ARTS)

Department of Art
College of Liberal Arts

ARTS 5104. The Nature of Abstraction, (4 cr; Stdt Opt. Prereq–3102 or #) Exploration of abstraction as concept. Studio practice with attention to developing individual work. Emphasizes understanding topics relevant to abstraction. Approached from discipline of painting, open to various material sensitivities.


ARTS 5106. Advanced Drawing: Interpreting the Site, (4 cr; Stdt Opt. Prereq–3106 or #) Search for personal content as inspired by site. Field trips (2/3 of course) to draw or paint from various metropolitan area locations. Interpretations enhanced by experimentation with new marks/symbols.


ARTS 5120. Advanced Painting, (4 cr [max 12 cr]; Stdt Opt. Prereq–3120 or #) Developing personal vision/content through painting. Emphasizes critical thinking, self-evaluation, and independent pursuit of ideas.


ARTS 5320. Advanced Sculpture: Spatial Problems, (4 cr [max 12 cr]; Stdt Opt. Prereq–3320 or #) Sculptural practice outside traditional media/approaches. Installation, theater, public art, architecture as topics for individual investigations into spatial organization.


ARTS 5403. Women’s Images and Images of Women, (3 cr; Stdt Opt. +ARTS 5403. Prereq–1001 or #) Women’s place in Western art from the artist’s perspective. Women as artists and the imagery they have created. Women as the object of imagery and the social and political attitudes those images convey. Survey of women artists from late-Renaissance through contemporary feminism; relevant issues.


ARTS 5441. Professional Practices, (3 cr; Stdt Opt. Prereq–Grad or #) Intensive writing seminar provides a context for theoretical issues, business practices, and professional skills required for career management and development in the visual arts.

ARTS 5444. Bachelor of Fine Arts Exhibition, (3 cr; S-N only. Prereq–5400, BFA candidate, sr) Final solo or small group exhibition and artist’s statement developed in consultation with faculty adviser. Visual documentation of work and statement as appropriate to media.

ARTS 5454. Workshop in Art, (1-4 cr [max 12 cr]; Stdt Opt) Selected topics and intensive studio activity. Topics vary yearly.
Course Descriptions

ARTS 5510. Advanced Printmaking. (4 cr [max 12 cr]; Stdnt Opt. Prereq-3510 or #)
In-depth research of personal imagery using a broad range of historical and contemporary applications. Development of imagery using color, photo-mechanical, digital processes. Cross-media approaches.

ARTS 5520. Advanced Printmaking: Relief and Lithography. (4 cr [max 12 cr]; Stdnt Opt. Prereq-3502 or #)

ARTS 5550. Advanced Papermaking. (4 cr [max 12 cr]; Stdnt Opt. Prereq-3505 or #)
Distinct expressive qualities of handmade paper, its versatility as contemporary art form. Independent research pursued in consultation with instructor.

ARTS 5610. New Media: Making Art Interactive. (4 cr [max 12 cr]; Stdnt Opt. Prereq-3601 or #)

Individual, advanced, creative projects with narrative forms of video art. Documentary, live action, memoir. Relationships between conceptual, aesthetic, and artistic process.

ARTS 5630. Advanced Experimental Video. (4 cr [max 12 cr]; Stdnt Opt. Prereq-3603 or #)
Experimental approaches in producing digital video within a contemporary art context. Using digital media technologies in installation, performance, and interactive video art. Explores relationships between personal art-making and video theory.

ARTS 5640. Advanced Animation. (4 cr [max 12 cr]; Stdnt Opt. Prereq-3604 or #)

ARTS 5650. Advanced Sound Art. (4 cr [max 12 cr]; Stdnt Opt. Prereq-3605)
Sound art practice/theory. Explores individual creative projects using sound as primary material. History of experimental sound art from early 20th century to present. Critiques, readings, writing, public presentations.

ARTS 5660. The Body Electric: Sensing New Domains for Creative Expression. (4 cr [max 12 cr]; S-N or Aud)
Cultural conceptions of the most personal of new media as hybrid domains of physical/virtual interplay. Readings and discussions of contemporary/historical conceptions of body/machine. Boundaries/membranes, response/reaction. The biological, the computational, the bionic. Advanced projects with interactive, sensing, and programmable technologies.

ARTS 5670. Interdisciplinary Media Collaborations. (5 cr [max 9 cr]; Stdnt Opt. Prereq–Upper-division undergraduate or graduate student in art, creative writing, dance, music or theater)
Interdisciplinary, collaborative artist teams explore modes of creative expression at intersections of the arts. Students collaborate to co-author/produce works of art for public presentation. Explores integration of multimedia art forms with theatrical, music, dance, and theater to produce interdisciplinary/collaborative art.

Studio course. Use of image-based media to document various artistic, site-specific acts that may otherwise go unnoticed. Relationship between original event (performance, social intervention, sculptural prop, ephemeral gesture) and memory trace left in image/record.

ARTS 5710. Advanced Photography. (4 cr [max 12 cr]; Stdnt Opt. Prereq–Two semesters of 3xxx photography)
Design/implementation of individual advanced projects. Demonstrations, lectures, critique. Reading, writing, discussion of related articles/exhibitions.

ARTS 5810. Advanced Ceramics. (4 cr [max 12 cr]; Stdnt Opt. Prereq–3801, 3802, 3810 or #)
Critical discourse of aesthetics. History of, and contemporary issues in clay and ceramic art. Independent, advanced projects.

ARTS 5821. Ceramic Materials Analysis. (4 cr; Stdnt Opt. Prereq–3801 or 3802 or #)
Ceramic materials, their interrelationships. Advanced investigation of glaze development, clay bodies in high-low temperature ranges. Individual interests related to students’ aesthetic needs.


ARTS 5990. Independent Study in Art. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq–Major; selected regular course with instructor)
Individual student designed by student in consultation with instructor.

Tutorial in drawing and/or painting.

ARTS 8300. Sculpture: Theory and Analysis. (3 cr [max 6 cr]; Stdnt Opt)
Theoretical issues of sculpture as understood by practicing sculptors. Research on and discussion of current sculpture in light of historical precedent; personal work relative to contemporary practice.

ARTS 8333. FTE: Master’s. (1 cr; No grade. Prereq–MFA student’s adviser and DGSS consent)

ARTS 8400. Theoretical Constructions in Contemporary Art. (3 cr [max 6 cr]; Stdnt Opt)

ARTS 8401. Studio and Pedagogy: Philosophy and Practice. (3 cr [max 6 cr]; Stdnt Opt)
Orientation to establishing studio practice, introduction of department and community resources, and preparation for teaching. Studio visits and critiques; development of teaching strategies. Required of drawing and painting students.

ARTS 8410. Studio Critique. (3 cr [max 6 cr]; A-F or Aud. Prereq–4400)
Studio based critique to foster critical dialogue about art practice across media/disciplines. Colloquium for ideas/theories that migrate between artistic practices and influence studio work.

ARTS 8420. Seminar: Visiting Artists Program. (2 cr [max 12 cr]; S-N only. Prereq–MFA student)
Introduction to works/ideas of visiting artists/critics. Individual studio critiques, group discussion. Students connect/extend topics to their thesis and supporting paper.

ARTS 8500. Printmaking: Theory and Practice. (3 cr [max 12 cr]; Stdnt Opt)
Focus on the complexities and multi-disciplinary activities of printmaking. Development of concepts and personally significant imagery leading to thesis work.

ARTS 8600. Time and Interactivity: Theory and Practice. (3 cr [max 12 cr]; Stdnt Opt)
Tutorial. Issues related to creative visual work using computer/other technologies. Interactivity, robotics, digitally based conceptual art, time-based art.

ARTS 8700. Photography: Theory and Practice. (3 cr [max 12 cr]; Stdnt Opt)
Contemporary issues in the production of photographic images.

ARTS 8800. Ceramics: Theory and Practice. (3 cr [max 12 cr]; A-F or Aud)
Tutorial emphasizing individual goals and directions. Discussion of aesthetics, history, theory, contemporary issues in clay, and criticism.

Research/studio work in preparation for thesis exhibition and supporting paper.

Art History (ARTH)

Department of Art History

College of Liberal Arts

ARTH 5101. Myths in Art: Cross-Cultural Comparison. (3 cr; A-F or Aud)
Relationships of text/image, efficacy of each in conveying meaning. Properties of visual/verbal communication. Ways in which artists convey mythological meanings, how and why these ways differ according to place/time. Students prepare/ critique visual presentations through Web pages.

ARTH 5103. Hellenistic and Early Roman Art and Archaeology. (3 cr; Stdnt Opt. +CNES 5103. Prereq–Clas/ARTH 3008, jr or #)
Sculpture, architecture, painting, and topography in developing centers of Hellenistic culture in the eastern Mediterranean, and in Etruscan and Roman towns from 400 B.C. to the beginnings of the Roman Empire.

ARTH 5108. Greek Architecture. (3 cr; Stdnt Opt. +CNES 5108. Prereq–ArH/Clas 3008, jr or sr or grad, or #)
Geometric through classical examples of religious and secular architecture and their setting at archaeological sites in Greece, Asia Minor, and Italy.

ARTH 5111. Prehistoric Art and Archaeology of Greece. (3 cr; Stdnt Opt. +CNES 5111. Prereq–Jr or sr or grad student, Greek art/archaeology course or #)
Artistic and architectural forms of Neolithic period in Aegean area and Cycladic, Minoan, and Mycenaean cultures. Aims and methods of modern field archaeology; the record of human habitation in the Aegean area. Archaeological evidence as a basis for historical reconstruction.

Sculpture, painting, architecture and minor arts in Greek lands from the 9th through 5th centuries B.C. Examination of material remains of Greek culture; archaeological problems such as identifying and dating buildings; analysis of methods and techniques. Emphasis on Periklean and Hellenistic architecture and sculpture.

ARTH 5120. Field Research in Archaeology. (3-6 cr [max 6 cr]; Stdnt Opt. +CLCV 5120, CNES 5120. Prereq–#)
Field excavation, survey, and research at archaeological sites in the Mediterranean area. Techniques of excavation and exploration; interpretation of archaeological materials.
ARTH 5172. House, Villa, Tomb: Roman Art in the Private Sphere. (3 cr; Stdnt Opt. +CNES 5172. Prereq: One intro art history course or #) The architecture, painting, and sculpture of urban houses, country estates, and tombs in the Roman World. Relationships between public and private spheres, and literary and physical evidence: usefulness of physical evidence in illuminating gender roles.

ARTH 5182. Art and the State: Public Art in the Roman Empire. (3 cr; Stdnt Opt. + CNES 5182. Prereq: One intro art history course or #) Origins of Roman public art; use in maintaining community; exploitation by the first Emperor, Augustus; development and diffusion through the later Empire; varying capabilities to adjust to the demands of a Christian Empire.

ARTH 5254. Gothic Sculpture. (3 cr; Stdnt Opt. Prereq: Jr or Sr or Grad or #) The origin, character, and development of Gothic sculpture in France, the German empire, and the Netherlands, 1150-1400. Emphasis on French sculpture of the cathedral age and the emergence of a court style in Paris and elsewhere in Europe (e.g. London, Prague).

ARTH 5255. History of Early Christian Art in Context. (4 cr; Stdnt Opt. +CNES 5252. Prereq: One 3xx Art History course or #) The role played by art in the formation of early Christian and Byzantine communities, and in establishing their relationships with the Pagan world and early Islam.

ARTH 5301. Visual Culture of the Atlantic World. (3 cr; A-F or Aud) Visual culture of Atlantic world, from Columbus to American Revolution. Visual objects, practices considered in context of Europe’s colonization of Americas. Slavery, religious conflict, international commerce, production of scientific knowledge addressed in terms of their impact upon visual imagery.

ARTH 5302. Print Culture in Early Modern Europe. (3 cr; A-F or Aud) Cultural history of printed images in Europe from their emergence in 15th century through about 1750. Book illustration, reproductive printmaking, History of print connoisseurship. Prints and scientific knowledge. Role of print culture in major social/political events such as Protestant Reformation.

ARTH 5324. 15th-Century Painting in Northern Europe. (3 cr; Stdnt Opt. Prereq: Jr or Sr or Grad or #) The origin, character, and development of painting in France, the Netherlands, and the German Empire during the years 1350 to 1500. Emphasis on the Flemish school (e.g., Van Eyck brothers, Campin, Van der Weyden) and its influences.


ARTH 5340. Practicum in Archaeological Field and Computer Techniques. (3 cr; Stdnt Opt. + ARTH 5340. CIVL 3340, CNES 5340. Prereq: One course in ancient art/archaeology or #) Methods for excavation of Old/New World sites. Meets at archaeological computer lab for part of semester and at selected site in Minnesota for day-long sessions for 9 to 10 weeks.

ARTH 5411. Gender and Sexuality in Art Since 1863. (3 cr; Stdnt Opt) History of art from late 19th to early 21st century. How gender/sexuality have been central to that period’s artistic production, art criticism, and aesthetic theorization. How gender/sexuality are important themes for artists. How the writing of history reveals assumptions about gender/sex. Critical reading/writing.


ARTH 5463. Early 20th-Century Painting and Sculpture. (3 cr; Stdnt Opt) Primary movements of early 20th century: fauvism, German expressionism, cubism, futurism, dadaism, surrealism, non-objective painting, constructivism, Orthodox, early abstraction. Framed against postimpressionism and internationalism at turn of century.


ARTH 5533. Style, Tradition, and Social Content in American Painting: Colonial Era to 1876. (3 cr; Stdnt Opt) America’s colonial, Revolutionary era, and 19th-century painters’ responses to the influence of European aesthetics. Key American painting types: portraiture, rural genre, and landscape from Copley and Gilbert Stuart to the Hudson River School and the chronicles of the Western frontier.

ARTH 5536. Topical Studies in American Art. (3 cr; Stdnt Opt) Course description varies from year to year, depending on the current research interests of the instructor and the needs and interests of advanced undergraduate and graduate students in modern and American art.

ARTH 5546. American Architecture: 1840 to 1914. (3 cr; Stdnt Opt) American architecture from 1840 to 1914, examined in relation to European precedents and American sociohistorical conditions. Critical attention to problems of style, the architectural profession, vernacular vs. “high” architecture of technology, economics, urbanism, and social reform.


ARTH 5725. Ceramics in the Far East. (3 cr; Stdnt Opt) Selective examination of representative pottery and ceramic wares produced in China, Korea, and Japan from the Neolithic era to modern times. Nearly every major ceramic type is represented.

ARTH 5765. Early Chinese Art. (3 cr; Stdnt Opt) Develop a more effective way to understand the unique qualities of an individual work of art. Concentration is on accessible works of art in local private and museum collections.

ARTH 5766. Chinese Painting. (3 cr; Stdnt Opt) Major works from the late bronze age to the modern era that illustrate the development of Chinese landscape painting and associated literary traditions.

ARTH 5767. Japanese Painting. (3 cr; Stdnt Opt) Japanese pictorial arts from the late tomb period to the modern era; special attention to the development of indigenous traditions.

ARTH 5769. Connoisseurship in Asian Art. (3 cr; Stdnt Opt) A selective examination of representative works of art produced in China from the Neolithic era to the Han Dynasty. Major archaeological sites and examples of art in local collections.

ARTH 5775. Formation of Indian Art: 2500 BCE to 500 CE. (3 cr; Stdnt Opt) Sculpture/architecture, from Indus Valley civilization through Kushana period.

ARTH 5776. Redefining Tradition: Indian Art, 1400 to 1300. (3 cr; Stdnt Opt) India’s art/architecture, from earliest free-standing temples through 13th century. Focuses on temples, associated sculpture. Mural painting, beginnings of Islamic architecture in India.

ARTH 5777. The Diversity of Traditions: Indian Art 1200 to Present. (3 cr; Stdnt Opt) Issues presented by sculpture, architecture and painting in India, from prehistoric Indus Valley civilization to present day.

ARTH 5781. Age of Empire: The Mughals, Safavids, and Ottomans. (3 cr; Stdnt Opt) Artistic developments under the three most powerful Islamic empires of the 16th through 19th centuries: Ottomans of Turkey; Safavids of Iran; Mughals of India. Roles of religion and state will be considered to understand their artistic production.

ARTH 5785. Art of Islamic Iran. (3 cr; Stdnt Opt) Architecture, painting, and related arts in Iran from the inception of Islam (7th century) through the 20th century. Understanding the nature of Islam in Persianate cultural settings and how artistic production here compares to the Islamic world.
Asian Languages and Literatures (ALL)

Department of Asian Languages and Literatures

College of Liberal Arts

ALL 5220. Pedagogy of Asian Languages and Literatures. (1-3 cr [max 9 cr]; A-F only. Prereq—Grad student) Second language acquisition theory, methods, testing, and technology applicable to teaching of modern Asian languages/literatures.


ALL 5276. Liberalism and Its Critics: Global Perspectives. (3 cr; A-F only) Survey of liberal political thought and various critics of it that arose in extreme left/right political perspectives, including those in colonial contexts and within non-Western religious formations, especially Hindu and Muslim.

ALL 5333. Poetry and Power in Early China: Book of Songs and Songs of the South. (3 cr; A-F only) How to read/analyze poems from early anthologies in terms of their display/invocation of different types of cultural power. Power that poems have held over Chinese literary tradition in subsequent millennia, their literary influence/position in intellectual/political lives of Chinese readers. Studies that relate to the poetry and social/material culture.

ALL 5334. Voices From Early China: Book of Songs and Songs of the South. (3 cr; Stdnt Opt. Prereq—Undergraduate major in ALL or grad student or #) Students read/analyze poems from Book of Songs and Songs of the South (ca. 1000-300 B.C.E.). Literary influence, position the poems have held in intellectual, emotional, and political lives of Chinese readers. Historical, cultural, and theoretical studies that relate to the poetry and the voices in it.


ALL 5356. Gender and Sexuality in Chinese Film. (3 cr; Stdnt Opt. Prereq—Upper div undergrad or grad student) How gender/sexuality have been depicted, constructed, and subverted in Chinese cinemas (including mainland China, Hong Kong, Taiwan) from 1930s to present. Weekly film screenings, readings on Chinese film, key works of feminist film theory.
ALL 5357. Chinese Cinematic Realisms. (3 cr; Stdnt Opt)
Various styles of realism in Chinese cinemas (mainland, Taiwan) from silent era to present. Theories of realism, conceptions of "the Real" applied in close readings of major films, placed in historical context. China's negotiation of modernity during 20th century.

ALL 5358. Chinese Revolutionary Cinema. (3 cr; Stdnt Opt)

ALL 5359. Early Shanghai Film Culture. (3 cr; Stdnt Opt)
Shanghai film culture, from earliest extant films of 1920s to the end of Republican Era in 1949. Influences on early Chinese film, from traditional Chinese drama to contemporary Hollywood productions. Effects of leftist politics on commercial cinema. Chinese star system, material film culture.

ALL 5366. The Nation in Modern Chinese Film and Drama. (3 cr; Stdnt Opt, Prereq-Jr or Sr or grad student)
Chinese nationhood as represented/negotiated in film/literature from early 20th Century to present. How China was re-imagined as a modern nation in culture, from republican era to the reform era. How alternative national visions of nationhood arose in Hong Kong and Taiwan.

ALL 5374. Representing the Past: Chinese Myth, Legend, and Ideology. (5 cr; Stdnt Opt)
Analysis of texts that contain early Chinese myths, legends, and historical narratives in their construction of an understandable world. How such materials have been incorporated into different cultural formations from dynasties to periods, into ongoing contemporary popular culture. How they have figured into the construction of China and Chineseess in 20th Century.

ALL 5433. Women's Writing in Premodern Japan in Translation. (3 cr; A-F or Aud)

ALL 5436. South Asian Women Writers. (3 cr; A-F or Aud. Prereq-One 3xxx course in modern [Meiji or later] Japanese language)
Survey of South Asian women's writing, from early years of nationalist movement to present. Contemporary writing includes works by immigrant women. Concerns, arguments, and nuances in works of women writing in South Asia and diaspora.

ALL 5571. Hinduism. (3 cr; Stdnt Opt. + ALL 5671)
Development of Hinduism focusing on sectarian trends, modern religious practices, myths and rituals, pilgrimage patterns and religious festivals, and the interrelationship between Indian social structure and Hinduism.

ALL 5672. Buddhism. (5 cr; Stdnt Opt. + ALL 5672, RELS 5371, RELS 5371)
Historical account of Buddhist religion in terms of its rise, development, various schools, and common philosophical concept. Indian Buddhism compared with Hinduism; Buddhism's demise and revival on the Indian subcontinent.

ALL 5682. Romanticism and Empire: Britain and India. (5 cr; Stdnt Opt)

ALL 5900. Topics in Asian Literature. (5 cr [max 12 cr]; Stdnt Opt)
Topics specified in Class Schedule.

ALL 5920. Topics in Asian Culture. (3 cr [max 12 cr]; Stdnt Opt)
Topics specified in Class Schedule.

ALL 5990. Directed Study. (1-4 cr [max 16 cr]; Stdnt Opt. Prereq.-, %, @)
Individual reading/study, with guidance of a faculty member, on topics not covered in regular courses.

ALL 8001. High Energy Astrophysics. (4 cr; Stdnt Opt. Prereq.-)
Energetic phenomena in the universe. Radiative processes in high energy regimes; supernovae, pulsars, and X-ray binaries; radio galaxies, quasars, and active galactic nuclei.

ALL 8021. Stellar Astrophysics. (4 cr; Stdnt Opt. Prereq.-)
Stellar structure, evolution, and star formation. Emphasizes contemporary research.

ALL 8031. Astrophysical Fluid Dynamics. (4 cr; Stdnt Opt. Prereq.-)

ALL 8041. Comparative Planetology. (4 cr; Stdnt Opt. Prereq.-)
Overview of current knowledge of the solar system. Formation history of protostellar nebula, physical properties of major planetary bodies/moons. Sun and fossils of epochs of planetary system formation: comets, asteroids, minor bodies.

ALL 8051. Galactic Astronomy. (4 cr; Stdnt Opt. Prereq.-)
Content, structure, evolution, and dynamics of Milky Way Galaxy. Emphasizes recent observations from space-ground-based telescopes.

ALL 8061. Radio Astronomy. (4 cr; Stdnt Opt. Prereq.-)

For definitions of course numbers, symbols, and abbreviations, see page 214.

AST 8081. Cosmology. (4 cr; Stdt Opt. Prereq—#) Role of gravity in cosmology. Background, recent research advances.

AST 8110. Topics in Astrophysics. (2-4 cr [max 4 cr]; Stdt Opt. Prereq—#)

AST 8200. Astrophysics Seminar. (1-3 cr [max 3 cr]; Stdt Opt. Prereq—#)

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

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

AST 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

AST 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])

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

AST 8990. Research in Astronomy and Astrophysics. (1-4 cr [max 4 cr]; Stdt Opt. Prereq—#) Research under supervision of a graduate faculty member.

Biochemistry (BIOC)
Department of Biochemistry, Molecular Biology, and Biophysics

College of Biological Sciences


BIOC 5225. Graduate Laboratory in NMR Techniques. (1 cr; S-N only, Prereq—BIOC 8001 or #) Practical aspects of nuclear magnetic resonance (NMR) spectrometry. Hands-on experience with 500/600 MHz instruments. Sample preparation/handling, contamination sources, tube/probe options, experiment selection, experimental procedures, software, data processing.

BIOC 5309. Bioanalytical and Biodegradation. (5 cr; Stdt Opt. =MICE 5309. Prereq—chemistry through organic chemistry, knowledge of wordprocessing, e-mail, access to World Wide Web, access to college-level science library) Assess validity of information on bioanalytical and biodegradation; learn fundamentals of microbial catabolic metabolism as it pertains to biodegradation of environmental pollutants; bioanalytical for specialty chemical synthesis; display of this information on the Web.

BIOC 5522. Biotechnology and Bioengineering for Biochemists. (3 cr; A-F or Aud. =MICB 5522. Prereq—[[Intro biochemistry, i.e. BIOL 2001 or MCB 4111, [BIOL 3301 or MCB 3301] or #] Protein biotechnology. Microorganisms used as hosts for protein expression, protein expression, and engineering methods. Production of enzymes of industrial interest. Applications of protein biotechnology in biotechnology. formulation of therapeutic biopharmaceuticals.


BIOC 5501W. Advanced Metabolism and Its Regulation. (3 cr; Stdt Opt. Prereq—2001 or 4331 or BIOL 2001) Underlying principles that determine metabolism of common/unusual compounds in plants, animals, microorganisms. Regulation of carbon, energy flow in whole organisms.

BIOC 5444. Muscle. (3 cr; Stdt Opt. =PHSL 5444. Prereq—[Bio/Biol 2001 or 4331 or Phsl 3001 or #] Muscle structure/function: molecular mechanism by which force is generated.

BIOC 5557. Introduction to Modern Structural Biology. (4 cr; Stdt Opt. Prereq—[intro biochemistry, intro physics] or physical chemistry or #) Methods employed in modern structural biology to elucidate macromolecular structures. Primary focus on X-ray diffraction, nuclear magnetic resonance (NMR) spectroscopy and mass spectrometry. Principles underlying structural biology and structure/function relationships.


BIOC 5531. Macromolecular Crystallography I: Fundamentals and Techniques. (1 cr; S-N or Aud. Prereq—[One organic chemistry or biochemistry course; two calculus or college physics courses] or instr approval) Macromolecular crystallography for protein structure determination/engineering. Determining macromolecule structure by diffraction.


BIOC 8084. Research and Literature Reports. (1 cr [max 5 cr]; S-N or Aud. Prereq—Grad BMBB major or #) Current developments.

BIOC 8184. Graduate Seminar. (1 cr [max 5 cr]; S-N or Aud. Prereq—Grad BMBB major or DGS consent) Reports on recent developments in the field and on research projects in the department.

BIOC 8213. Selected Topics in Molecular Biology. (4 cr; Stdt Opt. =GCD 8213. Prereq—#) Current topics such as DNA replication, recombination and gene conversion, regulation of gene expression, chromatin structure and transcription, developmental gene regulation, organellar gene expression, RNA splicing, initiation/control of translation, animal viruses, transposable elements, somatic recombination, oncogenes.

BIOC 8216. Signal Transduction and Gene Expression. (3 cr; Stdt Opt. Prereq—BIOC 8001 or #) Cell signaling, metabolic regulation in development. Procaryotic/eucaryotic systems used as models for discussion. Literature-based course.

BIOC 8290. Current Research Techniques. (1-3 cr [max 9 cr]; S-N or Aud. Prereq—Grad BMBB major) Research project carried out in laboratory of a staff member.

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

BIOC 8401. Ethics, Public Policy, and Careers in Molecular and Cellular Biology. (1 cr [max 2 cr]; S-N or Aud. Prereq—Grad student in [BMBB or MCDB&B]) Ethics of scientific investigation from viewpoint of western scientific enterprise. Relationship between science, culture, and public policies. Careers in molecular/cellular biology. Nontraditional career tracks. Invited speakers, case studies, small-group discussions, lectures.

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

BIOC 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)
Biomedical Engineering (BMEN)

Institute of Technology

BMEN 5001. Advanced Biomedical Materials. (3 cr; A-F or Aud. Prereq-3501 or MatS 3011 or grad student or #)

Commonly used biomaterials. Chemical/physical aspects. Practical examples from such areas as cardiovascular/orthopedic applications, drug delivery, and cell encapsulation. Methods used for chemical analysis and for physical characterization of biomaterials. Effect of additives, stabilizers, processing conditions, and sterilization methods.

BMEN 5041. Tissue Engineering. (3 cr; Stdt Opt. Prereq-IT upper div or grad student or med student or #)

Fundamentals of wound healing and tissue repair; characterization of cell-matrix interactions; case study of engineered tissues, including skin, bone marrow, liver, vessel, and cartilage; regulation of biomaterials and engineered tissues.

BMEN 5101. Advanced Bioelectricity and Instrumentation. (3 cr; Stdt Opt. Prereq-[IT upper div or grad student] or #)

Instrumentation, computer systems, and processing requirements for clinical physiological signals. Electrode characteristics, signal processing, and interpretation of physiological events by EOG, EEG, and EMG. Measurement of respiration and blood volume/flow.

BMEN 5102. Bioelectric Measurements and Therapeutic Devices II. (3 cr; Stdt Opt. Prereq-5101 or #)

Theory/application of electrical stimulation in areas of therapeutic/functional nervous system stimulation and pain control, cardiac pacing, defibrillation, tissue healing, and electrotherapy. Safety of electric fields. Electrical tissue impedance measurements.

BMEN 5151. Introduction to BiOMEMS and Medical Microdevices. (2 cr; A-F or Aud. Prereq-IT or grad student or med student)

Design/microfabrication of sensors, actuators, drug delivery systems, microfluidic devices, and DNA/protein microarrays. Packaging, biocompatibility, ISO 10993 standards. Applications in medicine, research, and homeland security.

BMEN 5201. Advanced Biomechanics. (3 cr; Stdt Opt. Prereq-[3501 or equiv.; [IT upper div or grad student]] or #)


BMEN 5212. Tissue Mechanics. (2 cr; A-F or Aud. Prereq-5201 or AEM 5501)

Fundamental principles of continuum mechanics applied to physiological systems. Systematic consideration of individual tissues and organs. Relationships among histology, anatomy, physiology, and mechanical function in these tissues. Changes in mechanical properties related to pathology. Emphasizes tissues in the cardiovascular system.

BMEN 5311. Advanced Biomedical Transport Processes. (3-4 cr [max 4 cr]; Stdt Opt. =CHEN 5753, ME 5351)


BMEN 5351. Cell Engineering. (3 cr; Stdt Opt. Prereq-[2501 or 5501], CSCI 1107, [Math 2243 or Math 3273; IT upper div or grad student or #])

Engineering approaches to cell-related phenomena important to cell/tissue engineering. Receptor/ligand binding. Trafficking/signaling processes. Applications to cell proliferation, adhesion, and motility. Cell-matrix interactions.

BMEN 5371. Biomedical Applications of Heat Transfer in Humans. (3-4 cr [max 4 cr]; Stdt Opt. Prereq-Phsl 3061, Phsl 3071, Phsl 5061)

Overview of physiology underlying thermoregulation in humans, clinical applications of heat transfer in humans, framework for design project.

BMEN 5401. Advanced Functional Biomedical Imaging. (3 cr; A-F or Aud. Prereq-IT upper div or grad student or #)

Functional biomedical imaging modalities. Principles/applications of representative functional imaging technologies that offer high spatial resolution or temporal resolution. Emphasizes principles and methodological foundations of bioluminescent imaging and magnetic resonance imaging. Other functional biomedical imaging modalities.

BMEN 5411. Neural Engineering. (3 cr; A-F or Aud. Prereq-3401 recommended)


BMEN 5421. Introduction to Biomedical Optics. (3 cr; A-F only. Prereq-IT upper div or grad student)

Biomedical optical imaging/sensing principles, laser-tissue interaction, detector design, noise analysis, interferometry, spectroscopy. Optical coherence tomography, polarization, bifringence, flow measurement, fluorescence, nonlinear microscopy. Tours of labs.

BMEN 5444. Muscle. (3 cr; Stdt Opt)

Muscle structure/function: molecular mechanism by which force is generated.

BMEN 5501. Biology for Biomedical Engineers. (3 cr; Stdt Opt. Prereq-Engineering upper div or grad student)


BMEN 5502. Pathobiology of Medical Devices. (3 cr; A-F or Aud. Prereq-IT upper division or grad student)

Biological response to biomaterials presented in context of fundamental principles of cell injury, adaptation, repair, or death. Diversity of medical uses of biomaterials, by organ system. Unique features of specific biological systems in which medical devices are used.

BMEN 5910. Special Topics in Biomedical Engineering. (3 cr; max 6 cr; Stdt Opt)

BMEN 5920. Special Topics in Biomedical Engineering. (2-3 cr [max 6 cr]; Stdt Opt)

BMEN 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

BMEN 8401. New Product Design and Business Development. (4 cr; A-F or Aud. =ENTR 6001, ENTR 6007, ME 8221, OMS 6061. Prereq-[IT grad student or CSOM grad student], some design experience; 8401, 8402 must be taken same yr)

Student teams work with IT and CSOM faculty and company representatives to develop a product concept for sponsoring company. Assignments include concept/detail design, manufacturing, marketing, introduction strategy, profit forecasting, production of product prototype.

BMEN 8402. New Product Design and Business Development. (4 cr; A-F or Aud. =ME 8222. Prereq--ME 8222; 8401)

Student teams work with IT and CSOM faculty and company representatives to develop a product concept for sponsoring company. Assignments include concept/detail design, manufacturing, marketing, introduction strategy, profit forecasting, production of product prototype.

BMEN 8431. Controlled Release: Materials, Mechanisms, and Models. (3 cr; A-F or Aud. =PHM 8431. Prereq-Differential equations course including partial differential equations or #)

Physical, chemical, physiological, and mathematical principles underlying design of delivery systems for drugs. Small molecules, proteins, genes. Temporal controlled release.

BMEN 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

BMEN 8601. Biomedical Engineering Seminar. (1 cr; S-N or Aud)

Lectures and demonstrations of university and industry research introducing students and faculty to methods and goals of biomedical engineering.

BMEN 8602. Biomedical Engineering Seminar. (1 cr; S-N or Aud)

Lectures and demonstrations of university and industry research introducing students and faculty to methods and goals of biomedical engineering.

BMEN 8630. Biomedical Engineering Graduate Student Seminar. (1 cr [max 5 cr]; S-N or Aud. Prereq-Grad BMEn major)

Student presentations of current thesis research or other areas of biomedical engineering.

BMEN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim; oral no required consent for lst/2nd registrations, up to 12 combined cr; 3 for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

BMEN 8710. Directed Research. (1-3 cr [max 3 cr]; Stdt Opt)

BMEN 8720. Internship in Biomedical Engineering. (3 cr; S-N or Aud. Prereq-Grad BMEn major)

Supervised cross lab or industrial experience unrelated to student’s normal academic or employment experience.

BMEN 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])
BPHY 5147. Advanced Physics of Magnetic Resonance Imaging (MRI). (3 cr; Shtdnt Opt. Prereq—BPHY 5147 or #) NMR (nuclear magnetic resonance) and MRI physics, spatial selection and encoding, imaging hardware and system engineering. Imaging sequences, associated contrast/resolution. Recent developments in MRI.


BPHY 5173. Medical and Health Physics of Imaging I. (3 cr; Shtdnt Opt. =TRAD 7173. Prereq—BPHY 5170 or #) Physics of diagnostic imaging: specification/quantification of image quality, X-ray production, image receptors, magnetic resonance imaging, radiation exposure and protection. Special imaging techniques, including mammography, computed tomography, and direct digital image capture.


BPHY 5177. Radiation Therapy Physics Lab: Radiation Physics Basics. (3 cr; A-F only. Prereq—BPHY 5170 or BPHY 5173 or #) This course provides students hands-on experience with Hardware/software used in radiation therapy clinic for physics measurements.

BPHY 5178. Picture Archiving and Communications Systems (PACS). (3 cr; A-F only. Prereq—BPHY 5178 or BPHY 5179 or #) Recent developments in PACS. Distribution of image data over the Internet. Medical imaging and communications standards. XML and DICOM. Methods for the implementation of PACS on personal computers.

BPHY 5190. Special Topics in Biomedical Engineering. (1-4 cr [max 8 cr]; A-F or Aud) Topics in biomedical engineering.

BPHY 5191. Independent Study. (1-3 cr [max 3 cr]; Shtdnt Opt. Prereq—Grad BME or M student) Research or study of a topic determined by interests of student in consultation with faculty supervisor. Requires approval by faculty supervisor and director of graduate studies.

Biomedical Science (BMSC)

Medical School

BMSC 5990. Research: Biomedical Sciences. (0-7 cr [max 2 cr]; S-N or Aud. Prereq—Enrollment in MD/PhD program) Content determined by interest of student in consultation with staff.

Biophysical Sciences (BPHY)

Department of Radiology

Medical School

BPHY 5138. Research Seminar. (1-5 cr [max 5 cr]; S-N or Aud) Topics introduce techniques/goals of biophysical sciences and medical physics. Lectures/demonstrations.

BPHY 5139. Seminar and Journal Club. (1 cr [max 2 cr]; S-N or Aud) Current research/topics related to goals/methods of biophysical sciences and medical physics. Lectures/discussions.


BPHY 5171. Medical and Health Physics of Imaging I. (3 cr; Shtdnt Opt. =TRAD 7171. Prereq—BPHY 5170 or #) Physics of diagnostic imaging: specification/quantification of image quality, X-ray production, image receptors, magnetic resonance imaging, radiation exposure and protection. Special imaging techniques, including mammography, computed tomography, and direct digital image capture.


Bioproducts and Biosystems Engineering (BBE)

Department of Bioproducts and Biosystems Engineering

College of Food, Agricultural and Natural Resource Sciences

BBE 5001. Chemistry of Plant Materials. (4 cr; A-F or Aud. =BEE 4001. Prereq—Grad student or #) Chemical principles underlying structure, properties, processing, and performance of plant materials.

BBE 5023. Process Control and Instrumentation. (3 cr; Shtdnt Opt. =BEE 4023W. Prereq—Grad student or #) Fundamental principles in system dynamics/control. Emphasizes process systems and problems faced by process engineers.

BBE 5095. Special Problems. (1-5 cr [max 5 cr]; Shtdnt Opt. Prereq—#) Advanced individual-study project. Application of engineering principles to specific problem.

BBE 5102. Residential Indoor Air Quality. (3 cr; A-F or Aud. =BEE 5102. Prereq—Grad student or #) Indoor air pollution issues found in residential structures, especially in the north central region of the United States. Pollutant descriptions, including measurement techniques and typical ranges of concentrations. Health effects. Pathways, transport mechanisms. Control strategies including mitigation and prevention.

BBE 5103. Environmental Impacts of Food Production. (3 cr; A-F or Aud. Prereq—intended for non-engineering students. Credit will not be granted if credit has been received for AGET 5203) Crop production intensity, animal raising options, food processing waste alternatives, pest control.

BBE 5121. Safety and Environmental Health Issues in Plant and Animal Production and Processing. (3 cr; A-F or Aud. Prereq—grad student or sr or #; Credit will not be granted if credit has been received for AGET 5212) Safety/health issues in food production, processing and horticultural work environments using public health, injury control, and health promotion frameworks: regulation, engineering, education. Traumatic injury, occupational illness, ergonomics, pesticide health effects, biotechnology, air contaminants.


BBE 5302. Organisms Impacting Bio-based Products. (3 cr; Shtdnt Opt. =BEE 4302. Prereq—Grad student or #) Organisms and their importance to bio-based products: deterioration, control, bioprocesses for benefit.


For definitions of course numbers, symbols, and abbreviations, see page 214.
BEB 5305. Pulp and Paper Technology. (3 cr; Stdnt Opt. Prereq-Grad student or #)

BEB 5312. Pulp and Paper Unit Operations. (4 cr; Stdnt Opt. Prereq-Grad student or #)
   Application of principles of momentum, heat, and mass transfer to unit operations in pulp/paper industry: Fluid transport, filtration, sheet formation, sedimentation, drainage, pressing, heat exchange, evaporation, washing, bleaching, humidification/ drying, chemical/energy recovery. Computer simulation of multiple-stage systems. Online course.

BEB 5314. Papermaking Processes and Process Engineering Laboratory. (3 cr; Stdnt Opt. Prereq-Grad student or #)

   Presented through the Internet. Basic concepts and most frequently used methods in statistical process control, analysis of variances, experiment design, and regression analysis. Online course.

BEB 5333. Off-road Vehicle Design. (3 cr; A-F only. +BEB 4333. Prereq-[[3001, 4303] or [AEM 2021, AEM 3031, [CE 3502 or & CE 3502], upper div IT] or #)
   Mechanics involved in designing/testing off-road vehicle. Vehicle mechanics, traction, and performance. Complexity/modeling of vehicle interaction with soil, muskog, and snow. Students conduct case study or literature review and develop paper for publication.

BEB 5362. Pulping and Bleaching. (4 cr; Stdnt Opt. Prereq-Grad student or #)
   Chemistry/technologies in producing paper-making raw material. Focuses on wood pulp/bleaching, including non-wood fibers and recycled fiber materials. Online course.

BEB 5401. Bioproducts Engineering. (3 cr; A-F or Aud. Prereq-Grad student or #)
   Unit operations of bioproducts engineering/manufacture. Project required.

BEB 5402. Bio-based Products Engineering Lab I. (1 cr; A-F or Aud. +BEB 5402. Prereq-Grad student or #)
   Laboratory exercises in bio-based products engineering.

BEB 5403. Bio-based Products Engineering Lab II. (1 cr; A-F or Aud. +BEB 5403. Prereq-Grad student or #)
   Laboratory exercises in bio-based products engineering.

BEB 5404. Bio-based Composites Engineering. (3 cr; A-F or Aud. +BEB 4404. Prereq-Grad student or #)
   Properties of bio-based composites.

BEB 5407. Bio-based Products Manufacturing and Applications I. (3 cr; Stdnt Opt. +BEB 4407. Prereq-Grad student or #)

BEB 5412. Manufacturing and Applications of Bio-based Products. (4 cr; Stdnt Opt. +BEB 4412W. Prereq-Grad student or #)
   Manufacturing processes, end-use applications of bio-based products.

BEB 5413. A Systems Approach to Residential Construction. (3 cr; Stdnt Opt. Prereq-Grad student or #)
   Dynamic/interrelated issues of energy, moisture control, indoor air quality in residential blgds. Emphasizes design, construction, and operational aspects to provide an energy efficient, durable structure, and healthy living environment. Interaction between moisture and wood products within building system.

BEB 5414. Advanced Residential Building Science. (3 cr. Stdnt Opt. +BEB 4414. Prereq-Grad student or #)
   Building science theory, advanced applications for residential buildings. Focuses on heat/mass transfer.

BEB 5415. Advanced Residential Building Science Lab. (1 cr; A-F or Aud. +BEB 4415. Prereq-Grad student or #)
   Concurrent with 4415. Exercises on advanced applications of heat/mass transfer to predict performance of residential buildings.

BEB 5416. Building Testing & Diagnostics. (2 cr; Stdnt Opt. +BEB 4416. Prereq-Grad student or #)
   Theoretical basis for performance testing. Diagnostics applications for residential structures. Focuses on existing structures and retrofit/remodel applications. Digital differential pressure gauges, blower doors, airflow hoods/grids, duct pressure testing, infrared thermography. Hands-on sessions for equipment use, problem solving.

BEB 5480. Special Topics. (3-6 cr [max 12 cr]; Stdnt Opt. +BEB 4480. Prereq-Gr or grad student)
   Topics specified in Class Schedule.

BEB 5503. Marketing of Bio-based Products. (4 cr; A-F or Aud. +BEB 5503. Prereq-Grad student or #)
   Introduction to marketing function as it relates to current/emerging bio-based products industries (building materials, paper, fuels, etc.). Product positioning, pricing, promotion, and channel management within strategic planning and environmental marketing management.

BEB 5504. Bio-based Products Development and Management. (3 cr; A-F or Aud. Prereq-Grad student or #)
   Concepts of new product development and product management and their application to bio-based products.

BEB 5513. Watershed Engineering. (3 cr; A-F or Aud. Prereq-3023, upper div IT or #)
   Application of engineering principles to managing surface runoff from agricultural, range, and urban watersheds. Design of facilities and selection of land use practices for controlling surface runoff to mitigate problems of flooding and degradation of surface-water quality.

BEB 5523. Ecological Engineering Design. (3 cr; A-F or Aud. +BEB 4523. Prereq-CHEM 1022, [BIOL 3407 or BIOL 3807 or EEB 4068 or LA 3204])
BIE 5011. Introduction to Computer Applications. (3 cr; A-F or Aud)(3 cr; A-F or Aud)

In this course, students will learn to use common computer applications, such as word processors and spreadsheets, to perform tasks related to business and industry. The course will cover topics such as basic word processing, spreadsheet usage, and database management. Students will also learn how to use computers to solve business problems and make informed decisions. Assessments will include assignments, projects, and exams to evaluate students' understanding of course material.

BIE 5014. Database Computer Applications. (3 cr; Stdnt Opt. Prereq–5011 or equiv)

This course focuses on teaching students how to utilize database software to develop, maintain, and prepare reports. Students will learn to create and manipulate databases using software such as Microsoft Access or SQL. The course will cover topics such as data entry, querying, and reporting, as well as more advanced concepts such as forms and reports. Assessments will include assignments, projects, and exams to evaluate students' understanding of course material.

BIE 5015. Integrated Computer Applications in Business and Marketing Education. (3 cr; Stdnt Opt. Prereq–5011, 5012, 5013, 5014 or equiv)

In this course, students will learn how to integrate computer applications into business and marketing education programs. The course will cover topics such as developing lesson plans, incorporating technology in the classroom, and using computer applications to enhance learning. Assessment will be through assignments, projects, and an integrated technology project.

BIE 5016. Web Development in Business. (3 cr; A-F or Aud. Prereq–5011 or equiv, CI 5362)

This course introduces students to web development techniques, including scripting languages and basic web development tools. Students will learn to develop interactive informational, instructional, and e-commerce sites. The course will cover topics such as HTML, CSS, and JavaScript. Assessments will include assignments, projects, and exams to evaluate students' understanding of course material.

BIE 5017. Thesis Credits: Master's. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Students will work with an advisor to complete a thesis project in the area of business education. The thesis will be a comprehensive study of a specific topic in business education, and will be submitted as a written report. The course will cover topics such as research methodology, data collection, and数据分析. Assessment will be through the thesis report and oral presentation.

BIE 5018. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Doctoral students will work with an advisor to complete a thesis project in the area of business education. The thesis will be a comprehensive study of a specific topic in business education, and will be submitted as a written report. The course will cover topics such as research methodology, data collection, and数据分析. Assessment will be through the thesis report and oral presentation.

For definitions of course numbers, symbols, and abbreviations, see page 214.
BIE 5596. Occupational Experience in Business and Industry. (1-10 cr; max 10 cr); S-N or Aud. Prereq.—#)
Observation/employment in business/industry to develop technical/occupational competencies. Includes 100 clock hours of supervised work experience per credit.

BIE 5597. Internship: Business and Industry Education. (1-6 cr; max 12 cr); S-N or Aud. Prereq.—#
Practical experience in business or industry as a professional educator or supervisor. Requires an integrative paper.

BIE 5605. Critical Issues in Business and Industry. (3 cr; Sndt Opt)
Identification and analysis of major current issues in business and industry education.

BIE 5662. Computer Training in School and Industry Settings. (3 cr; Sndt Opt; +HRD 5662. Prereq.—#) or equiv)
Alternative teaching practices for business applications software: word processors, spreadsheets, graphics, desktop publishing, databases, and communications; public school and industry settings.

BIE 5796. Field Based Projects in Business and Industry. (1-4 cr; max 4 cr); S-N or Aud)
Curricular, instructional, developmental, or evaluative problems and projects applicable to local school or business and industry situations.

BIE 5801. The Business of Tourism. (3 cr; A-F or Aud)
Introduction to major theories, concepts, skills, and techniques influencing tourism business/industry.

BIE 5802. Education and Human Resource Development Through Tourism. (3 cr; A-F or Aud)
Policies/practices of education and human resource development in tourism industry.

BIE 5803. Tourism Studies Capstone Seminar. (3 cr; S-N or Aud. Prereq—Tourism studies major)
Students present, critique, and discuss implications of supporting programs for tourism.

BIE 5993. Directed Study in Business and Industry. (1-4 cr; max 4 cr); Sndt Opt)
In-depth individual inquiry in the content areas related to business and industry.

BIE 5995. Research Problems: Business and Industry. (6-6 cr; max 6 cr); S-N or Aud. Prereq—Advisor approval)
Individual research in business and industry education.

Center for Spirituality and Healing (CSPH)

CSPH 5102. Art of Healing; Self as Healer. (1 cr; Sndt Opt. Prereq—Jr or sr or grad student or #)
Introduction to individual transformational journey as part of health science education. Students become aware of their responsibility/resources to facilitate development of the self. Research data, experience of self, and study of psychoneuroimmunology, mind-body-spirit approaches. Lecture, scientific literature, meditation, imagery, drawing, group interaction.

CSPH 5111. Ways of Thinking about Health. (2 cr; max 4 cr); S-N only. Prereq.—Jr or sr or grad student or #; instructor permission required for second enrollment in course)

CSPH 5115. Cultural Knowledge, Health, and Contemporary Cultural Communities. (3 cr; Sndt Opt. Prereq.—Jr or sr or grad student or #)
How personal cultural experience affects one’s view of health, illness, and healing and one’s professional practice. Wisdom of cultural communities. Cultural construct undermining the medical system. Role of culture in interaction between practitioner and patient. Reconnecting to cultural heritage in healing.

CSPH 5201. Spirituality and Resilience. (2 cr; Sndt Opt. Prereq.—Jr or sr or grad student or #)
Links between resilience and spirituality. Applications of resilience/health realization model to students’ personal/professional lives. Review of literature, theory, and research.

CSPH 5211. Peacemaking and Spirituality: A Journey Toward Healing and Strength. (2-3 cr; max 3 cr; A-F or Aud. Prereq.—Jr or sr or grad student or #)
Influence of spirituality upon process of resolving conflict and making peace in intense interpersonal/intrapersonal conflicts in multiple health care and social work settings, including in families, between patients/clients and nurses/social workers, within communities, among friends, between co-workers, or within ourselves.

CSPH 5215. Forgiveness and Healing: A Journey Toward Wholeness. (1 cr; Sndt Opt. Prereq.—Jr or sr or grad student or #)
Impact of forgiveness on process of inter-/intrapersonal healing. Forgiveness/healing in health care and social work settings from multiple spiritual/secular traditions.

CSPH 5221. Significant Spiritual Texts of the 20th Century. (3 cr; Sndt Opt. Prereq.—Jr or sr or grad student or #)
Diverse “spiritual classics” (i.e., elements of western canons that have proven over time to be resources of values). Resources of meaning for inner-life healers. How to establish a personal library for life-long journey of spiritual development.

CSPH 5225. Meditation: Integrating Body and Mind. (2 cr; Sndt Opt. Prereq.—Jr or sr or grad student or #)
Meditation as a physical, emotional, intellectual, and spiritual inquiry. Students examine a variety of texts and develop ability to enter a state of calm, meditative awareness.

CSPH 5226. Advanced Meditation: Body, Brain, Mind, and Universe. (1 cr; Sndt Opt. Prereq.—#) or [jr or sr or grad student]] or #)
Students work to integrate meditation practice into daily life, cultivating awareness of the fundamental oneness of body, brain, mind, and universe. Mind-body interactions in health. “Hard problem” of consciousness in brain science. Emergence of compassion, wisdom, and healing in non-discursive awareness.

CSPH 5301. Cultures, Faith Traditions, and Health Care. (2 cr; A-F or Aud. Prereq.—Jr or sr or grad student or #)
Culturally/spiritually based health care practices of selected native/immune populations in Minnesota. Clinical implications. Personal/professional conflicts for delivery of competent care to culturally diverse groups by those trained in Western health care.

CSPH 5311. Introduction to Traditional Chinese Medicine. (2 cr; A-F or Aud. Prereq.—Jr or sr or grad student or #)
Philosophical roots of Shamanism, Confucianism, Taoism, and Buddhism. Influence of these philosophies on Chinese medicine. Evolution of concepts of the tao, Yin-Yang, microcosm, macrocosm. Development of herbal medicine, Tui Na, Qi Gong, acupuncture, moxibustion. Traditional Chinese medicine etiology of disease, physiology, diagnosis, therapy, disease prevention, ethics, psychology, cosmology.

CSPH 5315. Traditional Tibetan Medicine: Ethics, Spirituality, and Healing. (2 cr; Sndt Opt. Prereq.—Jr or sr or grad student or #)
Ethics, spirituality, and healing from perspective of traditional Tibetan medicine. Belief that illness results from imbalance and that treating illness requires correcting underlying imbalance. How to apply these principles, integrate them into clinical practice, and consult with a traditional Tibetan doctor.

CSPH 5317. Yoga: Ethics, Spirituality, and Healing. (2 cr; Sndt Opt)
Students test claim that systematic yoga practice leads to optimal health. Yoga’s philosophy, scientific evidence, practical application. Students propose research-based programs for integrating yoga into personal/professional life.

CSPH 5318. Tibetan Medicine, Ayurveda, and Yoga in India. (3 cr Prereq—[5315, 5317] or #)
Students study with expert practitioners in India. Using critical thinking, philosophical knowledge, cultural practices, scientific evidence, and research-based programs to integrate these traditions into personal/professional life.

CSPH 5321. Public Health Priorities in the Developing World. (2 cr; Sndt Opt. +INMD 7567. Prereq.—Jr or sr or grad student or #)
Primary public health problems, priorities, and interventions in developing countries. Issues related to culture/indigenous health systems and of concern to health care providers who work abroad or with refugee communities in countries of resettlement.

CSPH 5325. Latinos: Culture and Health. (3 cr; Sndt Opt. Prereq.—Jr or sr or grad student or #)
How Latino world view (cosmovision) affects health and compares with U.S. perspective. Differences in perception of time, family involvement, community “belonging,” gender roles, and communication styles. Folkloric beliefs. Specific issues such as AIDS, pregnancy, women’s issues, pharmacy, and nutrition. Health issues of workers. Cultural competency.

CSPH 5331. Foundations of Shamanism and Shamanic Healing. (2 cr; S-N or Aud. Prereq.—Jr or sr or grad student or #)
3-2 day retreat intensive. Shamanic philosophies, ritual etiquette, Core beliefs common to all shamanic healing practices. Cross-cultural healing belief/practices, unique psychology for understanding them, their use with contemporary healing practices and for personal growth.

CSPH 5332. Global Healing Traditions: Amazonia Plant Spirit Medicine. (2 cr; S-N or Aud. Prereq.—#)
Non-biomedical traditional healing paradigms as practiced in other parts of the world. Focuses on indigenous healing practices in Peru as directed by a local shaman.
CSPH 5401. People, Plants, and Drugs: Introduction to Ethnopharmacology. (3 cr; Stdnt Opt. Prereq-Jr or sr or grad student or #) Biologically active substances used in traditional cultures. Ethnopharmacology’s past, current, and potential contributions to human knowledge. Concrete examples.

CSPH 5405. Plants in Human Affairs. (4 cr; Stdnt Opt. Prereq-Jr or sr or grad student or #) Twelve-week, intensive course. Introduction to ethnobotany/ethnopharmacology. Lectures, field trips, presentations by local experts.


CSPH 5421. Botanical Medicines in Complementary Healthcare. (3 cr; Stdnt Opt. Prereq-Jr or sr or grad student or #) Widely-used botanical medicines from biomedical perspective. Alternative therapeutic systems presented according to bodily systems/processes. Evidence for therapeutic use. Botanical characteristics, traditional uses, chemical properties, dosage, hazards/safety issues, quality control.

CSPH 5431. Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health. (2 cr; Stdnt Opt. Prereq-Jr or sr or grad student or #) Principles of nutrition related to metabolic function. Model attempts to reduce chronic disease by looking for underlying causes/triggers and to intervene to restore the body towards optimal health. Emphasizes importance of nutrition as a component of self-care.


CSPH 5505. Foundations of Homeopathic Practice. (1 cr; S-N only. Prereq-Jr or sr or grad student; designed for students in health sciences or practicing health professionals) Homeopathic philosophy, core principles, homeopathic materia medica. Review of research on utilization/efficacy of homeopathy. How to use common homeopathic remedies in acute situations. When/how to refer patients for homeopathic treatment. Issues of co-management with allopathic health care providers.


CSPH 5521. Therapeutic Landscapes. (3 cr; Stdnt Opt. Prereq-Jr or sr or grad student or #) Biologically active substances used in traditional cultures. Ethnopharmacology’s past, current, and potential contributions to human knowledge. Concrete examples.

CSPH 5522. Therapeutic Horticulture. (3 cr; Stdnt Opt. Prereq-S101 or Hort 5072 or #) Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health. (2 cr; Stdnt Opt. Prereq-Jr or sr or grad student or #) Principles of nutrition related to metabolic function. Model attempts to reduce chronic disease by looking for underlying causes/triggers and to intervene to restore the body towards optimal health. Emphasizes importance of nutrition as a component of self-care.

CSPH 5523. Applications in Therapeutic Horticulture. (2 cr) How to develop comprehensive program plans in therapeutic horticulture. Evidence-based principles, facilitation techniques. Documentation, assessment, program development techniques, evaluation. Leadership training, program plan components, book reviews, readings, comprehensive exam.

CSPH 5533. Introduction to Energy Healing. (2 cr; Stdnt Opt. Prereq-Jr or sr or grad student or #) Healing techniques that use energetic systems in body to enhance body’s ability to heal. Therapeutic touch, healing touch, Reiki, acupuncture, reflexology, magnets, homeopathy, other modalities. Scientific theories on mechanisms of energetic medicine and ways to measure energy. Students interact with practitioners of energy healing.

CSPH 5535. Reiki Healing. (1 cr; S-N only. Prereq-Jr or sr or grad student or #) Principles of energy healing. Alternative energy healing modalities, current research findings. Activation of the Reiki energy, hand positions to perform a treatment. Students provide Reiki treatments, discuss findings.

CSPH 5536. Advanced Reiki Healing: Level II. (1 cr; S-N only. Prereq-5535, #) Principles/application of Reiki energy healing. Four levels of healing. Emphasizes healing at spiritual level. Activation of Reiki energy. Symbols that allow for energy transfer through space/time. Using second level Reiki energy for both distance healing and standard treatment. Students provide Reiki treatments, discuss findings. Current literature, research findings.

CSPH 5541. Emotional Healing and Happiness: Eastern and Western Approaches to Transforming the Mind. (2 cr; Stdnt Opt. Prereq-Sr or grad student or #) Experiential training in the cultivation of happiness, emotional health, and healing for multi-disciplinary professions. Ancient/contemporary, eastern/western approaches. How to increase positive emotions and mind states. Meditation, integrative approaches. Case examples.

CSPH 5545. Mind-Body Healing Therapies. (2 cr; A-F or Aud. Prereq-Grad student or jr or sr or #) Philosophies/paradigms. Four modalities commonly used in allopathic nursing, medicine and other health professions (biofeedback, hypnosis, imagery/visualization, meditation). Experiential and group discussion format.

CSPH 5555. Introduction to Body and Movement-based Therapies. (2 cr; Stdnt Opt. Prereq-Jr or sr or grad student or #) How to develop comprehensive program plans in therapeutic horticulture. Evidence-based principles, facilitation techniques. Documentation, assessment, program development techniques, evaluation. Leadership training, program plan components, book reviews, readings, comprehensive exam.


CSPH 5611. Healthy Humor. (1 cr; Stdnt Opt. Prereq-Jr or sr or grad student or #) Use of humor to enhance communication, treatment, and relationships with patients. How to create a positive work environment and outlook. Physiologic effects/benefits of humor/laughter. Humor and spirituality. Connection between positive outlook and health.


CSHP 5705. Health Coaching Professional Internship. (2 cr; S-H only. Prereq–5701, 5702, 5703, admittance to postbaccalaureate certificate in complementary therapies/healing practices health coaching track. [5101, 5102, 5704] recommended) 120 hours of health coaching practice. Students work with individual clients in acute/longitudinal encounters, provide wellness teaching, and design a career plan.


CSHP 8100. Special Topics in Complementary Therapy and Healing Practices. (1–6 cr [max 12 cr]; Stdtnt Opt) Critiquing research on complementary therapies (e.g., design, outcome measures). Synthesizing research findings for a therapy. Hypothesizing next directions for research on complementary therapies.


CSHP 8191. Independent Study in Complementary Therapies and Healing Practices. (1–6 cr [max 6 cr]; Stdtnt Opt. Prereq–#) Students propose area for individual study with faculty guidance. Students write proposal, including outcome objectives and work plan. Faculty member directs work, evaluates project.

Central Asian Studies (CAS)
Department of Asian Languages and Literatures

College of Liberal Arts

CAS 5311. Medieval Sages. (3 cr; Stdtnt Opt. = MELC 5311) Prereq-background in Iranian, Central Asian, or Islamic studies recommended) Study and discussion of the intellectual life of the region from the rise of the Ghaznavids (A.D. 1000) to the fall of the Timurids (A.D. 1500). Ibn Sina (Avicenna), al-Biruni, al-Ghazali, Rumi, Hafiz, Yushij, and Farrukhzad are among the poets whose works are studied. Rudaki, Khayyam, Romi, Hafiz, and Behrang are analyzed/interpreted.

CAS 5601. Persian Fiction in Translation. (3 cr; Stdtnt Opt. = CAS 3601, MELC 3601, MELC 5601. Prereq–environment MELC 5601) Impact of westernization on Iran, from 1920s to present. Materials produced by Iranian writers, film makers, and intellectuals. Internal/external forces that bind contemporary Iranian society to world civilization. Works of Hayat (especially Blind Owl), Chubak, Al-I Ahmad, Daneshvar, and Behrang are analyzed/interpreted.

CAS 5602. Persian Poetry in Translation. (3 cr; Stdtnt Opt. = CAS 3602, MELC 3602, MELC 5602) Major poetic works of Iran dealing with life at the medieval courts. Sufic poetry, and “new” poetry are studied. Rudaki, Khayyam, Romi, Hafiz, Yushij, and Farrukhzad are among the poets whose works are examined.

CAS 599A. Directed Research. (1–10 cr [max 10 cr]; Stdtnt Opt. Prereq–#) Directed Research

Chemical Engineering (CHEN)
Department of Chemical Engineering and Materials Science

Institute of Technology


CHEN 5551. Survey of Renewable Energy Technologies. (3 cr; A-F or Aud. Prereq-[Upper div or #]) basic knowledge of chemistry, thermodynamics, Technologies to generate renewable energy/chemicals.Biomass, solar, wind, hydroelectric. Emphasizes biomass processing using chemical/biological methods. Renewable technologies compared with fossil fuel technologies.

CHEN 5595. Special Topics. (1–4 cr [max 12 cr]; A-F only. Prereq–CHEN major upper div) New or experimental special topics.

CHEN 5711. Biochemical Engineering. (3 cr; A-F or Aud. Prereq–[3005 or 4005], &3006 or &4006), &3102 or &4102) Chemical engineering principles applied to analysis/ design of complex cellular/enzyme processes. Quantitative framework for design of cells for production of proteins, synthesis of antibodies with mammalian cells, or degradation of toxic compounds in contaminated soil.


CHEN 5759. Principles of Mass Transfer in Engineering and Biological Engineering. (2 cr; A-F or Aud. Prereq–3005 or 4005) Principles of mass transfer in gases, liquids, biological and macromolecular solutions, melts, solids, membranes, and capillaries. Porous solids interaction between mass transfer and chemical reaction. Applications in biological, environmental, mineral, and chemical engineering systems.


CHEN 8115. Electronic Microscopy of Soft Matter. (2 cr; A-F or Aud. Prereq–Chemical engineering grad major or #) Use of principles of transmission electron microscopy (TEM) and scanning electron microscope (SEM). How these instruments are applied in study of soft materials (e.g., liquid, semi-solid material systems). Unique specimen preparation techniques, low image contrast, electron-beam radiation damage, and limited signal-to-noise ratio. TEM/SEM digital imaging.

CHEN 8201. Applied Mathematics I: Linear Analysis. (3 cr; A-F or Aud. = CHEN 4701. Prereq–Chemical engineering grad student or #) Integrated approach to solving linear mathematical problems. Linear algebraic equations. Linear ordinary and partial differential equations using theoretical numerical analysis based on linear operator theory.


CHEN 8221. Synthetic Polymer Chemistry. (4 cr; A-F or Aud. =CHEM 8221, CHEN 8221, CHEN 5221, MATH 5221, MATH 8221. Prereq–Undergrad organic chemistry course, undergrad physical chemistry course or #) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.


CHEN 8302. Physical Rate Processes II: Mass Transfer. (3 cr; A-F or Aud. Prereq–Chemical engineering grad student or #) Applications of mass transfer. Membranes, including gas separation and reverse osmosis. Controlled drug release. Dispersion, including examples of pollution modeling. Adsorption/chromatography. Coupled heat/mass transfer, including cooling towers. Double-diffusive effects.

CHEN 8335. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

CHEN 8401. Physical and Chemical Thermodynamics. (3 cr; A-F or Aud. Prereq–Undergraduate [engineering course or chemistry course in thermodynamics], Chemical engineering grad student or #) Principles of classical thermodynamics. Introduction to nonequilibrium thermodynamics, with applications in chemical engineering and materials science.

CHEN 8402. Statistical Thermodynamics and Kinetics. (3 cr; A-F or Aud. Prereq–Chemical engineering grad student or #) Introduction to statistical mechanical description of equilibrium and non-equilibrium properties of matter. Emphasizes fluids, classical statistical mechanics.

CHEN 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)


CHEN 8502. Process Control. (3 cr; A-F or Aud. Prereq–Chemical Engineering grad major or #) For linear systems: stability, controllability, observability, pole-placement via state feedback state observers, output feedback, and robustness of control systems. For nonlinear systems: solution properties, stability analysis, singular perturbations, feedback linearization via state feedback, and direct synthesis via output feedback.

CHEN 8503. Chemical Rate Processes: Homogeneous Reactions. (3 cr; A-F or Aud. Prereq–Chemical engineering grad student or #) Description/characterization of chemically reacting systems. Theories of elementary reactions. Experimental methods for investigating elementary reactions. Applications of chemical kinetics to complex reactions, such as combustion, flames, and the atmosphere.

CHEN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)


CHEN 8754. Systems Analysis of Biological Processes. (3 cr; Stdnt Opt. Prereq–Grad student in [life sciences or chemical/physical sciences or engineering]; CHEN students must take A/F) Relating biological processes at molecular level to physiological level of cells/organisms/populations. Methodology for analyzing data. Quantification of molecular interplays.

CHEN 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])

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

Chemical Physics (CHPH)

Institute of Technology

CHPH 8081. M.S. Plan B Project I. (4 cr; A-F only. Prereq–Grad chem phys major) Topic arranged by student adviser. Written report required.

CHPH 8082. M.S. Plan B Project II. (4 cr; A-F only. Prereq–Grad chem phys major) Topic arranged by student adviser. Written report required.

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

CHPH 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

CHPH 8601. Seminar: Modern Problems in Chemical Physics. (1 cr [max 2 cr]; S-N only. Prereq–Grad chem physics major or #) Topics in chemical physics.

CHPH 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

CHPH 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])

CHPH 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Chemistry (CHEM)

Department of Chemistry

Institute of Technology

CHEM 5210. Materials Characterization. (4 cr; A-F or Aud. Prereq–Chemeng grad student or #) Modern tools/techniques for both bulk- and thin-film characterization. Topics may include ion-solid interactions, Rutherford back scattering, secondary ion mass spectrometry, solid-state NMR, x-ray photoelectron spectroscopy, small-angle x-ray/neutron scattering, transmission/scanning electron/probe microscopy, near-field scanning optical microscopy, porosimetry, adsorption techniques, and ellipsometry.

CHEM 5245. Introduction to Drug Design. (3 cr; A-F or Aud. =MEDC 5245, PHAR 6245, PHPR 2302 or equiv) Concepts that govern design/discovery of drugs. Physical, biologic, medicinal chemical principles applied to explain rational design and mechanism of action drugs.

CHEM 5501. Introduction to Thermodynamics, Kinetics, and Statistical Mechanics. (3 cr; A-F or Aud. Prereq–1022 or 1032H, [MATH 2263 or &MATH 2374 or MATH 2374 or MATH 2374], [PHYS 1302 or PHYS 1402])


For definitions of course numbers, symbols, and abbreviations, see page 214.
CHEM 5755. X-Ray Crystallography. (4 cr; A-F or Aud. Prereq—Chem grad student or #) Essentials of crystallography as applied to modern, single-crystal X-ray diffraction methods. Practical training in use of instrumentation in X-ray crystallography facility in Department of Chemistry. Date collection, correction/refinement, structure solution, generation of publication materials, use of Cambridge Crystallographic Structure Database.


CHEM 8025. Introduction to Graduate Research. (1-2 cr [max 2 cr]; A-F or Aud. Prereq—Grad student in chem) New areas of chemistry, hands-on exposure to graduate research. Students rotate through up to two different labs for seven weeks. Labs are run by chemistry graduate faculty members.

CHEM 8066. Professional Conduct of Chemical Researchers. (1 cr; S-N or Aud. Prereq—Chem grad student) Builds sensitivity to ethical issues in chemical research. Readings/case studies, small-group/large-group discussion, synthesizing comments from instructors/guests/pans having special expertise. Weekly seminar.

CHEM 8081. M.S. Plan B Project I. (1-4 cr [max 4 cr]; A-F or Aud. Prereq—Chem grad major) Satisfies project requirement for Plan B master’s degree. May apply on M.S. degree program, but does not count toward 14-credit minimum in major field. Topic arranged by student adviser; written report required. 8081 required; 8082 optional.

CHEM 8082. M.S. Plan B Project II. (1-4 cr [max 4 cr]; A-F or Aud. Prereq—Chem grad major) Satisfies project requirement for Plan B master’s degree. May appear on M.S. degree program, but does not count toward 14-credit minimum in major field. Topic arranged by student adviser; written report required. 8081 required; 8082 optional.

CHEM 8101. Materials Chemistry. (4 cr; A-F or Aud. Prereq—CHEM 4201, 4701, 3502 or equiv) Crystal systems/unit cells, phase diagrams, defects/interfaces, optical/dielectric properties, electrical/thermal conductivity, X-ray diffraction, thin film analysis, electronic structure, polarons/phonons, solid state chemistry, liquid/molecular crystals, polymers, magnetic/optical materials, porous materials, ceramics, piezoelectric materials, biomedical materials, catalysts.
CHEM 8480. Special Topics in Biological Chemistry. (2-4 cr [max 4 cr]; Stdt Opt. Prereq-Grad chem major or #) Topics (and availability) vary by year, depending on instructor and development of the field.

CHEM 8541. Dynamics. (4 cr; Stdt Opt. Prereq-CHEM 5541. Prereq-Undergrad physical chem course) Mathematical methods for physical chemistry. Classical mechanics/dynamics, normal modes of vibration. Special topics such as rotational motion, Langevin equation, Brownian motion, time correlation functions, collision theory, cross sections, energy transfer, molecular forces, potential energy surfaces, classical electrostatics, Shannon entropy.


CHEM 8580. Special Topics in Physical Chemistry. (2-4 cr [max 4 cr]; Stdt Opt. Prereq-grad chem major or #) Topics (and availability) vary depending on instructor and development of the field.

CHEM 8601. Seminar: Modern Problems in Chemistry. (1 cr; S-N or Aud. Prereq-grad chem major or #) Weekly seminar series on modern chemical topics.

CHEM 8602. Seminar Presentation: Modern Problems in Chemistry. (1 cr; A-F or Aud. Prereq-grad chem major or #) Weekly seminar series on modern chemical topics presented by students.

CHEM 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelin oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)


CHEM 8715. Physical Inorganic Chemistry. (4 cr; Stdt Opt. Prereq-CHEM 4701 or equiv, grad chem major or #) Physical methods and concepts applied to inorganic and organometallic systems, including many of the following methods: NMR, IR, UV-VIS, ESR, M"{o}ssbauer and mass spectroscopy, magnetic measurements, X-ray diffraction.

CHEM 8725. Organometallic Chemistry. (4 cr; Stdt Opt. Prereq-CHEM 4701 or equiv, grad chem major or #) Synthesis, reactions, structures, and other important properties of main group and transition metal organometallic compounds; treatment in terms of modern electronic and structural theory; emphasis on their use as stoichiometric and homogeneous catalytic reagents in organic and inorganic systems.

CHEM 8735. Bioinorganic Chemistry. (4 cr; Stdt Opt. Prereq-CHEM 4701 or equiv, grad chem major or #) Survey of role of metal ions in biology; emphasizes structure, function, and spectroscopy of metalloproteins and their synthetic analogs.

CHEM 8745. Advanced Inorganic Chemistry. (4 cr; Stdt Opt. Prereq-CHEM 8715, grad chem major or #) Survey of topics in main group and transition metal chemistry; emphasizes synthesis, structure, physical properties, and chemical reactivity.

CHEM 8777. Thesis Credits: Master’s. (1-16 cr [max 50 cr]; No grade. Prereq-Max 16 cr per semester or summer; 10 cr total required [Plan A only])

CHEM 8800. Special Topics in Inorganic Chemistry. (2-4 cr [max 4 cr]; Stdt Opt. Prereq-Grad chem major or #) Topics (and availability) vary by year depending on instructor and development of the field.

CHEM 8880. Special Topics in Chemistry. (2-4 cr [max 4 cr]; Stdt Opt. Prereq-Grad chem major or #) Topics (and availability) vary depending on instructor and development of the field.

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

Chicano Studies (CHIC) Department of Chicano Studies

College of Liberal Arts

CHIC 5374. Migrant Farmworkers in the U.S.: Families, Work, and Advocacy. (3 cr; Stdt Opt) Social, economic, and legal realities of migrant workers. Demographic shifts, laws, and policies. Farmworker movements and other responses to conditions facing migrants in contemporary economy. Gendered nature of work. Way in which commodities are produced and resistance expressed within structures/traditions of an increasingly globalized system.


CHIC 5995. Directed Studies. (1-3 cr [max 16 cr]; Stdt Opt. Prereq-#) Guided individual reading, research, and study for completion of the requirements for a senior paper or honors thesis.

Child and Adolescent Psychiatry (CAPY) Department of Psychiatry

Medical School


CAPY 5629. Treatments for Children and Adolescents With ADHD and Disruptive Behavior Disorders. (1 cr; S-N only) Mechanisms, treatments. Behavioral management, cognitive-behavioral therapy, classroom accommodations, social skills training, coaching, pharmacological management.


CAPY 5632. Workshop: Competence Enhancement Training Programs for Children with Disruptive Behavior. (1 cr; Stdt Opt)


CAPY 5634. Workshop: Developmental Dyslexia: Theory, Research, and Clinical Differentiation. (1 cr; Stdt Opt)


CAPY 5636. Workshop: Disruptive Behavioral Disorders III. (1 cr; Stdt Opt)

CAPY 5638. Workshop: Prevention Science II. (1 cr; Stdt Opt)

CAPY 5639. Workshop: Behavior Problems in Preschool Children. (1 cr; Stdt Opt)


CAPY 5645. Workshop: Innovative Methods in Psychotherapy. (1 cr; Stdnt Opt)

CAPY 5646. Workshop: Methods of Measurement and Assessment in Psychopathology. (1 cr; Stdnt Opt)

CAPY 5647. Workshop: Prevention Science III. (1 cr; Stdnt Opt) Behaviors/mechanisms related to peer rejection. Social skills interventions for promoting positive relationships and for building meaningful friendships.

CAPY 5648. Workshop: Prevention Science IV. (1 cr; Stdnt Opt)

CAPY 5649. Workshop: Personality and Social Development. (3 cr; Stdnt Opt)


CAPY 5653. Introduction to Play Therapy. (1 cr; S-N only) Play explored from normal developmental perspective. Play as a powerful modality in treating mental health problems in children and in families. Play Therapy with adults. Case Studies, group participation.

CAPY 5654. Summer Practicum in Prevention Science II: Building Friendships and Peer Relationship Skills. (1 cr; A-F or Aud. Prereq—#) Behaviors/mechanisms related to peer rejection. Social skills interventions for promoting positive relationships and building meaningful friendships. Assignment worked out with instructor. Final exam.

CAPY 5660. ADHD Throughout the Life Span: Perspectives on Diagnosis, Assessment, and Developmental Course. (1 cr; Stdnt Opt. =CAPY 5660. ) ADHD, from its earliest presentation to its later adult manifestations. Clinical depression, diagnostic criteria. Disorders that commonly coexist with ADHD. Standard assessment procedures for making a diagnosis. Developmental changes in clinical procedures.


CAPY 5670. Preventing Violence and Antisocial Behavior in Children and Adolescents: Interventions, Practices. (1 cr; Stdnt Opt.) =CAPY 5662. Prereq—Community and school-based intervention programs aimed at the prevention of antisocial behavior are reviewed and evaluated) Community- and school-based intervention programs aimed at preventing antisocial behavior.

CAPY 5671. Suicide Prevention: Examining What Interventions May Alter Suicide Risk. (1 cr; Stdnt Opt) Suicide is examined from a range of perspectives by understanding differences across sex, development, and culture. Suicide prevention techniques are discussed and controversies in the field will be highlighted. Group participation is encouraged.

CAPY 5672. Children’s Exposure to Domestic Violence: Effects on Child Functioning, Treatment Implications. (1 cr; S-N only) Effects of exposure to domestic violence in context of development, from infancy to late adolescence. Assessment strategies, best practices in intervention/ prevention for vulnerable children and adolescents. Multidisciplinary approaches to working with children exposed to violence (e.g., judicial, medical, law enforcement partnerships).

CAPY 5673. Prevention Programming: Learning the Skills to Implement a Preventive Intervention. (1 cr; Stdnt Opt) Early intervention to reduce antisocial and risk taking behaviors (e.g., suicide, unsafe sex) in teenagers. “Early Risers Skills for Success” program as model for teaching techniques of early prevention. Social-emotional skill training, academic enrichment, monitoring/mentoring, behavioral management techniques group settings, techniques to support/educate parents of a risk children.


Child Psychology (CPSY)

Institute of Child Development

College of Education and Human Development

CPSY 5251. Social and Philosophical Foundations of Early Childhood Education. (3 cr; A-F only. Prereq—[MEd student in ECE or ECSE] or #) Surveys imagery, history, philosophy, and psychology of early childhood education. Analyzing/interpreting trends in early education, including diversity, special needs, legislation, public policy, and educationally appropriate practice.

CPSY 5252. Facilitating Social and Physical Learning in Early Childhood Education. (3 cr; A-F only. Prereq—Student in early childhood ed or early childhood special ed) Current theoretical/empirical literature and developmental knowledge as basis for planning, implementing, and evaluating social/physical growth/development of young children. For students obtaining ECE/ECSE licensure.

CPSY 5253. Facilitating Cognitive and Creative Learning in Early Childhood Education. (3 cr; A-F only. Prereq—MEd student in early childhood ed or early childhood special ed, or #) Overview of cognitive, creative, and language characteristics of children ages 0-8 years and of how teachers can plan curriculum to facilitate children’s development in these areas.

CPSY 5281. Student Teaching in Early Childhood Education. (3 cr; max 6 cr; S-N or Aud. Prereq—MEd student in early childhood ed or early childhood special ed) Application of theory/research relating to teaching preschool children. For individuals obtaining ECE licensure.

CPSY 5413. Early Childhood and Public Policy. (3 cr; Stdnt Opt) State, federal, and international policies and legislative activity touching first five years of a child’s life. Family, community, and institutional roles in promoting children’s social, cognitive, and emotional development. Issues related to health, mental health, poverty, developmental delays, and special needs.

CPSY 5414. Individualized Learning Experience in Early Childhood and Public Policy. (1-3 cr [max 5 cr]; Stdnt Opt. Prereq—Early Childhood Policy Certificate student, #) Individualized, applied learning experience. Focuses on early childhood policy development, research, or evaluation. Students attend an early childhood policy lecture series and participate in small discussion groups and follow-up activities.
CPSY 5501. Foundations in Infant and Early Childhood Mental Health I. (3 cr; A-F only. Prereq—Baccalaureate degree in an early-childhood-related field from an accredited U.S. institution or documented equiv), experience in early childhood [research or practice]! History, theory, research, concepts, and issues in infant mental health. Issues pertinent to difficulties in development. Readings, visual material. Expert guest lectures.


CPSY 5506. Infant Observation Seminar I. (1 cr Prereq—5501, #) How an infant develops in context of family relationships over a 9-12 month period. Students observe an infant for one hour a week, write a narrative, and discuss observations.

CPSY 5508. Infant Observation Seminar II. (1 cr Prereq—5506) How an infant develops in context of family relationships over a 9-12 month period. Students observe an infant for one hour a week, write a narrative, and discuss observations.

CPSY 5511. Infant Observation Seminar III. (1 cr Prereq—5506) How an infant develops in context of family relationships over 9-12 month period. Students observe an infant for one hour a week, write a narrative, and discuss observations.

CPSY 5513. Assessment in Infant and Early Childhood Mental Health: DC 0-3R. (2 cr; S-N only. Prereq—[Baccalaureate degree in early-childhood-related field from accredited U.S. institution or documented equiv], [experience in early childhood research or practice].) Infant Mental Health diagnostic manual DC 0-3R. Assessment using the manual. Lectures, discussions, cooperative learning, class exercises, case studies.

CPSY 5515. Assessment in Infant and Early Childhood Mental Health: NCAST. (2 cr; S-N only. Prereq—[Baccalaureate degree in early-childhood-related field from accredited U.S. institution or documented equiv], [experience in early childhood research or practice].) Achieving reliability in two observational measures of parent-child interaction: (1) nursing child assessment feeding (2) teaching Scales. Discussion, lecture, videotapes, listening/observation tasks.

CPSY 5518. Prevention and Intervention in Infant and Early Childhood Mental Health I. (3 cr; A-F only. Prereq—5501, 5503, 5505, 5506, 5508) Students design prevention/intervention programs and apply evidence-based strategies in workplace/practicum settings. Readings, in-class reflective practice groups.

CPSY 5521. Prevention and Intervention in Infant and Early Childhood Mental Health II. (3 cr; A-F only. Prereq—5518) Students design prevention/intervention programs and apply evidence-based strategies in workplace/practicum settings. Readings, in-class reflective practice groups.

CPSY 5525. Reflective Supervision in Infant and Early Childhood Mental Health: Clinical. (1 cr; S-N only. Prereq—5518 or 5521) Principles and strategies of reflective supervision consultation. Discussion, final assignment designated by instructor.

CPSY 5527. Reflective Supervision in Infant and Early Childhood Mental Health: Clinical. (1 cr; S-N only. Prereq—5518 or 5521) Principles and strategies of reflective supervision consultation. Discussion, final assignment designated by instructor.

CPSY 5530. Principles and strategies of reflective supervision consultation. Discussion, final assignment designated by instructor.

CPSY 5804. Research Methods in Child Psychology. (5 cr; S-N only. Prereq—Doctoral student or #) Review of principal research methods and designs in developmental psychology and consideration of special issues concerning research, including scientific integrity.

CPSY 5811. Developmental Psychology: Special Topics in Developmental Psychology. (3 cr; S-N only. Prereq—Doctoral student or #) Study of classical Chinese through reading and literature.

CPSY 5811. Developmental Psychology: Special Topics in Developmental Psychology. (3 cr; S-N only. Prereq—Doctoral student or #) Study of classical Chinese through reading and literature.

CPSY 5814. Research Problems in Child Psychology. (1-4 cr; S-N only. Prereq—Doctoral student or #) Study of classical Chinese through reading and literature.


CPSY 5821. Seminar: Current Issues in Teaching Developmental Psychology. (1 cr Prereq—[max 2 cr]; S-N only. Prereq—CPsy doctoral student or #) Study of classical Chinese through reading and literature.
Civil Engineering (CE)

Department of Civil Engineering

Institute of Technology

CE 5094. Civil Engineering Research. (1-4 cr [max 4 cr]; Stdt Opt. Prereq–#) Research or independent study in concrete, steel, soils, hydraulics, hydrology/municipal, environmental, or transportation problems. Investigations, reports, tests, designs.

CE 5170. Internet Based Study. (1-5 cr [max 15 cr]; A-F or Aud. Prereq–Upper div UPT) Internet based teaching with bi-weekly exercises on topic of concern.

CE 5180. Special Top.ics. (1-4 cr [max 4 cr]; A-F or Aud. Prereq–#) Topics vary depending on faculty and student interests.


CE 5311. Experimental Geomechanics. (3 cr; A-F or Aud. Prereq–GEOE 5311. Prereq–Upper div IT or grad, 4301, GeoE 4301 or #) Machine stiffness, closed-loop testing. Small-strain tests. Measurement of deformation: strain gages, LVDT’s, accelerometers, and associated circuits. Direct and indirect testing. Material behavior experiments on anisotropic, damaged, and fluid-filled solids.


CE 5331. Geomechanics Modeling. (3 cr; A-F or Aud. GEOE 5331. Prereq–Upper div IT or grad, 4301 or #) Soil and rock response in triaxial testing; drained and undrained behavior; elastic and plastic properties. Modeling stresses, strains, and failure in geomechanics problems.

CE 5341. Wave Methods for Nondestructive Testing. (4 cr; A-F or Aud. Prereq–[AEM 2021, AEM 5031] or #) Introduction to contemporary methods for nondestructive characterization of objects of civil engineering (e.g., highways, bridges, geological sites). Imaging technologies based on propagation of elastic waves such as ultrasonic/resonant frequency methods, seismic surveys, and acoustic emission monitoring. Lecture, lab.

CE 5351. Advanced Mathematics for Civil Engineers. (3 cr; A-F or Aud. Prereq–[Math 2263 or Math 2374 or equiv], or [sr or grad student in civil engineering] or #) Emphasizes skills relevant for civil engineers. Mathematical principles explained in an engineering setting. Applications from various areas in civil engineering.

CE 5411. Applied Structural Mechanics. (3 cr; A-F or Aud. Prereq–[Grade of at least C-in 4401, upper div IT or grad student] or #) Principal stresses and failure criteria in 3 dimensions. Introduction to plasticity, energy methods, torsion of beams, and bending of unsymmetrical beams.

CE 5541. Environmental Water Chemistry. (3 cr [max 4 cr]; A-F or Aud. Prereq–5301, Chem 1021, Chem 1022) Introduction to water chemistry. Physical chemical principles, geochemical processes controlling chemical composition of waters, behavior of contaminants that affect the suitability of water for beneficial uses.


CE 5551. Environmental Microbiology. (3 cr; A-F or Aud. Prereq–[Upper div or grad student] Role of microorganisms in environmental bioremediation, pollution control, water/wastewater treatment, bioscience, and hazard health. Lecture.

CE 5552. Environmental Microbiology Laboratory. (1 cr; A-F only. Prereq–5551 or 5551) Basic microbiological techniques: isolation, identification methods, culture, BOD, biodegradable kinetics, disinfection. Lab.
CE 8216. Urban Traffic Operations. (3 cr; Stdt Op)  Capacity analysis techniques for urban streets, optimal traffic signal timing, coordination, real time control. Traffic signal hardware, including detectors/ controllers. Operational techniques for traffic management. Use of computer program packages in traffic engineering practice. Freeway operations/ control.

CE 8217. Transportation Network Analysis. (4 cr; Cr-F only)  Concepts for transportation system and network analysis. Analytical models, algorithms for formation/solution of equilibrium assignment problem for transportation networks. Static/dynamic user equilibrium traffic assignment systems. System optimal, stochastic user equilibrium, traffic paradox. Linear/ nonlinear programming, variational inequalities.

CE 8231. Advanced Pavement Engineering. (3 cr; Stdt Op. Prereq-4231 or #)  Advanced concepts in pavement analysis and design; computation of stresses and strains in flexible and rigid pavement systems; review of Boussinesq theory, Burmister model, and Westergaard model; load transfer in rigid pavements; temperature induced stresses; mechanics of drainage.

CE 8233. Advanced Bituminous Materials Characterization. (3 cr; Stdt Op. Prereq-[4302, grad student] or #)  Applications of viscoelasticiy, rheology, elastoplasticity, and fracture mechanics to bituminous materials characterization. Lectures, discussions of advanced research reading assignments, laboratory assignments.

CE 8300. Seminar: Geomechanics. (1-3 cr [max 4 cr]; S-N or Aud. +GEOE 8300)  Presentations on various topics.


CE 8311. Advanced Rock Mechanics. (3 cr; A-F or Aud. +GEOE 8311. Prereq-IT grad student, 4331 or GEOE 4331 or #)  Stress transformations; principal stresses and directions. Friction and behavior of rock joints; stability of frictional sliding. Elastic waves; acoustic emission and seismic measurements. Fragmentation and rockbreakage.


CE 8332. FTE: Master’s. (1 cr; No grade. Prereq- Master’s student, adviser and DGS consent)  Advanced concepts in pavement analysis and design; computation of stresses and strains in flexible and rigid pavement systems; review of Boussinesq theory, Burmister model, and Westergaard model; load transfer in rigid pavements; temperature induced stresses; mechanics of drainage.


CE 8337. Boundary Element Methods II. (3 cr; A-F or Aud. +GEOE 8337. Prereq-GEOE 8336, GEOE 8336 or #)  Transient and nonlinear problems.


CE 8351. Advanced Groundwater Mechanics I. (3 cr; A-F or Aud. +GEOE 8351. Prereq-4351 or GEOE 4351. IT grad student)  Solute transport; shallow flow in leaky aquifers; complex variable methods in groundwater flow. Analytic element method: potentials for line sinks, line doublets, line dipoles, area sinks, and special analytic elements; singular Cauchy integrals; analytic elements in domains with closed boundaries.

CE 8352. Advanced Groundwater Mechanics II. (3 cr; A-F or Aud. +GEOE 8352. Prereq-4351, IT grad student or #)  Applying complex methods, including conformal mapping, in groundwater mechanics; solving problems with free boundaries using the hodograph method; drains in aquifers with free boundaries; superposition of solutions with drains; singular Cauchy integrals; boundary elements.

CE 8361. Engineering Model Fitting. (3 cr; A-F or Aud. +GEOE 8361. Prereq-IT grad student or #)  Parameter estimation and inverse modeling for civil and geological engineering. Formulating engineering model fitting problems; comparing and selecting various fit criteria; implementing numerical algorithms; analyzing and interpreting results using both statistical and qualitative tools; designing future measurement plans.

CE 8400. Seminar: Structures. (1 cr [max 3 cr]; S-N or Aud)  Content depends on instructor and student. Sample topics: theory of elasticity; optimization, reliability, wave propagation, soil dynamics, experimental equipment, wind forces on structures, structural failures, modern construction practices.


CE 8402. Nonlinear Finite Element Analysis. (3 cr; A-F or Aud. Prereq-4401 or #)  Advanced finite element analysis. Applications to design and optimization of structures and materials. Crack propagation, stress concentration, buckling, and non-linear behavior.

CE 8411. Plate Structures. (3 cr; A-F or Aud. Prereq-5411 or #)  Advanced plate analysis and design. Stress analysis of thin and thick plates. Applications to design of plates and shells.

CE 8412. Shell Structures. (3 cr; A-F or Aud. Prereq-IT grad or #)  Advanced analysis of plates and shells. Applications to design of plates and shells.


CE 8422. Earthquake Engineering. (3 cr; A-F or Aud. Prereq-8421 or #)  Introduction to earthquake engineering; response spectra; energy absorption capacity of structures; seismic codes; base isolation; soil-structure interaction. Blast resistant design. Wind effects on structures.

CE 8431. Structural Stability. (3 cr; A-F or Aud. Prereq-IT grad student or #)  Classification of discrete/continuous conservative/ nonconservative systems. Buckling analysis of, e.g., structural members, frameworks, and plates by classical/numerical methods. Offered alternate years.

CE 8432. Analysis of Thin-Walled Members. (3 cr; A-F or Aud. Prereq-4411 or #; offered alt yrs)  Analysis of thin-walled structural members based on Vlasov theory and its modifications. Members with open and closed cross sections. Second-order effects and buckling. Influence of material behavior on buckling.


CE 8442. Nonlinear Analysis of Structural Systems. (3 cr; A-F or Aud. Prereq-4411, 4413 or #; offered alt yrs)  Advanced theory and computational techniques for analyzing complex structural building systems. Using comprehensive geometric and material nonlinear analysis for design of steel and composite structures.

Course Descriptions

CE 8501. Behavior of Reinforced Concrete Structures. (3 cr; A-F or Aud. Prereq.–4412 or #) Advanced topics; experimental and theoretical background to design code provisions. Moment-curvature analysis of members. Shear; torsion; disturbed regions. Beam column joints; shear walls. Effects of earthquake loading. Limit analysis.


CE 8490. Special Topics. (1-4 cr [max 8 cr]; A-F or Aud. Prereq.–) Topics vary depending on faculty and student interests.

CE 8500. Environmental Seminar. (1 cr [max 3 cr]; S-N or Aud. Prereq.-grad CE major or #) Course Descriptions

Course Descriptions


CE 8502. Environmental Fluid Mechanics II. (4 cr; A-F or Aud. Prereq.–5051 or #) Reynolds equations. Developed and developing turbulent boundary layers; slender flow; and their interaction with inviscid flow. Jets, plumes, wakes and shear layers. Statistical description of turbulence; data analysis.

CE 8503. Environmental Mass Transport. (4 cr; A-F or Aud. Prereq.–3502, 5051 or equiv or #) Principles of interphase and interfacial chemical transport and fate in the environment, specifically the processes of diffusion, dispersion, and convection. Application to surface water and atmospheric mixing, dispersion in groundwater, and transport between these media.

CE 8504. Theory of Unit Operations. (4 cr; A-F or Aud. Prereq.–4541, 4531) Theoretical basis, design, and operation of chemical and physical processes used in treating and controlling water quality, including adsorption, ion exchange, sedimentation, thickening, filtration, gas transfer, coagulation, flocculation, membrane processes, and disinfection.

CE 8505. Biological Processes. (5 cr; A-F or Aud. Prereq.–4502, 5051 or #) Principles underlyng chemical and biological wastewater treatment processes, including aerobic and anaerobic treatment for organic carbon and nutrient removal. Mathematical models of microbial growth kinetics and mass transport in suspended growth and attached film applications are developed.

CE 8506. Stochastic Hydrology. (4 cr; A-F or Aud. Prereq.–Stat 3021 or equiv or #) Analysis and synthesis of hydrologic series and systems; derived distributions; uncertainty and risk analysis; flood frequency analysis; multivariate time series analysis; correlation and spectral analysis; series of long-range dependence; linear estimation; geostatistics; sampling networks; hydrologic forecasting.


CE 8521. The Atmospheric Boundary Layer. (4 cr; A-F or Aud. Prereq.–IT or COAFES grad student or #) Land-atmosphere interactions and turbulent transport in the atmospheric boundary layer (ABL), the lowest part of the atmosphere. ABL development and dynamics. Turbulence, surface energy balance, spectral analysis, similarity theory. Flow over homogeneous and heterogeneous surfaces. Atmospheric stability, measurement, simulation of turbulent fluxes.

CE 8541. Aquatic Chemistry. (3 cr; A-F or Aud. Prereq.–4541 or #) Advanced course on water chemistry; physical-chemical principles and geochemical processes controlling the chemical composition of natural waters, soil- and sediment-water interactions. Emphasizes behavior of inorganic contaminants in natural waters and engineered systems and dissolved natural organic matter.

CE 8542. Chemistry of Organic Pollutants in Environmental Systems. (3 cr; A-F or Aud. Prereq.–4541, 5541 or #) Structural characteristics and physico-chemical properties of organic contaminants in aquatic systems. Emphasizes PCBs, PAHs, dioxins, insecticides, herbicides, and chlorinated solvents. Factors affecting their transport/ transformation. Structure- and property-activity relationships, their use in predicting organic chemical behavior.

CE 8551. Environmental Microbiology: Molecular Theory and Methods. (4 cr; A-F or Aud) Introduction to microbial genetics and molecular phylogeny. Application of nucleic-acid techniques in environmental microbiology and microbial ecology.

CE 8552. Groundwater Microbiology Laboratory. (4 cr; A-F or Aud. Prereq.–grad CE major or #, exposure to basic environ engr and microbial) Subsurface microbial ecology, biogeochemical cycling, metabolic classification of subsurface bacteria. Modeling bacterial transport, diagnosis of microbial induced fouling (MIF) events, bioremediation of contaminated aquifers. Lectures and four lab hours per week.


CE 8562. Analysis and Modeling of Aquatic Environments II. (3 cr [max 6 cr]; Stdt Opt. Prereq.–One sem grad work or #) Models for transport/transformation of pollutants, nutrients, particulates, ecosystems, etc., from recently completed theses, articles, or research in progress. Students review assigned recent papers, make presentations, and analyze a topic of their choice.

CE 8563. Industrial Waste Treatment. (3 cr; A-F or Aud. Prereq.–3501, 4501, 4502, or equiv or #) Introduction to industrial waste treatment. Individual industries, emphasizing constituents of the wastewater and how best to recycle, recover, or reduce wastes. Cost concerns and regulations. Field trips to various industries to gain first-hand knowledge of processes involved in treatment.

CE 8571. Hydraulic Measurements. (3 cr; A-F or Aud. Prereq.–3502 or #) Lab and field methods and instruments for measuring hydraulic pressure, velocity, and discharge.

CE 8572. Computational Environmental Fluid Dynamics. (4 cr; A-F or Aud. Prereq.-grad student in IT or COAFES or #) Finite difference methods, their application to solution of one- and two-dimensional problems in environmental fluid dynamics. Stability, convergence, consistency, and accuracy of numerical schemes. Navier-Stokes equations, their physical meaning, and their numerical solution. Turbulence modeling: RANS and LES.

CE 8581. Research and Professional Ethics in Water Resources and Environmental Science. (3 cr; S-N or Aud. =WRS 8581. Prereq.—Environmental engineering or water resource science) grad student or #) Background material required to participate in a stream restoration project. How to assimilate geographic, hydrologic, and ecological data at watershed level and reach scales to plan a restoration project and evaluate/ critique existing stream restoration projects.

CE 8601. Introduction to Stream Restoration. (3 cr; A-F or Aud) Background material required to participate in a stream restoration project. How to assimilate geographic, hydrologic, and ecological data at watershed level and reach scales to plan a restoration project and evaluate/ critique existing stream restoration projects.

CE 8602. Stream Restoration Practice. (2 cr; S-N only. =EEB 8602, GEO 8602. Prereq.–8601 or Geo 8601) Field experience, group design project. Students provide a stream restoration context for each other’s elective coursework, complete critical assessments of stream restoration projects, and design a stream restoration site.

CE 8666. Doctoral Pre-Graduate Thesis. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)
CE 8777. Thesis Credits: Master's. (1-18 cr; max 50 cr); No grade. Prereq=Max 18 cr per semester or summer (max 60 cr total required [Plan A only])

CE 8888. Thesis Credit-Dissertation. (1-24 cr; max 100 cr); No grade. Prereq=Max 18 cr per semester or summer; 24 cr required

Classical and Near Eastern Studies (CNES)

College of Liberal Arts

CNES 5013. Introduction to Roman Law. (3 cr; Stndt Opt)
Survey of Roman law from social and historical perspectives. Basic concepts of Roman private law and legal procedure.

CNES 5014. Who Owns the Past?: Archaeology, History, Ethics, and Laws. (3 cr; Stndt Opt)
Competition among collectors, museums, countries, native cultures, religious groups, archaeologists, and historians for right to control cultural resources. Legal/ethical codes to assess/adjudicate claims.

CNES 5051. Before Herodotus: History and Historiography of Mesopotamia and the Ancient Near East. (3 cr; A-F or Aud. +HIST 5051. Prereq=Prev coursework in Ancient Near Eastern history recommended)
Historical method/sources for Ancient Near Eastern history. Seminar. Emphasizes historical tradition and historiographic texts of Mesopotamia and neighboring regions of Ancient Near East. Secondary emphasis on their relationship to the works of classical historians such as Herodotus. Use of these sources in modern historiography of Ancient Near East.

CNES 5070. Topics in Ancient Religion. (3 cr; Max 18 cr; Stndt Opt. Prereq=Sr or grad student only)
Specific aspect of religion in Classical and Near Eastern antiquity, such as healing cults, magic/divination, Gnosticism, or prophecy/authority. Topics specified in Class Schedule.

CNES 5071. Greek and Hellenistic Religions. (3 cr; Stndt Opt.+CNES 5071. Prereq=) Greek religion from the Bronze Age to Hellenistic times. Sources include literature, art, and archaeology. Homer and Olympian deities; ritual performance; prayer and sacrifice; temple architecture; death and the afterlife; mystery cults; philosophical religion; Near Eastern salvation religions. Meets with 3071.

CNES 5072. The New Testament. (3 cr; Stndt Opt)

CNES 5073. Roman Religion and Early Christianity. (3 cr; Stndt Opt)

CNES 5076. Apostle Paul: Life, Letters, and Legacy. (3 cr; Stndt Opt.+CNES 5076) How/what we can know about Paul. What his message was. What he was fighting. How he was later understood by friends/foes.


CNES 5080. New Testament Proseminar. (3 cr; Stndt Opt. Prereq=3072 or 3070 or equiv)
Study of some specific aspect of the New Testament and related literature. The class is organized as a discussion seminar. Topics specified in Class Schedule.


CNES 5082W. Greek Tragedy in Translation. (3 cr; Stndt Opt)
Origins of tragedy. Selected plays of Aeschylus, Sophocles, and Euripides.

CNES 5103. Hellenistic and Early Roman Art and Archaeology. (3 cr; Stndt Opt.+ARTH 5103. Prereq-Jr, Clas/ArtH 3006 or #) Sculpture, architecture, painting, and topography in developing centers of Hellenistic culture in eastern Mediterranean and in Etruscan and Roman towns, from 400 B.C. to the beginnings of the Roman Empire.

CNES 5108. Greek Architecture. (3 cr; Stndt Opt.+ARTH 5108. Prereq-Jr, Clas/ArtH 3008 or #) Geometric through classical examples of religious and secular architecture and their setting at archaeological sites in Greece, Asia Minor and Italy.

CNES 5111. Prehistoric Art and Archaeology of Greece. (3 cr; Stndt Opt.+ARTH 5111. Prereq-Jr, Greek art or archaeology course or #) Survey of Greek prehistory and archaeology. Development/diffusion through later empire. Varying practices and views of sacrifice, martyrdom, spectacles of violence, apocalyptic ideologies of violence, state persecution, texts and terror, and holy war.


CNES 5251. Archaeology of Herodian Israel. (3 cr; A-F or Aud.+RELA 5251, RELS 5251. Prereq-One course in [archaeology or ancient history] or grad student)
Archaeological sites in Israel dating to era of Herod the Great (37-4 BC). Palaces and religious edifices. Remains from Jewish/gentile settlements throughout the kingdom. Course readings consist of contemporary literary sources and excavation reports.


CNES 5340. Practicum in Archaeological Field and Computer Technologies. (3 cr; Stndt Opt.+ARTH 5340. ARTH 5340, CLCV 5340. CNES 5340. Prereq-CLCV major or ancient art and archaeology course or #) Methods used for excavation of Old and New World sites. Meets at archaeometry/computer lab for part of the semester and at a selected site in Minnesota for day-long sessions for 9 to 10 weeks. Meets with 3340.

CNES 5502. Ancient Israel: From Conquest to Exile. (3 cr; Stndt Opt.+CNES 5502. HIST 5502. Prereq-Knowledge of Hebrew not required; 5501 recommended) Israelite history in context of what is known from Egyptian, Canaanite, and Mesopotamian sources. Focuses on issues raised by archaeological data related to Israelite conquest of Canaan.


CNES 5713. Introduction to Ugaritic. (3 cr; Stndt Opt. Prereq-Adv Hebrew, previous study of biblical texts or #) Ugaritic alphabetic cuneiform script, morphology, and syntax. Reading of representative samples of Ugaritic literature. Attention to linguistic and cultural issues and links to biblical and other Ancient Near Eastern texts.

CNES 5794. Introduction to Classical and Near Eastern Studies. (1 cr; S-N or Aud. Prereq-major or minor or #) Introduction to core research materials and reference materials in the various disciplines which make up classical studies.

For definitions of course numbers, symbols, and abbreviations, see page 214.

251
Clinical Laboratory Science (CLS)
Department of Laboratory Medicine and Pathology

Medical School
CLS 5090. Special Laboratory Methods. [1-2 cr; max 2 cr]; A-F or Aud. Prereq—# Assignment on an individual basis to one of a variety of special areas of experience in the clinical lab.


CLS 5103. Diagnostic Microbiology: Laboratory. [2 cr; A-F only. Prereq—One microbiology course with lab, one biochemistry course, #] Techniques used in lab diagnosis of infectious disease. Isolating/identifying bacteria/yeast. Antimicrobial susceptibility testing. Lab.

CLS 5120. Seminar: Clinical Laboratory Science. [1 cr; max 3 cr]; S-N or Aud. Prereq—#] Current literature. Presentation/discussion of research.

CLS 5121. Journal Presentations. [1 cr; max 2 cr]; S-N or Aud. Prereq—[1st yr CLS grad student] Critical analysis, evaluation, discussion of current journal articles in student's specialty area.

CLS 5125. Practicum Teaching. [1-2 cr; max 2 cr]; A-F or Aud. Prereq—#] Supervised teaching experience, develop skills using instructional materials, tests, and measurements.

CLS 5129. Elements of Laboratory Administration. [2 cr; A-F or Aud. Prereq—#] Leadership styles, employee selection and evaluation, communications, motivation, morale, discipline, job descriptions, record keeping, budgets, cost accounting, purchasing, product evaluation, lab safety, labor relations, government regulations.

CLS 5130. Practicum in Laboratory Administration. [2 cr; A-F or Aud. Prereq—#] Supervised experience and assignment of specific problems related to lab service and management in health care institutions.

CLS 5140. Techniques for Teaching. [2 cr; A-F or Aud. Prereq—#] Developing objectives, classroom activities, and evaluation criteria for medical technology education.

CLS 5165. Advanced Clinical Immunohematology. [3 cr; A-F or Aud. Prereq—#] Observation, study, and practice in special problems, advanced techniques, and methodology.


CLS 5202. Hematology II. [3 cr; A-F only. Prereq—5201 or CLSP 4201 or #] Fundamentals of examining blood and bone marrow. Identification of normal, immature, and abnormal cells. Correlation of clinical and lab findings. Lecture. Lab.

CLS 5203. Hemostasis. [1 cr; A-F only. Prereq—5201 or CLSP 4201 or #] Theory/application of concepts/techniques in hemostasis/coagulation. Lecture online. Lab.
Cognitive Science (CGSC)
College of Liberal Arts

CGSC 8000. Seminar: Philosophy of the Cognitive Sciences. (3 cr; max 6 cr; Stdt Opt. *PHIL 8640. Prereq-Grad cog sci minor or #)*
Philosophical framework for analyzing cognitive sciences. Recent developments in metaphysics and epistemology. Nature of scientific theories, methodologies of cognitive sciences, relations among cognitive sciences, relation of cognitive science to epistemology and various philosophical problems.

CGSC 8001. Proseminar in Cognitive Science. (2 cr; S-N or Aud. Prereq-Grad cog sci minor or #)
Survey of major topics, including theoretical assumptions, methods, and samples of current research.

CGSC 8041. Cognitive Neuroscience. (4 cr; A-F or Aud. *NSC 8041. Prereq-#*)

CGSC 8360. Seminar: Topics in Cognitive Science. (1-3 cr; max 6 cr; Stdt Opt. Prereq-Grad cog sci minor or #)
Lectures and in-depth discussion on a topic.

CGSC 8410. Perspectives in Learning, Perception, and Cognition. (2 cr [max 2 cr]; S-N only)
Lectures/discussions in cognitive sciences by local/visiting faculty.

CGSC 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade, Prereq-Doctoral student, adviser consent, DGS consent)

CGSC 8866. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade, Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

CGSC 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade, Prereq-Max 18 cr per [semester or summer])

Communication Studies (COMM)
Department of Communication Studies
College of Liberal Arts

COMM 5110. Special Topics in Communication Theory. (3 cr [max 9 cr]; Stdt Opt)
Advanced theoretical problems. See department office for current offerings.

Problems affecting U.S. commercial and educational electronic media. Audiences; race/gender issues; regulation.

COMM 5211. Critical Media Studies: Theory and Methods. (3 cr; A-F only, Prereq-Grad student or #)
Survey of theories, research methods, and scholars dominating critical media studies since late 1920s.

COMM 5220. Television Genres. (3 cr; Stdt Opt)
Nature, historical development, and influence on society of specific genres of television programming: drama, situation comedy, mystery, soap opera. Program genre change over time and how society, government regulation, and economics of production influence that historical process.

COMM 5221. Media, Race, and Identity. (3 cr; Stdt Opt. Prereq-3221, sr, #)
Critical media studies perspective on cultural politics of race and ethnicity. Social construction of race, politics of racism, media representations of race.

COMM 5233W. Electronic Media and National Development. (3 cr; Stdt Opt)
Use of electronic media to change social, political, economic, and cultural life. Use by developing nations to improve agricultural practices, hygiene standards, literacy, and awareness of civic responsibility.

COMM 5261. Political Economy of Media Culture. (3 cr; Stdt Opt. Prereq-3261 or #)
Organizational practices of media communicators. Media content as link between communicators and audiences. How viewers use/ process media content.

COMM 5271. Media Historiography. (3 cr; A-F only, Prereq-3271, jr or sr)
Critical media studies perspective (political economy, cultural, and technological) on history of mass media in the U.S., 1800s to present. Conceptual approaches to writing of media history. Skills/techniques for doing historical research in media studies.

COMM 5401. Advanced Theories of Communication. (3 cr; Stdt Opt. Prereq-3401 or grad)
Survey of major theoretical approaches to communication including, positivism, constructivism, and systems.

COMM 5402. Advanced Interpersonal Communication. (3 cr; Stdt Opt. Prereq-3401 or 3402)
Social scientific approaches to interpersonal communication. Theory, research findings.

COMM 5404. Language and Culture. (3 cr; Stdt Opt. Prereq-3401 or #)
How language and culture are transmitted as knowledge, attitudes, and beliefs. Connections among language, thought, and culture. Social/ethnic perspectives on study of language/communication.

COMM 5406. Communication and Gender. (3 cr; Stdt Opt. *GWS 5400. Prereq-One women's studies course or #)
How gender affects verbal communication. Development of analytical skills through readings, exercises, research that raise awareness of the power of language and the influence of gender prescriptions. Comparisons across languages where possible.

COMM 5408. Social Cognition. (3 cr; Stdt Opt)
Role of cognitive processing in communication studies. Models include perception, attention, memory and their use in communication. Evaluation of social cognition theory and research.

COMM 5411. Small Group Communication Research. (3 cr; A-F or Aud. Prereq-3411 or #)
Survey of small group communication research; theory and practice. Group decision-making and leadership.

COMM 5421. Quantitative Methods in Communication Research. (3 cr; A-F or Aud. Prereq-3601 or #)
Social scientific methods used in studying human communication. Optional data processing laboratory for additional credit.

COMM 5431. The Process of Persuasion. (3 cr; Stdt Opt. Prereq-3431)
Communication theories (e.g., advertising, political) illustrating persuasive processes and theories. Research paper required.

COMM 5441. Communication in Human Organizations. (3 cr; Stdt Opt. Prereq-9 cr social science, 3441 or #)
Communication in organizational settings. Organizational structure and dynamics and their effect upon the communication process. Individual projects.

COMM 5451W. Intercultural Communication Processes. (3 cr; Stdt Opt)
Theory and research on cultural differences in values, norms, behaviors, and perceptions that affect communication across cultures internationally and domestically.

COMM 5461. Conversation Analysis. (3 cr; Stdt Opt. *LING 5461. Prereq-Ling 3001 or Ling 5001)
Discourse processes in dyadic and multiparty conversation. Application of concepts through analysis of conversations.

COMM 5462. Field Research in Spoken Language. (3 cr; Stdt Opt. *LING 5462. Prereq-5461, Ling 3001 or Ling 5001)
Transcribing and analyzing verbal communication and movement related to it. Applying concepts to recorded conversations.

COMM 5461. Survey of Rhetorical Theory. (3 cr; Stdt Opt)
Rhetorical theory, from ancient to contemporary period. Application to public discourse.

COMM 5615W. Introduction to Rhetorical Criticism. (3 cr; Stdt Opt. Prereq-1101 or 3601 recommended)
Analysis of public discourse using various theoretical perspectives.

How discourse has been used to establish or maintain power. Speeches and public debates used to examine American public address from 17th century (e.g., Puritan sermons) to the Civil War.

How discourse has been used to establish or maintain power. Speeches and public debates used to examine U.S. public address from the mid 19th century to 1950.

COMM 5970. Directed Study. (1-3 cr [max 6 cr]; S-N or Aud. Prereq-#)
N-14 and Aud. Prereq-Nine 5xxx-5xxx Spch cr, #, @)
Guided individual reading or study.

COMM 599A. Communication Research Practicum. (1-3 cr [max 9 cr]; S-N or Aud. Prereq-#)
Students participate in research group.

COMM 8110. Seminar: Advanced Speech Problems. (3 cr [max 15 cr]; Stdt Opt. Prereq-undergrad degree in spch-comm or equiv)
Evaluation of research methods in speech-communication.

COMM 8210. Seminar: Selected Topics in U.S. Electronic Media. (3 cr [max 6 cr]; Stdt Opt. Prereq-5210 or #; offered when feasible)
Literature survey; evaluating research on topics; conducting independent research project on a particular topic.

COMM 8211. Critical Communication Studies: History, Theory, Method. (3 cr; Stdt Opt)
Qualitative research methods for studying media institutions, texts, audiences, and contexts.

Historical and contemporary aspects of national and international electronic media systems. Roles of national and international regulatory bodies. Approaches to programming and evidence of effectiveness.
Course Descriptions

COMM 8333. FTE: Master’s. (1-6 cr; No grade. Prereq-Master’s student, adviser and DGS consent)
COMM 8402. Seminar: Interpersonal Communication. (3 cr; Stdnt Opt. Prereq-5402 or #)
Evaluate and develop new perspectives for analyzing, diagnosing, and managing interpersonal communication problems.


COMM 8406. Seminar: Language and Gender Research. (3 cr; Stdnt Opt. Prereq-5406) Readings and research on current issues. Data collected to test hypotheses and apply theory.


COMM 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)


COMM 8452. Methods of Intercultural/Diversity Facilitation. (3 cr; Stdnt Opt. Prereq-4451 or 5452 recommended) Theories of and techniques for managing effective intercultural communication and diversity.

COMM 8502. Seminar: Communication Theory Construction. (3 cr; Stdnt Opt. Prereq-5421 or #) Logic of communication theory development and modification from a social scientific perspective. Types of communication theories.

COMM 8503. Historical and Descriptive Research in Speech Communication. (3 cr; Stdnt Opt) Elements involved in conducting and analyzing historical and descriptive research; approaches to historical research, assessing primary and secondary sources; completing a major research project.

COMM 8504. Seminar: Rhetorical Criticism. (3 cr, Stdnt Opt. Prereq-5431 or #) Rhetorical criticism theories and methods. Rhetoric as applied to literary studies and the growth of hermeneutics as the basis for exploring rhetorical traditions.

COMM 8606. Seminar: Rhetorical Analysis of Campaigns and Movements. (3 cr; Stdnt Opt. Prereq-5431, 5611 or 5618, 10 cr soc sci or #) Literature and methodology in historical and contemporary rhetorical campaigns and movements.


COMM 8625. Seminar: Communication Ethics. (3 cr; A-F or Aud. Prereq-Ethics course or #) Independent research on communication ethics in interpersonal, group, organizational, intercultural, and media settings. Theories of ethics and methods of analysis.

COMM 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

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

COMM 8888. Thesis Credit: Doctoral. (1-24 cr [max 24 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

COMM 899A. Directed Research. (1-3 cr [max 6 cr]; S-N or Aud) Supervised research project.

Comparative and Molecular Biosciences (CMB)

College of Veterinary Medicine

CMB 5180. Ecology of Infectious Diseases. (3 cr; A-F only. =PVBH 6180. Prereq-MVB or CMB or VMed grad student or #) Ways in which host, agent, and environmental factors influence transmission of infectious agents. Environmental dissemination, eradication/ control, evolution of virulence, analytical/molecular tools.


CMB 5335. Molecular Biotechnology Laboratory for the Novice. (2 cr; S-N only) Five day course. Understanding/applying basic concepts of biotechnology. Lectures, hands-on lab experiments.

CMB 5381. Pathogenesis of Infectious Zoonotic Diseases. (3 cr; A-F only. =MICB 5381, OBIO 5381) Introduction to mechanisms of transmission/pathogenesis for zoonotic infectious diseases. Lectures, review of current literature, student presentations, written reports.

CMB 5594. Directed Research in Comparative and Molecular Biosciences. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq-Jr) Independent study as determined by instructor. Usual activity includes conduct of research in instructor’s lab.


CMB 6010. Research Rotation in Comparative and Molecular Biosciences. (4 cr [max 8 cr]; A-F or Aud. Prereq-1st yr CMB grad student) Directed research lab rotations. Experimentation, supplemental reading, research presentations under guidance of faculty member who is potential thesis adviser. Taught by program faculty.

CMB 6134. Ethical Conduct of Animal Research. (3 cr; A-F or Aud. =ANSC 6134, VMED 6134. Prereq-[Grad or professional school] student or #) Ethical considerations in the use of animal subjects in agricultural, veterinary, and biomedical research. Federal, state, and University guidelines relating to proper conduct for acquisition/use of animals for laboratory, observational, educational, and clinical research. Regulatory requirements. Bases for proper conduct. Societal impact on scientific investigations utilizing animal subjects.


CMB 8202. Mechanisms of Animal Health and Disease II. (3 cr; Stdnt Opt. Prereq-8201) Multi-perspective approach to critically evaluating journal articles, as done for peer-reviewed journals. Aspects of host/pathogen interactions, including molecular/genetic mechanisms of host resistance and pathogenesis.


CMB 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

CMB 8335. Molecular Biology Techniques. (3 cr; Stdnt Opt. =ANSC 8131. Prereq-Biol 5001, Biol 5003 or equiv or #) Basic theory and current methodologies of molecular biology and recombinant DNA technology. Lab work includes DNA and RNA hybridization, gene transfer, and polymerase chain reaction techniques. Primarily for students with limited exposure to molecular biology.


CMB 8361. Neuro-Immune Interactions. (3 cr; Stdnt Opt. =ANSC 8026, PHCL 8026, PSY 8026. Prereq-[MicB 5210 or equiv] or #) Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune interaction. Course is offered fall of even-numbered years.

CMB 8371. Mucosal Immunobiology. (3 cr; A-F or Aud. =MICA 8371, OBIO 8371. Prereq-MICA 8001 or equiv or #) Host immune processes at body surfaces. Innate/ adaptive immunity at mucosal surfaces. Interactions/ responses of various mucosal tissues to pathogens. Approaches to target protective vaccination to mucosal tissues. Lectures, journal.

CMB 8394. Research in Comparative Biomedical Sciences. (1-6 cr [max 18 cr]; Stdnt Opt. Prereq-Grad CMB major) Directed research determined by student’s interests, in consultation with faculty mentor.

CMB 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

CMB 8481. Advanced Neuropharmacology. (4 cr; A-F or Aud. =NSC 6481, PHM 8481. Prereq-#) Delivery of compounds to central nervous system (CNS) to activate proteins in specific brain regions for therapeutic benefit. Pharmaceutical/pharmacological issues specific to direct drug delivery to CNS.
Comparative Literature (CL)

Department of Cultural Studies and Comparative Literature

College of Liberal Arts

CL 5331. Discourse of the Novel. (3 cr; Stdnt Opt. +CSCL 5331)
Comparative study of the novel (eighteenth century to present): its relation to ordinary language practices, emergent reading publics, technologies of cultural dissemination, problems of subjectivity, its role in articulating international cultural relations.

CL 5555. Introduction to Semiotics. (3 cr; Stdnt Opt. +CSCL 5555)
Problems of the nature of the sign; sign function/production; signifying systems as articulated in philosophy, linguistics, anthropology, psychoanalysis, and art theory. Applying semiotics to various signifying practices (e.g., literature, cinema, daily life).

CL 5751. Basic Concepts of Cinema. (4 cr; Stdnt Opt. +CSCL 5751, CSDS 5751)
Cinema as object of theoretical/historical analysis. Emphasizes concepts that have transformed scope/aim of film analysis since 1960s. Readings of filmic/theoretical texts.

CL 5910. Topics in Comparative Literature. (3 cr [max 24 cr]; Stdnt Opt)
Topics specified in Class Schedule.

CL 5992. Directed Reading in Comparative Literature. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq–#)
Guided individual reading and study.

CL 8001. Basic Seminar in Comparative Literature I. (3 cr; Stdnt Opt. Prereq–CLit or Germanic Studies grad major)
Key texts, positions, and problematics in field of comparative critical theory. Historical precursors, influential contemporary debates, and disciplinary genealogies.

CL 8002. Basic Seminar in Comparative Literature II. (3 cr; Stdnt Opt)
Key texts, positions, and problematics in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, and disciplinary genealogies.

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

CL 8362. Modernity and Its Others. (4 cr; Stdnt Opt)
Dialectical interrogation of Western and non-Western theories of modernity. Reckoning with differences and variations in its history, providing an account of the normative category of modernity (designated as European), and alternative articulations around the globe.

CL 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

CMB 8550. Comparative and Molecular Biosciences Seminar. (1 cr [max 8 cr]; S-N or Aud. Prereq–Biol sciences grad student)
Student/faculty presentations of their own research or a directed topic.

CMB 8560. Research and Literature Reports. (1 cr [max 8 cr]; S-N or Aud. Prereq–Grad CMB student or #)
Current developments in cellular and molecular mechanisms of animal health and disease.

CMB 8570. Comparative Biomedical Sciences Seminar. (1 cr [max 8 cr]; S-N or Aud. Prereq–Biol sciences grad student)
Weekly seminar by primarily outside speakers discussing current issues.

CMB 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

CMB 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])

CMB 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Comparative Studies in Discourse and Society (CSDS)

Department of Cultural Studies and Comparative Literature

College of Liberal Arts

CSDS 5301. Society, Ideology, and the Production of Art. (3 cr; Stdnt Opt. +CSCL 5301)
Recent critical theories of relation of arts to social/ideological forces. Selected artifacts from Western culture (e.g., Renaissance to 20th century; high, popular, mass culture). Music, visual art, literature.

CSDS 5302. Aesthetics and the Valuation of Art. (3 cr; Stdnt Opt. +CSCL 5302)
Society, ideology, aesthetic value in light of recent critical theories of visual art, music, literature. Mediations of place, social class, gender, ideology on aesthetic judgment in post-reconstruction Western culture.

CSDS 5555. Introduction to Semiotics. (3 cr; Stdnt Opt)
Problems of the sign. Sign function/production. Signifying systems as articulated in philosophy, linguistics, anthropology, psychoanalysis, and art theory. Applying semiotics to various signifying practices (e.g., literature, cinema, daily life).

CSDS 5751. Basic Concepts of Cinema. (4 cr; Stdnt Opt. +CL 5751, CSCL 5751)
Cinema as object of theoretical/historical analysis. Emphasizes concepts that have transformed scope/aim of film analysis since 1960s. Readings of filmic/theoretical texts.

CSDS 5910. Topics in Comparative Discourse and Society. (3 cr [max 24 cr]; Stdnt Opt)
Themes in comparative, sociohistorical analysis of discursive practices. Individually or team taught. Topics specified in Class Schedule.

CSDS 5993. Directed Study. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq–#)
Guided individual reading and study.

CSDS 8001. Basic Seminar: Comparative Studies in Discourse and Society I. (3 cr; Stdnt Opt. Prereq–CSDS or Germanic Studies grad major)
Key texts, positions, and problematics in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, and disciplinary genealogies.

CSDS 8002. Basic Seminar in Comparative Studies in Discourse and Society II. (3 cr; Stdnt Opt)
Key texts, positions, and problematics in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, and disciplinary genealogies.

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

CSDS 8404. International Hierarchy. (3 cr; Stdnt Opt. +POL 8404)
Asymmetric structures and processes of international relations; systemic conditions and implications of informal empire and structures of dependency and hegemony.

CSDS 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)
Course Descriptions

CSDS 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 9% for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

CSDS 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

CSDS 8901. Pedagogy of Cultural Studies and Comparative Literature. (3 cr; Stndt Opt + CSCI 8901. Prereq–Grad CSDS major)
Prepare graduate majors for teaching. Issues of pedagogy. Preparing syllabi for specific courses that graduate instructors teach. Required for students planning to teach in Department of Cultural Studies and Comparative Literature.

CSDS 8902. Methodologies Colloquium. (1 cr [max 2 cr]; S-H only. Prereq–CSDS grad major or #)

CSDS 8910. Advanced Topics in Comparative Studies in Discourse and Society. (3 cr [max 24 cr]; Stndt Opt) Themes in comparative, sociohistorical analysis of discursive practices. Individually or team taught. Topics vary by instructor and semester.

CSDS 8920. Advanced Topics in Comparative Studies in Discourse and Society. (3 cr [max 15 cr]; Stndt Opt) Practical applications of specific methodologies and theories to a determined area. Topics vary by instructor and semester.

CSDS 8993. Directed Study in Comparative Studies in Discourse and Society. (1-4 cr [max 12 cr]; Stndt Opt. Prereq–#)

CSDS 8994. Directed Research in Comparative Studies in Discourse and Society. (1-4 cr [max 4 cr]; Stndt Opt. Prereq–#)

Computer Engineering (CMPE)

Department of Electrical and Computer Engineering

Institute of Technology

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

CMPE 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])

Computer Science (CSCI)

Department of Computer Science

Institute of Technology

CSCI 5103. Operating Systems. (3 cr; Stndt Opt. Prereq–4061 or #)
Conceptual foundation of operating system designs and implementations. Relationships between operating system structures and machine architectures. UNIX implementation mechanisms as examples.

CSCI 5104. System Modeling and Performance Evaluation. (3 cr; Stndt Opt. Prereq–5103 or #)
Techniques for modeling computing systems for performance evaluation through analytical/simulation techniques. How to model computing systems and communications protocols to evaluate their performance under different operating conditions.

CSCI 5105. Foundations of Modern Operating Systems. (3 cr; Stndt Opt. Prereq–5103 or #)
Advanced concepts that build foundations of modern operating systems. Advanced scheduling algorithms, distributed communication/synchronization, consistency/replication models, distributed file systems, security, protection/virtualization, OS architectures.

CSCI 5106. Programming Languages. (3 cr; Stndt Opt. Prereq–4011 or #)
Design and implementation of high-level languages. Course has two parts: (1) language design principles, concepts, constructs; (2) language paradigms, applications. Note: course does not teach how to program in specific languages.

Emphasizes programming projects in C++. Scan conversion, hidden surface removal, Euclidean transformations, projection, illumination/shading, parametric cubic curves, texture mapping, antialiasing, ray tracing. Developing graphics software, graphics research.

CSCI 5108. Fundamentals of Computer Graphics II. (3 cr; Stndt Opt. Prereq–5107 or #)
Advanced topics in image synthesis, modeling, and rendering. Image processing, image warping, global illumination, non-photorealistic rendering, texture synthesis. Parametric cubic surfaces, subdivision surfaces, acceleration techniques, advanced texture mapping. Programming is in C++.

CSCI 5109. Visualization. (3 cr; Stndt Opt. Prereq–1902, 4041 or equiv or #)
Fundamental theory/practice in data visualization. Emphasizes programming applications. Volume visualization, vector field visualization, information visualization, multivariate visualization, visualization of large datasets, visualization in immersive virtual environments, and perceptual issues in effective data representation. Projects are implemented in C++ using VTK or similar visualization API.

CSCI 5110. Cloud Infrastructure. (3 cr; Stndt Opt. Prereq–4041 or #)
Theory, design, programming, and evaluation of interactive application interfaces. Human capabilities and limitations, interface design and engineering, prototyping and interface construction, interface evaluation, and topics such as data visualization and World Wide Web. Course is built around a group project.

CSCI 5112. Collaborative and Social Computing. (3 cr; Stndt Opt. Prereq–5115 or #)
Introduction to computer-supported cooperative work, social computing. Technology, research methods, theory, case studies of group computing systems. Readings, hands-on experience.

CSCI 5131. Advanced Internet Programming. (3 cr; Stndt Opt + CSCI 4131. Prereq–5106 or #)
Issues in Internet programming: Java programming, concurrent programming, workflow, distributed databases, security, collaborative computing, object-oriented architecture/design, network publishing, messaging architecture, distributed object computing, internets.

CSCI 5143. Real-Time and Embedded Systems. (3 cr; A-F only. Prereq–4061 or #, experience with C language)
Real-time systems that require timely response by computer to external stimulus. Embedded systems in which computer is part of machine. Increasing importance of these systems in commercial products. How to control robots and video game consoles. Lecture, informal lab.

CSCI 5161. Introduction to Compilers. (3 cr; Stndt Opt. Prereq–[2011, 5106] or #)
Design, implementation of high-level languages. Course has two parts: (1) language design principles, concepts, constructs; (2) language paradigms, applications. Note: course does not teach how to program in specific languages.

CSCI 5211. Data Communications and Computer Networks. (3 cr; Stndt Opt. + CSCI 4211. Prereq–[4061 or #], basic knowledge of computer architecture, operating systems, probability, grad student)
Concepts, principles, protocols, and applications of computer networks. Layered network architectures, data link protocols, local area networks, network layer/routing protocols, transport, congestion/control, emerging high-speed networks, network programming interfaces, networked applications. Case studies using Ethernet, Token Ring, FDDI, TCP/IP, ATM, Email, HTTP, and WWW.

CSCI 5221. Foundations of Advanced Networking. (3 cr; Stndt Opt. Prereq–4211 or 5211 or equiv; intro course in computer networks recommended)

CSCI 5231. Wireless and Sensor Networks. (3 cr; Stndt Opt. Prereq–4211 or 5211 or equiv; intro course in computer networks recommended)
Enabling technologies, including hardware, embedded operating systems, programming environment, communication, networking, and middleware services. Hands-on experience in programming tiny communication devices.

CSCI 5271. Introduction to Computer Security. (3 cr; Stndt Opt. Prereq–4061 or equiv or #)
Concepts of computer, network, and information security. Risk analysis, authentication, access control, security evaluation, audit trails, cryptography, network/database/application security, viruses, firewalls.

CAD for digital systems. Emphasizes VLSI. Hardware description languages, synthesis, simulation, test generation.

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INTRODUCTION
Introduction to AI. Problem solving, search, inference

OPT. Prereq—[2011 or #], grad student

Chapter 3: Data mining for microarray expression analysis.
for gene/promoter and protein structure prediction.
measurements of gene expression changes.

Chapter 3: Genomics.

Chapter 3: Cryptography.
authentication codes, identification, authentication,
(public key), digital signatures, hash functions, message

Chapter 3: Secure systems/networks.

Chapter 3: Introduction to cryptography. Theoretical foundations,
number theory or finite fields

Chapter 3: CSCI 5471. Modern Cryptography.

Chapter 3: CSCI 5451. Introduction to Parallel Computing:
Computational models, complexity measures in each
model, and related complexity classes.

Chapter 3: CSCI 5451. Introduction to Parallel Computing:

Chapter 3: CSCI 5451. Introduction to Parallel Computing:
Parallel architectures design, embeddings, routing.
Examples of parallel computers. Fundamental
communication and synchronization. Performance metrics.
Parallel algorithms for sorting. Matrix problems,
graph problems, dynamic load balancing, types of
parallelisms. Parallel programming paradigms.
Message passing programming in MPI, Shared-address space
programming in OpenMP or threads.

Chapter 3: CSCI 5461. Functional Genomics, Systems
Biology, and Bioinformatics.

Chapter 3: CSCI 5471. Modern Cryptography.

Chapter 3: CSCI 5481. Computational Techniques for
Genomics.

Chapter 3: CSCI 5511. Artificial Intelligence I.

Chapter 3: CSCI 5512. Artificial Intelligence II.


Chapter 3: CSCI 5523. Introduction to Data Mining.


Chapter 3: CSCI 5541. Natural Language Processing.

Chapter 3: CSCI 5551. Introduction to Intelligent Robotic
Systems.

Chapter 3: CSCI 5552. Sensing and Estimation in
Robotics.

Chapter 3: CSCI 5551. Introduction to Intelligent Robotic
Systems.

Chapter 3: CSCI 5561. Computer Vision.


Chapter 3: CSCI 5708. Architecture and Implementation
of Database Management Systems.

Chapter 3: CSCI 5802. Software Engineering II.

Chapter 3: CSCI 5980. Special Topics in Computer
Science.

Chapter 3: CSCI 5991. Independent Study.

Chapter 3: CSCI 5999. Curricular Practical Training.

Chapter 3: CSCI 5994. Directed Research.


Chapter 3: CSCI 5999. Curricular Practical Training.

Chapter 3: CSCI 5994. Directed Research.

Course Descriptions

CSCI 8115. Human-Computer Interaction and User Interface Technology. (3 cr; Stdnt Opt. Prereq-5155 or #)
Current research issues in human-computer interaction, user interface toolkits and frameworks, and related areas. Research techniques, model-based development, gesture-based interfaces, constraint-based programming, event processing models, innovative systems, HCI in multimedia systems.

CSCI 8161. Advanced Compiler Techniques. (3 cr; Stdnt Opt. Prereq-4601 or #)
Techniques for unprocessors and parallel computers. Fundamental program analysis instruments such as data flow analysis and data dependence analysis. Variety of code generation and transformation techniques.

CSCI 8205. Parallel Computer Organization. (3 cr; Stdnt Opt. EE 8367, Prereq-5202 or EE 5364 or #)

CSCI 8211. Advanced Computer Networks and Their Applications. (3 cr; Stdnt Opt. Prereq-5211 or #)
Current research issues in traffic and resource management, quality-of-service provisioning for integrated services networks (such as next-generation Internet and ATM networks) and multimedia networking.

CSCI 8271. Security and Privacy in Computing. (3 cr; A-F or Aud. Prereq-[5211, 5103] or #; 5471 or EE 5246 or Math 5248 or equiv recommended)
Recent security/privacy issues in computer systems/networks. Threats, attacks, countermeasures. Security research, authentication, network security, wireless security, computer system security, anonymous system, pseudonym, access control, intrusion detection system, cryptographic protocols. How to pursue research in security and design secure systems.

CSCI 8283. Research Problems in Computer-Aided Design for Electronic Design. (3 cr; Stdnt Opt. Prereq-5201 or 5283 or equiv or #)
Open research problems in contemporary CAD for electronic design, approaches to their solution.

CSCI 8314. Sparse Matrix Computations. (3 cr; Stdnt Opt. Prereq-5304 or numerical linear algebra course or #)

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

CSCI 8363. Numerical Linear Algebra in Data Exploration. (3 cr; Stdnt Opt. Prereq-5304 or #)

CSCI 8404. Design and Analysis of Approximation Algorithms. (3 cr; Stdnt Opt. Prereq-5403 or 5421 or #)
Because an exact solution is often infeasible for computationally difficult problems in important applications, approximation algorithms are a significant area of study. Introduces techniques for design of approximation algorithms; theory for evaluating the algorithms performance.

CSCI 8442. Computational Geometry and Applications. (3 cr; Stdnt Opt. Prereq-5421 or #)
Designing efficient algorithms and data structures for geometric problems. Models of computation, convex hulls, geometric duality, multidimensional search, Voronoi diagrams and Delauney triangulations, linear programming in fixed dimensions, lower bound techniques. Applications, advanced topics.

CSCI 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

CSCI 8551. Intelligent Agents. (3 cr; Stdnt Opt. Prereq-5511 or #)
Theories of intelligent agents. Agent architectures; knowledge representation, communication, cooperation, and interaction among multiple agents; planning and learning; issues in design and agents with a physical body; dealing with sensors and actuators; world modeling.

CSCI 8666. Doctoral Pre-Thesis Credits. (1-6 cr; max 12 cr; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

CSCI 8701. Overview of Database Research. (3 cr; Stdnt Opt. Prereq-5708 or #)
Research papers from journals and conferences on current topics in databases, such as database research methodologies, relational implementation techniques, active databases, storage systems, benchmarking, distributed and parallel databases, new data models, prototype systems, data mining, and future directions.

CSCI 8703. Distributed and Parallel Databases. (3 cr; Stdnt Opt. Prereq-5708 or #)
Distributed database management systems (DBMS) architecture, including client-server, distributed DB design, distributed query optimization and processing; distributed transaction management (concurrency control and recovery), federated/multibases (definition and issues); database machines (concepts, successes, and failures); parallel databases.

CSCI 8715. Spatial Databases and Applications. (3 cr; Stdnt Opt. Prereq-4707 or 5707 or GIS 5571 or GIS 5573)
Motivation, Models of spatial information, querying spatial data, processing strategies for spatial queries, multi-dimensional storage/access methods, spatial graph datasets, spatial data mining, trends (e.g., spatio-temporal databases, mobile objects, raster databases).

CSCI 8725. Databases for Bioinformatics. (3 cr; Stdnt Opt. Prereq-4707 or 5707 or GIS 5573 or #)
DBMS support for biological databases, data models. Searching integrated public domain databases. Queries/analyses, DBMS extensions, emerging applications.

CSCI 8735. Advanced Database Systems. (3 cr; A-F or Aud. Prereq-4707 or 5707 or 5708)
Database systems for emerging applications, nontraditional query processors, multi-dimensional data indexing. Current research trends.

CSCI 8760. Plan B Project. (5 cr; S-N or Aud. Prereq-CSci MS student, #)
Project arranged between student and faculty.

CSCI 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))

CSCI 8801. Advanced Software Engineering. (3 cr; Stdnt Opt. Prereq-5801 or #)
Software reusability, internet/intranet programming, software reengineering, and software safety.

CSCI 8888. Thesis Credit: Doctoral. (1-24 cr; max 100 cr; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

CSCI 8970. Computer Science Colloquium. (1 cr; max 5 cr; S-N or Aud)
Recent developments in computer science and related disciplines. Students must attend 13 of the 15 lectures.

CSCI 8990. Special Advanced Topics in Computer Science. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq-#)
Lectures and informal discussions.

CSCI 8991. Independent Study. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq-#)
Independent study with professor.

CSCI 8994. Directed Research in Computer Science. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq-professor)
Directed research with professor.

Conservation Biology (CBIO)

College of Biological Sciences

CBIO 8001. Conservation Biology Seminar. (1 cr; max 6 cr; S-N or Aud. Prereq-#)
Topics vary.

CBIO 8004. Economic and Social Aspects of Conservation Biology. (3 cr; Stdnt Opt. Prereq-CBio student or #)

CBIO 8095. Directed Study Experience. (1-5 cr; max 6 cr; S-N or Aud. Prereq-#)
Directed Study Experience

CBIO 8095. Contemporary Problems in Conservation Biology. (1 cr [max 3 cr]; S-N or Aud. Prereq-8004, FW 8452, #)
Comprehensive review of conservation biology issue. Written exam.

CBIO 8103. Research in Support of Resource Management: a Dialog With Land Managers. (2 cr; S-N only)
Effective communication between researchers and natural resource managers. Organized around research needs of land managers. Students select topics of interest from these needs and, as small teams, prepare short research proposals to address each topic.

CBIO 8201. How to Excel in Graduate School. (1 cr [max 4 cr]; S-N only)
Overview of history/philosophy of science as framework for writing thesis or dissertation. How to conduct research. Time management.

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

CBIO 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)
Control Science and Dynamical Systems (CSDY)

Institute of Technology

CSDY 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser, and DGS consent)

CSDY 8666. Doctoral Pre-Thesis Credits. (1–6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

CBI 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])

CBI 8888. Thesis Credit: Doctoral. (1–24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Coptic (COPT)

Department of Classical and Near Eastern Studies

College of Liberal Arts

COPT 5001. Elementary Coptic. (3 cr; Stdnt Opt) Introduction to Coptic grammar and vocabulary, chiefly in the Sahidic dialect.

COPT 5002. Elementary Coptic. (3 cr; Stdnt Opt. Prereq–5001 or equiv) Reading a variety of Coptic literature, such as Gnostic, martyrological, or monastic texts.

Cultural Studies and Comparative Literature (CSCL)

Department of Cultural Studies and Comparative Literature

College of Liberal Arts

CSCL 5147. Teaching as Dialogue. (3 cr; Stdnt Opt) Teaching and the teacher are the subject. Entering into dialogue is the method. Issues with the politics of teaching, techniques of entering into dialogue, questions of judgment, and the idea of self-teaching as the goal of teaching.

CSCL 5154W. Theoretical Constructions of Space. (3 cr; Stdnt Opt) Inquiry into theoretical space drawn from various disciplines including anthropogeography, art, geography, history, landscape design, philosophy, planning, and sociology. Focus on sociopolitical interests that are served and sustained; emphasis on opportunities and implications for personal identity.

CSCL 5256W. Suburbia. (3 cr; Stdnt Opt) Suburbia from origins in 18th-century England to the present. Historical changes and present challenges, especially in America. Sociology, mythology, planning, development, geography, transportation, the family. Specific sites and designs; representations in film, television, popular literature, and music.

CSCL 5301. Society, Ideology, and the Production of Art. (3 cr; Stdnt Opt. ¸CSDS 5301) Recent critical theories on the relation of the arts to social and ideological forces; selected artifacts from Western culture (Renaissance to 20th century; high, popular, and mass culture). Music, visual art, literature.

CSCL 5302. Aesthetics and the Valuation of Art. (3 cr; Stdnt Opt. ¸CSDS 5302) Society, ideology, and aesthetic value considered in light of recent critical theories of visual art, music, and literature. Meditations of place, social class, gender and ideology on aesthetic judgment in post-Renaissance Western culture.

CSCL 5331. Discourse of the Novel. (3 cr; Stdnt Opt. ¸CL 5331) Comparative study of the novel, 18th century to present. Its relations to ordinary language practices, emergent reading publics, technologies of cultural dissemination, problems of subjectivity and its role in articulating international cultural relations.

CSCL 5411. Avant-Garde Cinema. (4 cr; A-F only. Prereq–1921 or ARTH 1921W or equiv) History/theory of avant-garde cinema, from classical period (1920s) to post-WWII.

CSCL 5415. Cinema and Society in the Arab World. (4 cr; A-F only. Prereq–1921 or ARTH 1921W or equiv) Focuses on Egypt, Algeria, and Syria, against background of European colonialism, loss of Palestine, Arab-Israeli wars, rise of Arab nationalism, and Algerian War.

CSCL 5555. Introduction to Semiotics. (3 cr; Stdnt Opt. ¸CL 5555) Problems of the nature of the sign; sign function; sign production; signifying systems as articulated in philosophy, linguistics, anthropology, psychoanalysis, and art theory. Application of semiotics to various signifying practices (literature, cinema, daily life).

CSCL 5711. Sociocriticism. (3 cr; Stdnt Opt) Sustained consideration of the modern tradition of sociological reflection on literature. Early and late 18th-century England, Frankfurter School, Bakhtin circle, and the various French intellectuals associated with both Les Temps Modernes and Tel Quel.


CSCL 5910. Topics in Cultural Studies and Comparative Literature. (3 cr [max 24 cr] Stdnt Opt) Topics specified in Class Schedule.

CSCL 5993. Directed Study. (1–3 cr [max 9 cr]; Stdnt Opt. Prereq–4, %, @) Guided individual reading or study.
Course Descriptions

CI 5097. Student Teaching in Art Education. (8 cr; S-N or Aud. Prereq-Licensure student in art ed) Observation of, participation in, and supervisory experiences with various types and levels of art classes.

CI 5111. Introduction to Elementary School Teaching. (3 cr; A-F or Aud. Prereq-Foundations of ed major or elem ed initial lic) Curriculum organization, instruction, management, assessment, professional decision making.

CI 5113. Classroom Management in the Elementary School. (3 cr; Stdnt Op) For teachers, administrators, and support staff working in elementary school programs. Focus on management of student behavior, instruction as it relates to student behavior, and teacher organizational tasks in the classroom.


CI 5137. Multicultural Gender-Fair Curriculum. (3 cr; A-F or Aud) Issues in diversity and culture in educational contexts. Rationalization for multicultural gender-fair curriculum. Cultural issues inherent in curriculum change. Language, culture, sexual preference, special needs students. Conflicts between culture and curriculum.

CI 5138. Multicultural and Moral Perspectives on Classroom Instruction. (3 cr; Stdnt Op. Prereq-MEd or PhD student) Factors leading to effective communication in ethnically diverse classroom, preschool to adult. Communication techniques and classroom structures that have cultural and moral implications.

CI 5141. Reflective Teaching and Professional Ethics. (3 cr [max 4 cr]; Stdnt Op. Prereq-Teaching license and one yr teaching exper) Students develop their professional identities as educators by considering their world views and values in relation to their professional role and responsibilities in the context of a diverse society. Encourages reflective practice and critical review of research.

CI 5145. Critical Pedagogy. (3 cr; A-F or Aud) Examination of critical pedagogy; critique of power relations regarding race, culture, class, gender, and age in various educational settings; consideration of improved practice in education for children, youth, and adults.

CI 5149. Issues of Diversity in Schools and Classrooms. (5-4 cr [max 4 cr]; Stdnt Op. Prereq-Grad student or Teacher Leadership program) Examination of issues in schools and classrooms that affect people from diverse groups, using historical, communication, value, and intercultural frameworks.

CI 5150. Curriculum Topics. (1-6 cr [max 12 cr]; Stdnt Op) Special topics, current trends in curriculum. Subject integration, curriculum contexts, development, implementation, evaluation.

CI 5155. Contemporary Approaches to Curriculum: Instruction and Assessment. (3 cr; A-F or Aud. Prereq-Grad students only) Current research/issues that cross disciplinary boundaries in curriculum development, instructional practices, and assessment methods. Interrelations among curriculum, instruction, and assessment within frameworks of constructivist learning theory. Individual classroom practices/theories.

CI 5162. Peer Coaching for Teachers. (1-2 cr [max 2 cr]; A-F or Aud. Prereq-Teaching experience) Teachers coaching teachers; acquiring concepts, skills, and dispositions necessary for observing classroom instruction and providing constructive feedback.

CI 5177. Practical Research. (3 cr; A-F or Aud. Prereq-CI MEd student, or CI or EdPA Teacher Leadership MEd student) Preparation for identifying a research and development topic, reviewing the existing knowledge on the topic, planning and carrying out a project, further investigating the topic, and writing a report on the project.

CI 5178. Project in Teacher Leadership. (3-6 cr; Stdnt Op. +EDPA 5361. Prereq-CI or EdPA teacher leadership MEd student) Create, implement, evaluate, and present a leadership project designed to initiate positive change in educational environments. Review related literature, proposal development, project development, implementation/evaluation, critical reflection. Share learning outcomes.

CI 5181. Clinical Experience in Elementary School Teaching. (3-8 cr [max 16 cr]; S-N or Aud. Prereq-Foundations of education and elem ed initial licensure only) Students spend full days in the elementary classroom gradually assuming responsibility for teaching the class. Students prepare a portfolio based on criteria given. One seminar per week.

CI 5183. Applying Instructional Methods in the Elementary Classroom. (1-2 cr [max 8 cr]; S-N or Aud. Prereq-Foundations of ed major or elem ed initial licensure only) Supervised experiences in elementary classrooms.

CI 5186. School-Related Projects. (1-4 cr [max 4 cr]; A-F or Aud. Prereq-MEd student) Research or evaluation project related to teaching, curriculum, or other aspect of schooling. Approved and supervised by faculty advisor.

CI 5187. Practicum: Improvement of Teaching in Elementary or PreKindergarten Schools. (2-3 cr [max 3 cr]; S-N or Aud. Prereq-Foundations of ed major or elem ed initial licensure only) Elementary school classroom teaching project designed to improve specific teaching skills. Approved and directed by advisor.


CI 5344. Kindergarten Methods. (2 cr; A-F or Aud. Prereq-Foundations of Education/ Elementary Education or M.Ed./ILP Elementary Education) Purpose of kindergarten, its place in elementary program. Curriculum appropriate for needs of age group, including children with special needs. Assessment procedures, role of classroom teacher.

CI 5321. Foundations of Distance Education. (3 cr; A-F or Aud) History, philosophies, technologies, and best practices related to distance learning environments. Distance education theories. Issues in distance education.

CI 5323. Online Learning Communities. (3 cr; A-F or Aud) Students design/research an online learning environment that promotes community. What community is, how people learn in educational learning environments. Theories of distance learning instruction. Community models. Technological tools to develop online communities.

CI 5325. Designing and Developing Online Distance Learning. (3 cr; A-F or Aud. Prereq-5344 or 5362 recommended) Students research, use, and evaluate technologies for distance learning and design their own learning environments.

CI 5327. Designing Online Adventure Learning. (3 cr; A-F or Aud) Designing, developing, and integrating adventure learning environments in K-16. Examples of effective adventure learning environments.

CI 5330. Topics in Instructional Systems and Technology. (1-5 cr [max 12 cr]; Stdnt Op) Topics related to needs of in-service teachers. Topics, location, credits, and duration are flexible.

CI 5331. Introduction to Learning Technologies. (3 cr; Stdnt Op) Orientation to examination of various issues affecting use of technology. Students identify research topics for investigation in future courses and identify key literature in preparation for masters/doctoral examinations.


CI 5337. Planning for K-12 Technology Design and Integration. (3 cr; A-F or Aud) Developing technology-enhanced learning (TEL) lessons/units for K-12 instructional contexts (e.g., content areas across PK-12 grades). Contemporary perspectives on instruction/learning, TEL lesson categorization techniques.

CI 5342. School Technology Planning. (1 cr; A-F or Aud) How to establish plans for use of technology that support K-12 instruction and student learning. Facilitating ongoing comprehensive planning for technology integration. Identifying priorities for technology planning.

CI 5343. School Technology Funding. (1 cr; A-F or Aud. Prereq-[Mac or PC] with 128 MB RAM, [Windows NT or 2000 or XP] or Mac [OS 9 or OS 10]), [Pentium 2 or faster], Internet connectivity, up-to-date [Netscape, Internet Explorer], virus protection software; Certificate in School Technology Leadership or #) Developing a multi-year funding strategy for establishing K-12 technology integration in accordance with a technology vision/plan.

CI 5344. Facilitating Technology Integration in Classrooms I. (1 cr; A-F or Aud) Intersection of student learning theories and research base on effective technology practices. Video cases of technology-supported teaching, peer teaching exercise.

CI 5345. Facilitating Technology Integration in Classrooms II. (1 cr; A-F or Aud. Prereq-[5344 or #], [Mac or PC] with 128 MB RAM, [Windows NT or 2000 or XP] or Mac [OS 9 or OS 10]), [Pentium 2 or faster], Internet connectivity, up-to-date [Netscape, Internet Explorer], virus protection software; Certificate in School Technology Leadership or #) Technology-supported teaching/learning at one’s educational site. Preparing a vision statement for technology’s role in student learning. How to assume an advocacy role in establishing technology use for instruction/learning.
CI 5346. Staff Technology Development and Support. (1 cr; Sdtnt Opt. -EDPRA 5346. Prereq- [Mac PC: 200 MB RAM, Windows NT 2000 or XP or Mac OS 9 or 10]. Pentium [2 or faster], internet connection, up-to-date version of [Netscape, Internet Explorer], virus protection software, Certificate in School Technology Leadership or #) How to lead organization in designing, implementing, evaluating, improving, and sharing approaches to staff development. Technology-related staff development. Facilitating development through use of technology.


CI 5351. Technology Tools for Educators. (3 cr; A-F or Aud. Prereq- Basic knowledge of Macintosh operating system and a word processing program) Develop skills in using selected technology applications to support teaching and learning. Internet applications, presentation software, multimedia authoring tools, publishing software. Web page creation. May also include a field-site project.

CI 5361. Integrating the Internet into K-12 Schools for Learning, Instruction, and Professional Development. (3 cr; Sdtnt Opt. Prereq- Experience with computers recommended) Capabilities of the Internet for professional development and instructional use. Use of specific client/server software. Instructional issues/ opportunities. Implications for K-12 student involvement and classroom management. Web page development by teachers and their students.


CI 5364. Computer-Based Instruction: Games and Simulation. (3 cr; A-F or Aud. Prereq- 5363) Principles and procedures of computer simulation and game design. Types of computer simulation, the components common to simulation design, and the theory underlying educational simulation design.


CI 5367. Interactive Multimedia Instruction. (3 cr; A-F or Aud. Prereq- Knowledge of principles and procedures of CBI design and one multimedia authoring system) Principles of effective computer-based design; tools in multimedia development; contemporary issues and skills used in the design, development, and implementation of interactive multimedia instruction. Use multimedia development tools, create a multimedia portfolio, and investigate the issues surrounding their effective use.


CI 5402. Introduction to Special Collections. (3 cr; A-F or Aud. Prereq- Children’s lit course) Uses Children’s Literature Research Collection as research material. Study of manuscripts, original art, and letters.

CI 5403. Creative Writing For and By Children. (3 cr; A-F only. Prereq- Children’s lit course or #) Aspects of writing/illustrating children’s literature or children’s own writing. May feature authors/illustrators of children’s books.


CI 5405. Middle School Language Arts Methods. (2 cr; A-F only. Prereq- Elem ed licensure student) Introduction to the unique needs of middle school students in the language arts classroom. Language arts content and pedagogical skills. Adolescent development/psychology. Field placement in a middle school language arts classroom.

CI 5410. Special Topics in the Teaching of Literacy. (0-3 cr; max 12 cr; Sdtnt Opt) Topics related specifically to the needs of in-service teachers. Topics, location, credits, and duration will be highly flexible.

CI 5411. Teaching Reading in the Elementary School. (3 cr; A-F or Aud) Aids the inservice elementary classroom teacher in the development of knowledge of theory and practice in the teaching of reading.

CI 5412. Reading Difficulties: Instruction and Assessment. (3 cr; A-F or Aud. Prereq- 5411 or 5451) Causes, diagnosis and assessment, prevention and correction; intervention practices useful to the classroom teacher and special teacher of reading.

CI 5413. Teaching Students with Reading Difficulties. (3 cr; A-F or Aud. Prereq- 5412) Assessment and teaching individual children who have difficulty reading in school.

CI 5415. Literacy Development in the Primary Grades. (3 cr; A-F or Aud. Prereq- Elem teach exp or #) Theory/practice of integrated teaching of reading, literature, writing, and language in primary classroom settings. Uses national/state language arts standards and assessment protocols to examine primary literacy curricula.

CI 5416. Literacy Development in the Intermediate Grades. (3 cr; A-F or Aud. Prereq- Elem teach exp or #) Theory/practice of integrated teaching of reading, literature, writing, and language in intermediate classroom settings. Uses national/state language arts standards and assessment protocols to examine intermediate literacy curricula.

CI 5417. Elementary literacy Instruction for ESL Students. (3 cr; A-F or Aud. Prereq- Bachelor’s degree completed) Teaching reading/writing in elementary grades to students from diverse languages. Second-language literacy development. Phonemic awareness, phonics, fluency, vocabulary, comprehension. Ways to connect students background knowledge to literacy curriculum.

CI 5418. Whole Language Teaching and Learning in the Elementary School. (3 cr; A-F or Aud. Prereq- Med or grad student, minimum one yr of teaching exp) Theory, research, and politics of whole language teaching. Applications for developing an elementary school whole language curriculum.


CI 5431. Introduction to Instructional Leadership in K-12 Reading. (3 cr; A-F or Aud. Prereq- Minnesota license valid for classroom teaching in pre-kindergarten, [adult basic education or grades kindergarten through 6 or 1 through 5 or 5 through 8 or 9 through 12 or kindergarten through 12]) K-12 curriculum in reading, major theories/research that motivate curriculum. Major instructional principles, alignments needed, resources available.


CI 5433. Instructional Leadership in Reading for the Middle and Secondary Grades. (3 cr; A-F or Aud. Prereq- 5432) Curriculum/Instruction for middle/secondary school students.


CI 5442. Literature for Adolescents. (3 cr; A-F or Aud)
Characteristics of literature written for adolescents; rationale for using adolescent literature; adolescents’ reading interests and attitudes; analysis of quality and appeal; individualized reading programs; methods of promoting reading; multicultural literature; developing teaching activities.

CI 5451. Teaching Reading in Middle and Secondary Grades. (3 cr; A-F or Aud)
Methods of accommodating to students’ abilities and facilitating reading in regular content classes.

CI 5452. Reading in the Content Areas for Initial Licensure Candidates. (1 cr; A-F only. Prereq–Enrolled in Initial Licensure Program, concurrent enrollment in licensure area methods courses(, Internet access, basic understanding of [computer use, Web browsers, e-mail, word-processing software))
Web-based course for content disciplines whose primary responsibility is to foster students reading related to their teaching.

CI 5461. Teaching Composition in the Secondary School. (2 cr; A-F or Aud)

CI 5462. Evaluating and Assessing Writing. (3 cr; A-F or Aud)

CI 5463. Minnesota Writing Project Annual Invitational Summer Institute. (3 cr; A-F only. Prereq–Licensed teacher or administrator or [space available, faculty letter of recommendation required])
Workshop. Participants reflect on their own literacy processes, participate in a writing group, discuss current reading texts, and demonstrate best practices in classroom.

CI 5472. Teaching Film, Television, and Media Studies. (3 cr; A-F or Aud)
Methods of teaching film, video, and media studies at the secondary and college level; methods for eliciting critical responses; analysis of film/video techniques; analysis of cultural representations and genre characteristics; connecting and comparing film/video and literature; studying documentary and television news; developing media studies units.

CI 5475. Teaching Digital Writing: Blogs, Wikis, Online Talk, Podcasting, and E-Portfolios to Teach Writing. (3 cr; A-F or Aud. Prereq–Elem ed licensure only)

CI 5481. Developments in Teaching English and Speech. (3 cr; A-F or Aud)

CI 5482. Reading, Language Arts, and Literature: Intermediate. (3 cr; A-F or Aud. Prereq–Elem ed licensure only)
Curricular and methodological issues of reading, language arts, and children’s literature. Evaluating children’s literature, response to literature, reading/writing processes, strategy instruction for word recognition/comprehension, authentic assessment strategies, teaching diverse students in upper elementary grades.

CI 5496. Directed Experiences in Teaching English. (6 cr; S-N or Aud. Prereq–Med/initial licensure students in English ed only)
Student teaching/clinical experience for English post-baccalaureate students only.

CI 5500. Special Topics: Outdoor Science Education. (1-8 cr [max 12 cr]; Stdnt Opt. Prereq–Elem tch exp)
Classroom and fieldwork activities aimed at increasing the knowledge and interest of students in teaching outdoor in all seasons. Topics include snow and ice ecology, the timber wolf and white-tailed deer, pond ecology, Twin Cities’ geography, trees and plants of Minnesota, and stargazing.

CI 5501. Teaching Science and Health in the Elementary School. (2 cr; A-F or Aud. Prereq–Elem ed initial licensure only)
Methods and materials for teaching science and health at the elementary school level.

CI 5504. Elementary School Science: Materials and Resources. (3 cr; Stdnt Opt. Prereq–Elem tch exp or #)
Examination of the teacher’s role in inquiry teaching; the current science curriculum; and resources for teaching science in the elementary school.

CI 5505. Middle School Science Methods. (2 cr; A-F only. Prereq–Elem ed licensure student)

CI 5530. Secondary Science Teaching: Laboratory-based Instruction. (3 cr; A-F only. Prereq–Science ed Med (ILP) student)
Lab-based science teaching in secondary school setting. Research-based teaching strategies are modeled that address national/state-level standards. How to use varied inquiry-based instructional techniques/methods.

CI 5531. Teaching Middle School Science. (4 cr; A-F or Aud. Prereq–initial licensure student in science ed)
Methods of planning/teaching science to middle school students.

CI 5532. Teaching Secondary School Science. (4 cr; A-F or Aud. Prereq–Admission to initial licensure program in science)
Methods of planning and teaching science for secondary school students.

CI 5533. Current Developments in Science Teaching. (3 cr; A-F or Aud. Prereq–[Med, initial licensure, grad student] or #)
Using curriculum standards to design science courses.

CI 5534. Studies in Science Education. (3 cr; A-F or Aud. Prereq–Med. ed lic, init lic, or #)
Improvement of science teaching through the application of research findings.

CI 5535. Foundations of Science Education. (3 cr; A-F or Aud. Prereq–Med. ed lic, grad student, or #)
Analysis of present science teaching practices in light of historical and philosophical foundations of science education.

CI 5536. Equity, Policy, and Assessment in Science Education. (3 cr; A-F only. Prereq–Med or grad student or #)
Nature of equity, diversity, and policy matters that influence schools/teachers involved in science teaching and scientific literacy. Classroom presentations, discussions, readings in current research.

CI 5537. Principles of Environmental Education. (3 cr; A-F or Aud. Prereq–Undergrad in NRES or M.Ed. or grad student in education or #)

CI 5538. Research-based Decision-making in Science Education. (3 cr; A-F only. Prereq–Med or grad student or #)
Nature of research and data-driven decision-making in science education. Focuses on analysis, interpretation, and impact of research on science education. Developing/conducting research. Students discuss, analyze, and present research.

CI 5539. Improving Secondary Science Instruction: Surviving the First Two Years. (3 cr; A-F only. Prereq–Med/secondary science education student, in first three years of teaching)
Students reflect on their instruction and student learning during first years of teaching. Monthly meetings, observations, online discussion. Classroom management, planning, inquiry-based teaching, assessment, equity in the classroom.

CI 5540. Special Topics: Science Education. (1-8 cr [max 12 cr]; Stdnt Opt)
Detailed examination and practice of the teaching of one area of science (e.g., geology, health, physical science) or one method of instruction (e.g. laboratories, demonstrations, Internet, simulations).

CI 5546. Clinical Experience in Middle School Science. (4 cr; A-F or Aud. Prereq–initial licensure in science ed)
Supervised clinical experience in middle school science teaching.

CI 5547. Clinical Experience in Secondary School Science Teaching. (4-8 cr [max 8 cr]; S-N or Aud. Prereq–initial licensure or #)
Supervised clinical experience in secondary school science teaching.

CI 5619. Teaching Second Languages and Cultures in Elementary Schools. (3 cr; Stdnt Opt)
Methods and materials for ESL and foreign languages; development of oral and written communication in a second language; alternatives in second-language program format; global awareness and cross-cultural experience; assessment of children’s language; children’s literature, games, and songs; planning and development of units and lessons.

CI 5631. Second Language Curriculum Development and Assessment. (3 cr; A-F or Aud. Prereq–SLC initial licensure only)
Developing skills for selecting, organizing, providing, and assessing effective second language learning opportunities through study, practice, and reflection.

CI 5632. Communication and Comprehension in Second Language Classrooms. (3 cr; A-F or Aud. Prereq–SLC initial licensure only)
Comprehension and communication processes in a second language focus on listening, speaking, reading, and writing; techniques for initial to advanced literacy instruction; fundamental principles of effective second language instruction; the relationship of culture to proficiency in the four modalities; traditional and alternative approaches to assessing language proficiency; use of technology to enhance instruction.
CI 5634. Content-Based Instruction in Second Language Settings. (3 cr; A-F or Aud. Prereq—SLC initial licensure program only) Content-based language instruction: principles, models and methods; learning strategy instruction; developing content-based language curriculum; traditional and alternative approaches to assessing cognitive-academic language proficiency; use of technology to enhance content-based instruction.

CI 5635. Culture and Diversity in Second Language Classrooms. (3 cr; Stdnt Opt. Prereq—initial licensure program only) Developing skills for teaching a diverse student population in both foreign language and English as a second language instructional settings through study, practice, and reflection.

CI 5641. Language, Culture, and Education. (3 cr; A-F or Aud. Prereq—MED or grad student) Applies current sociolinguistic and discourse theory/research to study of relationships between language and culture in educational settings: language curriculum and instruction; classroom language use; borders and second language and home/community language use; and educational policies on literacy/second-language instruction.

CI 5642. The Assessment of Learners with Limited English Proficiency. (3 cr; A-F or Aud) Explores policies, procedures, and instruments in use in assessing the English language proficiency and academic readiness of limited English proficient students in American public schools; academic competence, bilingualism and special needs populations; alternative assessment; preparation of students for mainstream classrooms.

CI 5644. Working with Linguistically and Culturally Diverse Students in the Mainstream Classroom. (1 cr; Stdnt Opt) Benefits and challenges of working with linguistically and culturally diverse students; instructional practices and strategies; issues related to language learning, cultural considerations, and integration of culturally and linguistically diverse learners in the classroom.

CI 5646. Understanding and Teaching English Grammar. (3 cr; Stdnt Opt. Prereq—Ling 5001 or #) English syntax from pedagogical perspective. Grammatical structures that challenge ESL learners. Analyzing learner errors. Issues/activities related to teaching grammar and learning in ESL.


CI 5651. Foundations of Second Languages and Cultures Education. (3 cr; A-F or Aud) Historical overview of second language teaching and learning in the U.S. Exploration of second language instructional settings across multiple contexts: elementary/secondary options for foreign language, bilingual education, immersion language programs, and English as a second language programs. Theoretical frameworks for language instruction are tied to practical approaches.

CI 5652. Integrating Culture in the Second Language Classroom. (3 cr; Stdnt Opt) Exploration of culture in second language contexts. Rationale for and process of implementing cultural awareness, culture learning, and the integration of language and culture instruction as integral to effective second language development.

CI 5656. Reading and Writing in a Second Language. (3 cr; A-F or Aud) Reading comprehension and composing processes in a second language; relationship between first and second language comprehension and composing processes; relationship between reading and writing; relationship of culture to reading comprehension and writing; politics of literacy; assessment of second language reading comprehension and writing proficiency, using technology to enhance literacy instruction.

CI 5657. Speaking and Listening in a Second Language. (3 cr; A-F or Aud) Theories and methods in teaching language as communication in oral and aural modes; planning student interactions; classroom organization for second language learning and acquisition; using technology to enhance interaction; assessment of listening comprehension and oral communication.

CI 5658. Second Language Testing and Assessment. (3 cr; A-F or Aud) Aligning second language classroom instruction and assessment; fundamental concepts in language assessment; traditional and alternative approaches to assessing proficiency in speaking, listening, reading, writing; creation of formative and summative assessments; critique of common assessment instruments.

CI 5660. Special Topics in the Teaching of Second Languages and Cultures. (1-14 cr [max 12 cr]; Stdnt Opt) Topics related specifically to the needs of the in-service teacher. Topics, location, credits, and duration are flexible.

CI 5662. Issues in Second Language Curriculum Design. (3 cr; A-F or Aud) Historical overview of curriculum development in second language education; contexts that influence curriculum development; models for curriculum development in second language settings; politics of curricular reform; national and state standards and implications for curriculum development; effects of technology on second language curriculum.


CI 5693. Directed Study in Second Languages and Cultures. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq—#) Individual or group work on curricular, instructional, or assessment problems.

CI 5696. Practicum: Teaching World Languages and Cultures in Elementary Schools. (2-6 cr [max 12 cr]; Stdnt Opt. Prereq—5619, adviser approval; credits cannot be counted on a graduate degree program for endorsement candidates) Teaching and learning experiences in Second Languages and Cultures at the elementary-school level. Requires students to work in a public school setting.


CI 5698. Student Teaching in Second Languages and Cultures. (2-6 cr [max 14 cr]; Stdnt Opt. Prereq—Adviser approval; credits cannot be counted on a graduate degree program) Student teaching in Second Languages and Cultures at the secondary level for teachers already licensed in another field. Requires students to work in a public school setting.

CI 5699. Clinical Experiences in Second Languages. (6-8 cr [max 16 cr]; A-F or Aud. Prereq—SLC initial licensure program only) Teaching and learning experiences in elementary and secondary second language instructional settings. Includes a seminar held concurrently to support the student teaching experience.


CI 5705. Middle School Social Studies Methods. (2 cr; A-F only. Prereq—Elem ed licensure student) Introduction to the unique needs of middle school students in the social studies classroom. Social studies content and pedagogical skills. Adolescent development/psychology. Field placement in a middle school social studies classroom.

CI 5711. Social Studies for the In-Service Elementary and Middle School Teacher. (3 cr; A-F or Aud) Content/organization of social studies programs. Improving teaching/learning situation through analysis of trends/issues. Integration with other subject areas.

CI 5741. Introduction to Social Studies Education. (5 cr; A-F only. Prereq—social studies initial licensure student) Broad issues and themes related to social studies education, including societal context, rationale, and scope and sequence. Analysis and evaluation of selected teaching strategies, methods, and resources.

CI 5742. Advanced Methods of Teaching the Social Studies. (3 cr; A-F only. Prereq—Social studies initial social studies licensure student) Focus on developing a repertoire of instructional methods that support authentic pedagogy and assessment. Enhancing reading comprehension and writing skills in the social studies.

CI 5743. The Social Sciences and the Social Studies. (3 cr; A-F only. Prereq—Social studies initial licensure student) Development of instructional strategies and contexts for exploring the social sciences as disciplines at the secondary level; central concepts and generalizations; tools of inquiry; competing structures and theories; and the relative impact of multicultural and gender-fair perspectives on the nature of history and the social sciences.

CI 5744. Seminar: Reflecting on Professional Development in Social Studies Education. (3 cr; A-F only. Prereq—Social studies initial social studies licensure student) Reflecting on teaching experience, examining social/cultural context of teaching/learning, developing a professional identity. Refining teaching and teacher research skills.

CI 5745. Engaging Youth With Social Studies Texts. (3 cr; A-F only) Ways to engage students (grades 5-12) in social studies (textbooks, literature, speeches, editorials, political cartoons, tables, graphs, language, film). Developing middle/high school students’ disciplinary literacy.
Course Descriptions

CI 5746. Global and Multicultural Education in the Secondary Classroom. (3 cr; A-F only)
Issues, classroom practices, and controversies surrounding global/multicultural perspective-taking in social studies education. Strategies for helping secondary social studies students develop global/multicultural worldviews.

CI 5747. Global and Environmental Education: Content and Practice. (3 cr; A-F or Aud)
Prepares educators for leadership responsibilities in the area of global environmental education. Focus on the knowledge and process skills necessary to carry out a leadership role in the curriculum.

CI 5761. Social Studies Education for the Inservice Middle/Secondary Teacher. (3 cr; Stdnt Opt)
Trends and issues in social studies education. Current developments and controversies in social studies pedagogy, curriculum, and assessment.

CI 5762. Developing Civic Discourse in the Social Studies. (3 cr; A-F or Aud)

CI 5782. Clinical Experiences in Teaching Social Studies. (1-8 cr; max 7 cr; S-N or Aud. Prereq–MED/initial licensure student)
Overviews of learning pertinent to modern program of mathematics in elementary grades. Objectives, content, philosophy, instructional materials, methods of instruction/evaluation.

CI 5900. Special Topics in Family, Youth, and Community. (1-2 cr; max 20 cr; Stdnt Opt)
Topics not dealt with in regular courses. Topics vary by offering.

CI 5902. Family Education Perspectives. (3 cr; A-F or Aud)
Origins, evolution, and critique of alternative perspectives on family education. Implications for educators, programs, and participants.

CI 5904. Contemporary Family Education. (3 cr; A-F or Aud)
Contemporary conditions and transitions in family life. Emphasizes implications for educators and educational programs.

CI 5906. Program Planning in Family Education. (3 cr; A-F or Aud)

CI 5908. Family and Work Relationships. (3 cr; A-F only)
Interactions of work/family roles, responsibilities, and aspirations. Resources, legal aspects, gender.

CI 5912. Sexuality Education. (3 cr; A-F only)
Development, delivery, and evaluation of sexuality education curriculum/programs.

CI 5914. Education for Family Communication. (5 cr; A-F only)
Development, delivery, and evaluation of curriculum/programs related to family communication.

CI 5922. Family and Consumer Sciences Curriculum in Grades 5-12. (3 cr; A-F only. Prereq–ILP student)
Examination, development, and implementation of family and consumer sciences curriculum in grades 5-12.

CI 5923. Educational Strategies in Family Education. (3 cr; A-F only)
Examination, development, and implementation of a variety of educational strategies.

CI 5924. Family and Consumer Sciences Student Teaching I. (1 cr; S-N only. Prereq–WHRE 5696. Prereq–ILP student)
Initial experiences in family/consumer sciences teaching profession. Observations of school organization/administration, seminars, relationship building with cooperating teachers, reflections on personal involvement as beginning student teachers.

CI 5925. Family and Consumer Sciences Student Teaching II. (2 cr; Stdnt Opt. Prereq–5924)
Part-time supervised teaching experience in family/consumer sciences programs. On-campus seminars emphasize reflective teaching practice and student learning in context of middle/high schools.

CI 5926. Family and Consumer Sciences Student Teaching III. (8 cr; Stdnt Opt. Prereq–5925)
Full-time supervised teaching experience in family/consumer sciences programs. On-campus seminars.

CI 5927. Family and Consumer Sciences Student Teaching IV. (1 cr; Stdnt Opt. Prereq–WHRE 5699. Prereq–5926)
Full-time supervised student teaching experience in family/consumer sciences programs.

CI 5932. Introduction to Parent Education. (1 cr; A-F only)
Philosophy, history, and models of parent education. Ethical, critically reflective professional practice.

CI 5936. Advanced Practice of Parent Education. (3 cr; Stdnt Opt. Prereq–5935 or FE 5701 or B)

CI 5937. Parent-Child Interaction. (3 cr; A-F only)

CI 5938. Reflective Dialogue in Parent Education. (3 cr; A-F or Aud)

CI 5942. Everyday Experiences of Families. (2 cr; A-F only)
Culture and everyday experiences of diverse families. Relevance to parent education and to professional development of parent educators. Research/theoretical knowledge woven with observation/personal reflection.

CI 5943. Parent Learning and Development: Implications for Parent Education. (2 cr; A-F only)
Research/theoretical perspectives critiqued. Challenging assumptions, examining competencies.

CI 5944. Parent Education Curriculum. (2 cr; A-F only. Prereq–5943 or #)
How parent learning, family, child development, and family systems theories influence curriculum approaches/materials in parent education. Student develop construct, critique, and select curriculum.

CI 5945. Teaching and Learning in Parent Education. (2 cr; A-F only. Prereq–5943 or #)
Students select parent education teaching strategies/processes to meet needs of various populations of adult learners. Critical reflection, ethical practices, parent educator competencies.

CI 5946. Assessment and Evaluation in Parent Education. (2 cr; A-F only. Prereq–5943 or #)

CI 5949. Student Teaching in Parent Education. (2 cr; A-F only. Prereq–#)
Supervised parent education practice to meet individual student needs/interests. Online discussion, reflection, cooperative learning.

CI 5952. Everyday Lives of Youth. (3 cr; A-F or Aud)
Youth as idea/lived-reality in scholarship, public discourse, and professional practice. Building practice of work with or on behalf of youth.

CI 5954. Experiential Learning: Pedagogy for Community and Classroom. (3 cr; Stdnt Opt)
Relationship between experiential learning and education in community and school settings. Emphasizes intentional application of experiential learning theory/practice to educational program development.

CI 5956. Organizational Approaches to Youth Development. (3 cr; A-F or Aud)
Historical contexts, theoretical frameworks, organizational practices, and public policies that shape nonformal educational experiences of youth in community-based or school-linked settings.

CI 5958. Community Context for Youth Development Leadership. (3 cr; A-F or Aud)
Issues/policies in family, school, and community that drive the professional practice of community-based youth work. Practical projects explore what it means to be local, to build social capital for youth, and to involve youth in community change.

CI 5960. Seminar in Youth Development Leadership. (1-4 cr; max 4 cr; S-N or Aud. Prereq–YDL student or #)
Group study of topics/issues. Course proposal, educational program development. Students participate in co-created learning experiences with a group of peers. Four-course sequence.

CI 5962. Leadership Field Experience: Youth Development. (4 cr; S-N only. Prereq–YDL student)
Demonstration of leadership in practice. Project on youth, experiential pedagogy, and community/program settings. Focuses on public policy, advocacy, evaluation, pedagogical issues, program design, curriculum development, or applied research.

CI 5972. Education in the Community. (3 cr; Stdnt Opt)
Models of community/education, their intersections. Twentieth century practice of education in the community in the U.S. Examples from other cultures/times.

CI 5974. The Democratic Learning Community. (3 cr; Stdnt Opt)
Historical/theoretical development of how leading thinkers have conceptualized education centered in the community. Colonial, Native American, transcendentalist, progressive, experiential, critical, and feminist perspectives.

CI 5993. Directed Study in Family, Youth, and Community. (1-3 cr; max 9 cr; A-F only. Prereq–#)
Self-directed study in areas not covered by regular courses. Specific program of study is jointly determined by student and advising faculty member.
CI 5996. Internship in Family, Youth, and Community. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq–Grad or PhD or MA student or #) Involvement in work experience focused on educational competencies in family, youth, and community settings. Nature/extent of responsibilities are defined by position the student assumes.

CI 8075. Seminar: Art Education. (2 cr; A-F or Aud. Prereq–Educ grad student or #) Reports, evaluation of problems, and review of recent literature.

CI 8079. Research in Art Education. (3 cr; A-F or Aud. Prereq–Educ grad student or #) Current research agenda. Helps students identify research questions and choose appropriate methodologies.

CI 8095. Problems: Art Education. (1-12 cr [max 12 cr]; Stdnt Opt. Prereq–Grad art educ major or #) Independent research under faculty guidance; may include advanced studio practice and educational issues requiring a research methodology.

CI 8111. Representations of Knowledge in Curriculum and Culture. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq–CI grad student or #) Overview of research and theory on sociology of knowledge and education. Conceptions of knowledge in curriculum; connections between cultural conditions and curriculum design and implementation; influence of national political agendas, population, the mass media, and textbooks on curriculum in diverse educational settings.

CI 8115. Curriculum and Achievement Outcomes in a Diverse Society. (3 cr; A-F or Aud. Prereq–Doctoral student) Analysis of American public school experiences for students of African-American, Hispanic, Asian, and American Indian background; social, political, regional, and educational variables that influence student outcomes; perspectives concerning ethnic student achievement; factors influencing school achievement, and prospects for change.

CI 8121. Curriculum Change: Perspectives, Processes, and Participants. (5 cr; Stdnt Opt. Prereq–CI grad student or #) Examination of curriculum within educational organizations; educational organization as mediator and transmitter of societal/cultural perspectives; implications of organizational context for curriculum change, change processes, and change participants.

CI 8127. Curriculum Theory and Research: Alternative Paradigms and Research Methods. (5 cr; Stdnt Opt. Prereq–CI grad student or #) Traditions of inquiry, exemplary studies, and associated research methods; survey and assessment of topics and methods as applied to curriculum questions; and relationships between theory and research.

CI 8131. Curriculum and Instruction Core: Critical Examination of Curriculum in Context. (3 cr; A-F or Aud. Prereq–CI PhD or MA student or #) Central concepts, ideas, and debates in professional field of curriculum. Curriculum in general education.

CI 8132. Curriculum and Instruction Core: Teaching Theory and Research. (3 cr; A-F or Aud. Prereq–CI PhD or MA student or #) Overview of research on teaching: historical perspective, modern research/findings, implications for practice/research.

CI 8133. Research Methods in Curriculum and Instruction. (3 cr; A-F or Aud. Prereq–CI PhD or MA student or #) Survey of educational research methods, comparison of underlyng assumptions/procedures.

CI 8146. Critical Ethnography in Education. (3 cr; A-F or Aud. Prereq–CI 8148, EPDA 5061, WOST 5901 or #) Theoretical/methodological foundations. Possibilities and problematic for understanding inequality/disparities in education. Research design, data collection, analysis, writing.

CI 8147. Critical Discourse Analysis in Educational Research. (3 cr; A-F or Aud. Prereq–[MA or PhD] student) Students apply CDA methods to analysis of written, visual, and spoken texts in social settings such as schools, families, and communities.

CI 8148. Conducting Qualitative Studies in Educational Contexts. (3 cr; Stdnt Opt. Prereq–CI MA or PhD student or #) Introduction to use of qualitative research methods. Ethnography, sociolinguistics, symbolic interactionism. Emphasizes observation.

CI 8149. Qualitative Research: Coding, Analysis, Interpretation, and Writing. (3 cr; A-F or Aud. Prereq–[8153, 8148, grad student, completion of a qualitative research study] or #) How to code/analyze field notes. Individual/group interviews, multimedia using NUDIST NVivo software. Students interpret analyzed material and complete an article length document that includes a review of related research/methodology.

CI 8150. Research Topics Curr & Instruct. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq–[MA. or Ed.D or Ph.D] student or #) Special topics, current research trends in curriculum/instruction. Research review, subject integration, curriculum contexts, development, implementation, data collection, analysis, evaluation.


CI 8152. Teacher Learning and Professional Development. (3 cr; A-F or Aud. Prereq–Grad student) Theoretical/empirical work on teacher learning, professional communities, teacher inquiry, perspectives on outcomes of professional development, and policy recommendations for supporting teacher learning. Research methodologies.

CI 8154. Culturally Relevant Pedagogy. (3 cr; A-F or Aud) Research on relationship between home and school cultures. Education of students of color. Culture, including experiences/practices of students homes. Cultural approaches for improving teaching, transforming society.


CI 8159. Culture and Teaching Colloquium. (3 cr [max 6 cr]; A-F or Aud) Doctoral seminar. Interdisciplinary perspectives on theme central to cultural study of teaching. Theme varies year to year.

CI 8160. A Study of Research in Composition. (3 cr; Prereq–[6132, 6137 or 6142] of research methodology, CI PhD student or #) Students identify research topic, conduct literature review, refine research questions, design study, obtain IRB approval as needed, and begin data collection. Readings, seminar discussions, peer critique of work.

CI 8162. Research Experience II: Data Analysis and Manuscript Preparation. (3 cr Prereq–8160) Students complete data collection/analysis, prepare research manuscript. Seminar discussions, critical examination of their own and peers work.

CI 8181. Seminar in Teaching Colleges of Education. (3 cr; Stdnt Opt. Prereq–CI PhD student or #) Goals, instructional strategies, evaluation procedures, and professional considerations.

CI 8195. Problems: Improvement of Instruction. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq–#) Independent research in curriculum and instruction.

CI 8196. Practicum in Teaching in Colleges of Education. (1 cr; Stdnt Opt. Prereq–8181) Supervised teaching in an education course at the University of Minnesota or other college or university.


CI 8198. Problems: Teacher Education. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq–#) Independent research.

CI 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser approval, DGS approval)

CI 8361. Advanced Courseware and Design: Issues. (3 cr; A-F or Aud) Examination and critique of existing research. Students identify a research topic, write a literature review, plan a study, and present a research proposal.

CI 8391. Instructional Systems Seminar. (1-3 cr [max 6 cr]; Stdnt Opt. Prereq–CI grad student or #) Topics related to needs of the in-service teacher; topics, location, credits, and duration are highly flexible.


CI 8400. Special Topics in Children’s and Young Adult Literature. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq–grad course in children’s or young adult lit) Overview of research and issues. Study of original manuscripts and artwork for children’s books; research in child and young adult response to literature. Topics vary by offering.

CI 8410. Special Topics in Reading Research and Instruction. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq–[MA or PhD] student) Research at all levels. Topics vary. May include research designs, trends, and specific studies.

CI 8412. Research in Reading. (3 cr [max 6 cr]; Stdnt Opt. Prereq–[MA or PhD] student) Theory of and research on writing process. Applications to developing writing curriculum/instruction.

Course Descriptions

CI 8444. FTE: Doctoral. (1 cr; No grade. Prereq: Doctoral student, adviser approval, DGS approval)


CI 8470. Special Topics on Literacy. (1-6 cr [max 6 cr]; Stndt Opt. Prereq-[MA or PhD] student) Current theories/research on literacy and literacy development. Alternative methods of conducting literacy research. Implications for literacy instruction.

CI 8492. Readings in English Education and Reading. (1-3 cr [max 10 cr]; Stndt Opt. Prereq-#) Independent study course.

CI 8495. Problems: Teaching English and Reading. (1-6 cr [max 6 cr]; A-F or Aud. Prereq-#) Individual research.

CI 8511. Seminar: Research in Science Education. (1 cr [max 6 cr]; Stndt Opt. Prereq- CI grad student or #) Students and faculty present research projects for comment and critique. Special topics may also be considered.

CI 8570. Advanced Topics in Science Education. (1-4 cr [max 6 cr]; A-F or Aud. Prereq- CI grad student or #) Examining and critique of current research topics, methods, and issues.

CI 8571. Equity, Policy, and Social Justice in Science Education. (3 cr Prereq- Science ed grad student or #) Interactions of issues of diversity, equity, policy, and social justice related to science education. Diverse perspectives on purposes/scope of science education. Consequences for diversity, equity, access, social justice, empowerment, and educational policy.

CI 8594. Conducting Research in Science Education. (3 cr; Stndt Opt. Prereq- sci educ research course) Application of research methodology to a specific science education issue.

CI 8595. Problems: Science Education. (1-6 cr [max 12 cr]; Stndt Opt. Prereq- CI grad student or #) Independent research.

CI 8650. Seminar: Special Topics in Second Languages and Cultures Research. (1-3 cr [max 6 cr]; Stndt Opt. Prereq- CI grad student or #) Research topics vary.

CI 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq- Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

CI 8691. Readings in Second Languages and Cultures Education. (1-3 cr [max 3 cr]; Stndt Opt. Prereq-#) Independent reading.

CI 8695. Problems: Second Languages and Cultures Education. (1-6 cr [max 12 cr]; Stndt Opt. Prereq-#) Independent research.

CI 8742. Seminar: Research in Social Studies Education. (3 cr; A-F or Aud. Prereq- CI grad student or #) Critical review and analysis of seminal research studies; criteria for appraising research findings; educational implications.

CI 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade)

CI 8795. Problems: Social Studies Education. (1-6 cr [max 12 cr]; Stndt Opt. Prereq- CI grad student or #) Independent research.

CI 8796. Research Internship in Social Studies Education. (1-6 cr [max 6 cr]; A-F or Aud. Prereq- CI grad student) Internship with social studies education faculty member; experience in collecting and analyzing data; drafting and presenting reports; writing for publication.

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

CI 8900. Family, Youth, and Community Colloquium. (1-4 cr [max 4 cr]; S-N only. Prereq- [MA or PhD] student) Theory, philosophies, practices, pedagogies, epistemologies, and public policies not dealt with in regular courses. Content varies by offering.

CI 8902. Family, Youth, and Community in Social, Political, and Economic Context. (3 cr; A-F only) Meanings of and relationships among family, youth, and community in social, political, and economic contexts across cultures/time. Realities/philosophies influencing these meanings/relationships. Implications/consequences for professional practice.

CI 8904. Families, Youth, and Communities: Historical and Contemporary Perspectives. (3 cr; A-F only. Prereq- MEd or MA or PhD student) Teaching/learning in family/community settings and in formal education settings. Interrelationships, implications.

CI 8913. Interpretive Research. (3 cr; A-F only) Hermeneutic, ethnographic, and philosophical research methodologies. Ethics, evaluation, and usefulness of interpretive research. Practice in conducting interpretive research.

CI 8914. Critical Science Research. (3 cr; A-F only) Influences, influences, characteristics, and central concepts. Distinction between critical science and other action research. Requisite skills/knowledge for conducting critical science research, using that knowledge in a project.

CI 8994. Directed Research in Family, Youth, and Community. (1-6 cr [max 6 cr]; A-F only. Prereq- Family, Youth, and Community student doing Plan B research)

Dance (DNCE)

Department of Theatre Arts and Dance

College of Liberal Arts


DNCE 5333. Laban Movement Analysis. (2 cr; Stndt Opt. Prereq-#) Concepts of Laban, which is used to describe, understand, and perform all forms of movement/dance. Movement experiences, lectures, discussion, observation.


DNCE 5337. Body-Mind Centering 2. (2 cr [max 4 cr]; Stndt Opt. Prereq- 3337 or equiv) Embodied consciousness. How knowledge is created. How mind/body are indissolubly linked. How body gives rise to states of consciousness that influence and often unconsciously control opinions, feelings, thoughts, and actions.

DNCE 5443. Theorizing Dancing Bodies. (3 cr; Stndt Opt. DNCE 4443. Prereq-#) Major developments in Western philosophic thought on dance and dance theory, from its beginnings to present.


DNCE 5500. Topics in Dance. (1-3 cr [max 10 cr]; Stndt Opt) Topics specified in Class Schedule.

DENT 5302. Applied Dental Biomaterials. (1.6 cr; A-F or Aud, Prereq-5322) Principles of biomaterials science applied to practical usage. P... to examine, diagnose, prevent, and treat periodontal patients.

DENT 5613. Periodontology Technique II. (1 cr; S-N or Aud, Prereq-5612) Extension of DENT 5612. Close supervision, students treat... before assuming responsibility for their comprehensive care.

DENT 5701. Introduction to Endodontics Lecture and Laboratory. (4 cr; A-F or Aud) Study of morphology, physiology, and pathology of the human dental pulp and periodontial tissues.

DENT 5800. Introduction to Psychomotor Skill Development. (6 cr; A-F only, Prereq-5828) Virtual-reality-based training for psychomotor skills. Mirror skills, proper ergonomics. Preparation of infra-coronal activity.

DENT 5801. Operative Dentistry I. (1.7 cr; A-F only, Prereq-5610) Restoration of small caries lesions, cervical abrasion lesions, and attrition defects. Practical aspects of caries risk assessment, lesion identification, and comprehensive caries management. Emphasizes indications for surgical intervention, principles of restoration design, and rationale for various design features.

DENT 5802. Operative Dentistry Laboratory. (2.5 cr; A-F or Aud, Prereq-5810, Biomaterials) Restoration of small caries lesions, cervical abrasion lesions, and attrition defects in clinical simulation setting. Emphasizes designing/executing restorative/ resistant restorations, conserving tooth structure, and operating in clinically realistic environments. Self-evaluation techniques, discriminatory skills.

DENT 5803. Operative Dentistry II Laboratory. (2 cr; A-F or Aud, Prereq-Operative Dentistry I) Diagnosis, treatment planning, and treatment of moderate to severe phase of dental caries. Use of dental amalgam, cast gold, composite resin, and cast porcelain. Aesthetic modifications to teeth.

DENT 5804. Operative Dentistry II Lab. (3 cr; A-F or Aud, Prereq-Operative Dentistry I Lab) Exercises in treatment of moderate to severe phase of dental caries utilizing dental amalgam, cast gold, composite resin, and cast porcelain. Aesthetic modifications to teeth.
Clinical variation in occlusion encountered in a typical clinical setting. Guidelines to manage this variation.

DENT 5805. Operative Dentistry III. (3.8 cr; A-F only. Prereq—Operative Dentistry I, II, Operative Dentistry I, II Lab) Integration/application of skills/knowledge in diagnosis, treatment planning, and treatment. Clinical setting.

DENT 5806. Introduction to Psychomotor Motor Skills II. (1 cr; S-N only. Prereq—1st yr DDS Program) Maintaining r psychomotor skills for tooth preparation work.

DENT 5901. Oral Anatomy I. (2 cr; A-F or Aud) Tooth morphology, nomenclature, classification, charting, calcification, and erosion sequences; mouth growth and development.

DENT 5902. Oral Anatomy Laboratory I. (2.9 cr [max 5.8 cr]; A-F or Aud) Application of oral anatomy, fixed prosthodontic lab techniques, fundamentals of tooth preparation.

DENT 5903. Preclinical Prosthodontics Lecture II. (2 cr; A-F or Aud. Prereq—5901, 5902) Prostodontic procedures.

DENT 5904. Preclinical Prosthodontic Technique Laboratory II. (2 cr; A-F or Aud. Prereq—5901, 5902) Lab techniques, fundamentals of tooth preparation.

DENT 5905. Preclinical Prosthodontic Technique Lecture III. (1.5 cr; A-F or Aud. Prereq—5901, 5902, 5903, 5904) Fixed, removable, and occlusion topics.

DENT 5906. Preclinical Prosthodontics Technique Laboratory III. (2.1 cr; A-F or Aud. Prereq—5901, 5902, 5903, 5904) Fixed, removable, and occlusion topics.

DENT 5907. Preclinical Prosthodontics Technique Lecture IV. (3 cr; A-F or Aud. Prereq—5901, 5902, 5903, 5904, 5905, 5906) Fixed, removable, and occlusion topics.

DENT 5908. Preclinical Prosthodontic Technique Laboratory IV. (3 cr; A-F or Aud. Prereq—5901, 5902, 5903, 5904, 5905, 5906) Fixed, removable, and occlusion topics.

DENT 5909. Preclinical Prosthodontics Technique Lecture V. (3.3 cr; A-F or Aud. Prereq—5901, 5902, 5903, 5904, 5905, 5906, 5907, 5908) Fixed, removable, and occlusion topics.

DENT 5910. Preclinical Prosthodontics Technique Laboratory V. (3 cr; A-F or Aud. Prereq—5901, 5902, 5903, 5904, 5905, 5906, 5907, 5908) Fixed, removable, and occlusion topics.


DENT 5912. Preclinical Prosthodontics Techniques Laboratory VI. (2 cr; A-F or Aud. Prereq—5901 through 5910) Implanting fixed/removable protocols. Principles of restoring damaged teeth.

DENT 5915. Clinical Occlusion. (1.3 cr [max 2.6 cr]; A-F only. Prereq—Enrolled in dentistry program) Clinical variation in occlusion encountered in a typical clinical setting. Guidelines to manage this variation.

DENT 8031. Topics in Problems in Dental Education. (1-3 cr [max 3 cr]; Stdnt Opt) Independent study in student learning, instructinal development, curriculum planning, student testing and evaluation, and academic administration, where these areas and their interfaces are applied directly to professional dental education. Provides opportunity for applying and extending concepts learned in Dent 7033.

DENT 8090. Evidence-based Clinical Pediatric Dentistry. (2.5 cr; A-F or Aud) Selected pediatric dentistry topics. In-depth literature review, seminar discussion.

DENT 8091. Interdisciplinary Care of the Cleft Palate Patient. (1 cr; S-N or Aud) Comprehensive surgical, dental, and speech and hearing evaluation and management of patients with cleft lip and palate.

DENT 8100. Topics in Advanced Periodontology. Literature Review. (2 cr; Stdnt Opt) State-of-the-art information on a variety of topics concerning risk factors and therapeutic modalities for periodontal disease.


DENT 8120. Advanced Principles and Techniques of TMJ and Orofacial Pain Disorders. (3 cr; A-F or Aud. Prereq—Participation in TMJ and orofacial pain advanced education program) Interdisciplinary study of theory, principles, epidemiology, and mechanisms associated with TMJ and craniofacial pain disorders and a basis for scientific understanding of diagnostic and management strategies for them.

DENT 8121. Current Literature in TMJ and Craniofacial Pain. (1 cr; A-F or Aud) Review of current literature and of how it relates to past literature, theories on pain, and philosophies of management.

DENT 8123. Advanced Topics in Orofacial Pain. (3 cr; A-F or Aud. Prereq—Grad student in dentistry or other health sciences grad student or #) Review of cutting edge research and clinical findings regarding etiology/treatment of acute/chronic orofacial pain conditions and related disorders.

DENT 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent) DENT 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])

Design (DES)

DES 5160. Topics in Design. (1-4 cr [max 24 cr]; A-F only) Topics in Design

DES 5193. Directed Study in Design. (1-6 cr [max 36 cr]; A-F only. Prereq—%)
DHA 5382. Digital Sound and Video. (3 cr; A-F or Aud. Prereq: [5384 or 5341]. [DHA major or grad student])

DHA 5383. Digital Illustration and Animation. (4 cr; A-F or Aud. Prereq: [5384 or 5341]. [DHA major or DHA grad student]) Experience with computer illustration) or #)
Advanced computer design. Focuses on integration of design knowledge with Macintosh computer applications. Students use software to create digital illustration, 2D/3D digital animations. Technical/aesthetic investigation of processes inherent to 2D/3D motion graphics. Adobe Illustrator, After Effects, Macromedia Flash, 3D animation software.

DHA 5386. Fundamentals of Game Design. (3 cr; A-F or Aud. Prereq: [5341 or 4354]. DHA major or [sr or grad student]) or #)

DHA 5388. Design Planning, Analysis, and Evaluation. (3 cr; A-F or Aud. Prereq: [5354]. DHA major) or grad #)
Preparatory work, including theoretical, applied, and legal aspects. Planning/developmental models. Study prototyping, testing, and analysis.

DHA 5399W. Theory of Electronic Design. (3 cr; A-F or Aud. Prereq: [DHA major, sr] or grad student or #; offered alternate yrs)
Theories, methodologies, histories of electronic design, its impact on visual communications. Digital artifacts, processes, paradigms.

DHA 5463. Housing Policy. (3 cr; A-F or Aud. =PA 5261. Prereq: 2401, 2463 or #)
Examine competing ideas about solving the nation’s housing problems through public intervention in the market. Federal and local public sector responses to housing problems will be evaluated.

DHA 5467W. Housing and the Social Environment. (4 cr; A-F or Aud. Prereq: 2401 or #)
Housing choices in context of social environment. Emphasis on needs of elderly, disabled minorities, large families, female-headed households, and low-income households. Students conduct a post-occupancy evaluation of housing.

DHA 5469. Understanding Housing: Assessment and Analysis. (3 cr; A-F or Aud. Prereq: [2401, 2463] or #)
Analytical design applied to analysis/presentation of housing/housing-related data. Use of Geographical Information Systems (GIS) to display, analyze, and communicate spatial data related to housing.

Integrative seminar and “capstone” to Certificate program. Students prepare an individual career plan that focuses on application of housing studies to community/career. Students are expected to contribute a segment of the seminar.

DHA 5481. Promoting Independence in Home and Community. (3 cr; A-F or Aud. Prereq: [2401, [sr or grad student]] or #)
Housing, work, and community environments as they relate to aging and managing disabilities. Principles of home modification, universal design, livable communities, and assistive technology to support individuals/families.

DHA 5484A. Rural Housing Issues. (3 cr; A-F or Aud. Prereq: [2401, 2463] or #)
Housing issues related to rural places, small towns, and rural areas. Housing needs and policy implications for rural residents. Economic development strategies for housing availability, adequacy, and affordability.

DHA 5484B. Housing Issues. (3 cr; A-F or Aud. Prereq: [2401, 2463] or #)
Housing issues related to urban places, large families, female-headed households, and low-income households. Students conduct a post-occupancy evaluation of housing.

DHA 5484C. Housing Issues. (3 cr; A-F or Aud. Prereq: [2401, 2463] or #)
Housing issues related to urban places, large families, female-headed households, and low-income households. Students conduct a post-occupancy evaluation of housing.

DHA 5819. Directed Study in Design, Housing, and Apparel. (1-3 cr [max 8 cr]; A-F or Aud. Prereq: #)
Directed Study in Design, Housing, and Apparel. (1-3 cr [max 8 cr]; A-F or Aud. Prereq: #)
Directed Study in Design, Housing, and Apparel. (1-3 cr [max 8 cr]; A-F or Aud. Prereq: #)

DHA 8222. Plan B Master’s Project. (3 cr; S-N or Aud. Prereq: DHA master’s student; #)
Plan B master’s project.

DHA 8262. Readings on Dress: Historical Perspectives. (3 cr; A-F or Aud)
Dress as a significant factor in human interaction prior to 1940. Early social science and philosophical writing, beginning with Montaigne in 1537. These perspectives appraised for relevance to current research and theory.

DHA 8263. Readings on Dress: Contemporary Themes. (3 cr; A-F or Aud. Prereq: 8101 or #)
Current conceptualizations and thematic areas in literature of textiles and apparel.

DHA 8265. Dress: Race, Class, and Gender. (3 cr; A-F or Aud. Prereq: 4212 or #)
Dressing the body as a sociocultural and personal expression of an individual’s identity. Gender, race, and class differences in apparel explored to understand the global market, international and niche retailing, as related to clothing practices.

DHA 8267. Dress and Culture. (3 cr; A-F or Aud. Prereq: 4212 or #)
Cultural factors of identity expressed through dress. Focuses on issues of cultural diversity through analysis of dress and textiles within a specific world region.

DHA 8268. Behavioral Aspects of Dress. (3 cr; A-F or Aud)
Research and social science theories as applied to appearance/dress as manifestations of human behavior.

DHA 8333. FTE: Master’s. (1 cr; No grade. Prereq: Master’s student, adviser and DGS consent)

DHA 8361. Color, Design, and Human Perception. (3 cr; A-F or Aud. Prereq: Basic color theory course or #)
Study and psychological aspects of color and design. Human factors of color variables and design strategies that can enhance human experience of, and interaction with, color.

DHA 8362. The Nature of Representation in Visual Communication. (3 cr; A-F or Aud. Prereq: DHA major or #)
Relationship of images to the design communication process. Aspects of representation and pictorial information modes. Human interaction with images and their role in increasing understanding, enhancing learning, and positively affecting human experience.

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

DHA 8465. Housing: Race and Class. (3 cr; A-F or Aud)
Intersections between housing, race, and class. How housing reflects and helps to constitute racial/class difference. Housing as spatial expression of race/class. Case studies.

DHA 8467. Theoretical Perspectives in Housing Studies. (3 cr; A-F or Aud. Prereq: 5467 or #)
Investigation/evaluation of theories applied to study of housing. Levels of analysis. Links between theory, research questions, and methodological approaches.
Course Descriptions

DHA 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Docent student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

DHA 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])

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

DHA 8990. MFA Creative Thesis. (6 cr [max 12 cr]; A-F or Aud. Prereq—Completed coursework requirements for MFA in DHA w/webimedia emphasis, #)

MFA project.

Development Studies and Social Change (DSSC)

DSSC 8111. Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change. (2 cr; S-N or Aud. Prereq—Grad DSSC minor or #)

Approaches practiced by physical, biological, social science, and humanities scholars. “Ways of knowing” in different cultures/groups. Issues/methodological challenges facing interdisciplinary/international studies. Team taught by faculty from biological, social sciences, and humanities.

DSSC 8112. Scholarship and Public Responsibility. (2 cr; S-N only. Prereq—Grad DSSC minor or #)


DSSC 8211. Doctoral Research Workshop in Development Studies and Social Change. (2 cr; S-N or Aud. Prereq—Grad DSSC minor or #)

Identification of potential funding sources for field research and the writing of grant proposals. Preparing for and conducting field research. Taken during the year before undertaking field research, typically the third year of graduate study.

DSSC 8212. Doctoral Research Workshop in Development Studies and Social Change. (1 cr; S-N or Aud. Prereq—Grad DSSC minor or #)

Identification of potential funding sources for field research and the writing of grant proposals. Preparing for and conducting field research. Taken during the year before undertaking field research, typically the third year of graduate study.

DSSC 8310. Topics in Development Studies and Social Change. (1 cr [max 3 cr]; S-N only. Prereq—Grad DSSC minor or #)

Seven-week seminar. Topical issues in development and social change.

Dutch (DTC)h

Department of German, Scandinavian, and Dutch College of Liberal Arts

DTC 5993. Directed Studies. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq—Graduate student)

Guided individual reading or study.

East Asian Studies (EAS)

Institute of International Studies

College of Liberal Arts

EAS 5940. Topics in Asian History. (1-4 cr [max 16 cr]; Stdnt Opt. Prereq—Grad or intcr consent)

Selected topics with special emphasis on transpacific history, diplomacy, economic, intellectual, political, and social history.

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

EAS 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])

Ecology, Evolution, and Behavior (EEB)

Department of Ecology, Evolution and Behavior

College of Biological Sciences

EEB 5001. Spatiotemporal Dynamics of Plant Communities. (3 cr; Stdnt Opt. Prereq—[Biol 5407, 4014] or #)

Dynamic structure of plant communities in times of environmental changes. Examines species invasion as key to structure/dynamics of plant assemblages. Observational, theoretical, and experimental studies on spatiotemporal dynamics of plant communities under various changes in biological/environmental conditions, including human-induced Global Warming.

EEB 5008. Forest Response to Quaternary Climate Change. (2 cr; A-F or Aud. Prereq—Biol 4631 or Geo 4631 [concurrent registration EEB 5009])

Forest responses to past climate change at the population, community, and ecosystem level. Response to natural and human disturbance, range shifts and invasions. Limitations to the speed of response to rapid climate change.

EEB 5009. Quaternary Vegetation History and Climate. (3 cr; Stdnt Opt. Prereq—[(Biol 5407 or Geo 4631), Biol 3407] or #)


EEB 5011. Pollen Morphology. (2 cr; Stdnt Opt. Prereq—Biol 3007, PBio 4321 or #)

Morphology and nomenclature of pollen grains and pteridospores, survey of pollen and spores of major plant families, lab techniques.

EEB 5013. Quaternary Plant Macrofossils. (2 cr; Stdnt Opt. Prereq—PBio 4321 or 4511 or #)

Morphology of seeds, fruits, and other macroscopic remains likely to occur in Quaternary deposits, survey of fossils of major plant families, lab techniques.

EEB 5033. Population and Quantitative Genetics. (4 cr; A-F or Aud. Prereq—[Biol 4003 or GCD 5022], intro statistics) or #)

Fundamentals of quantitative genetics. Genetic/environmental influences on expression of quantitative traits. Approaches to characterizing genetic basis of trait variation. Processes that lead to change in quantitative traits. Applied/evolutionary aspects of quantitative genetic variation.

EEB 5042. Quantitative Genetics. (3 cr; A-F only. Prereq—[Biol 4003 or GCD 5022] or #)

A course in statistics is recommended.

Fundamentals of quantitative genetics. Genetic/environmental influences on expression of quantitative traits. Approaches to characterizing genetic basis of trait variation. Processes that lead to change in quantitative traits. Applied/evolutionary aspects of quantitative genetic variation.

EEB 5051. Analysis of Populations. (3 cr; Stdnt Opt. Prereq—One semester college biology, intro statistics)

Factors involved in the regulation, growth, and general dynamics of populations. Data needed to describe populations, population growth, population models, and regulatory mechanisms.


Classical and modern mathematical theories of population growth, interspecific interactions, ecosystem dynamics and functioning, with emphasis on underlying assumptions and on effects of added biological reality on robustness of predictions, stability, interspecific interactions, ecosystem structure and functioning.

EEB 5068. Plant Physiological Ecology. (3 cr)

Plant function, its plasticity/diversity in an ecological context. Impact of environmental stresses on major physiological processes of plants, including photosynthesis, respiration, water uptake/transport, and nutrient uptake/assimilation. Lab, field trip to Cedar Creek.

EEB 5122W. Plant Interactions with Animals and Microbes. (3 cr; A-F or Aud. Prereq—Biol 2012 or 3002, 3407 or 3409)

Ecological and environmental implications of mutualistic and antagonistic interactions between plants, animals and microbes at organismal, population, and community levels.

EEB 5146. Science and Policy of Global Environmental Change. (3 cr; A-F or Aud, +FR 5146. Prereq—Biol 5407, Biol 5407 or equiv)


EEB 5221. Molecular and Genomic Evolution. (3 cr; A-F or Aud. Prereq—[Biol 4003 or GCD 5022], grad student) or #)

Molecular basis of evolutionary change. Current studies of selection and neutral evolutionary processes at molecular level. Evolution from gene to genome: protein structure and function, multigenic families, organelle genomes, genome organization. Lectures, discussions of current literature, and workshops where students practice analyses.

EEB 5231. Evolution of Social Behavior. (3 cr; A-F or Aud. Prereq—Biol 3411 or #)

Introduction to theories and concepts relating to behavior evolution, mating systems, and cooperative behavior in animals.

EEB 5322. Evolution and Animal Cognition. (3 cr; Stdnt Opt. Prereq—Biol 3411 or Psych 3061 or #)

Animal cognitive abilities. Learning, perception, memory, navigation, and communication from an evolutionary/comparative perspective. Cognitive abilities as adaptations that solve specific environmental problems. Empirical methods for assessing cognitive abilities. Emphasizes parsimonious interpretations of data. Controversial topics such as animal intelligence, animal language and whether non-human animals have a “theory of mind.”
EEB 5333. Neural and Endocrine Mechanisms Underlying Vertebrate Behavior. (2 cr; A-F or Aud. Prereq-Biol 3411 or Biol 3101 or NSC 3101 or Phsl 3101 or #) Selected aspects of the physiological basis of vertebrate behavior with emphasis on neural and endocrine integration and the effects of evolutionary pressures on it. Hormones and sex behavior, sensory perception, neuroethology of communication.


EEB 5601. Limnology. (3 cr; Stdnt Opt. Prereq-Grad student or #) Advanced introduction to description/analysis of interaction of aquatic biological, chemical, and biological factors that control functioning of life in lakes and other freshwater aquatic environments.

EEB 5605. Limnology Laboratory. (2 cr; A-F or Aud. Prereq-5603 or #) Field/lab methods to obtain information on environmental conditions in aquatic environments and measure abundance of aquatic organisms, especially plankton. Field/lab instruments, sampling devices, microscopy, water chemistry, data analysis.

EEB 5609. Ecosystem Ecology. (3 cr; Stdnt Opt. Prereq-Biol 3407 or Biol 5407 or #) Regulation of elements cycling through ecosystems. Dependence of cycles on kinds/numbers of species within ecosystems. Effects of human-induced global changes on functioning of ecosystems.


EEB 5963. Modeling Nature and the Nature of Modeling. (3 cr; Stdnt Opt. +EEB 5963. Prereq-Math 1281, Math 1282 or equiv or #) Hands-on modeling experiences in context of biological applications. Reviews calculus concepts. Students carry out modeling steps, from developing the model, to analytical analysis, to developing computer code, to running the model.

EEB 8010. Seminar in Paleocology. (1 cr [max 4 cr]; S-N or Aud. Prereq-#) Reading and discussion of recent literature on Quaternary paleocology.

EEB 8020. Community Ecology Seminar. (1 cr [max 5 cr]; S-N or Aud. Prereq-#) Research topics in selected areas.

EEB 8050. Population Biology Seminar. (1 cr [max 5 cr]; S-N or Aud. Prereq-#) Research topics in selected areas.

EEB 8051. Empirical Ecology. (4 cr; Stdnt Opt. Prereq-stat or biometry course or #) Overview of analytical methods in interpreting data collected from observational and experimental studies in ecology and related fields of evolution, behavior, and conservation biology. Univariate, bivariate, and multivariate methods, including computational intensive methods, ordination, and hypothesis testing.

EEB 8060. Evolutionary Genetics Seminar. (1 cr [max 5 cr]; S-N or Aud. Prereq-#) Research topics in selected areas.

EEB 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

EEB 8360. Behavioral Ecology Seminar. (1 cr [max 5 cr]; S-N or Aud. Prereq-#) Research topics in selected areas.

EEB 8601. Introduction to Stream Restoration. (3 cr; Stdnt Opt. + GEO 8601. Prereq-Grad student in [CE or GEO or EEB or WRS or FW or BAE or FR or HORT or ENR or LA or SRSE] or #) Science/policy behind stream restoration. How to evaluating/critiquing a stream restoration project. Assimilate geomorphic, hydrologic, and ecological data at watershed and reach scales to plan a restoration project. Developing a monitoring/assessment program for an existing or future restoration project.

EEB 8602. Stream Restoration Practice. (2 cr; S-N only. + CE 8602, GEO 8602. Prereq-CE 8601 or GEO 8601) Field experience, group design project. Students provide a stream restoration context for each student’s elective coursework, complete critical assessments of stream restoration projects, and design a stream restoration site.


EEB 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

EEB 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])

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

EEB 8980. Seminar on Current Topics. (1-3 cr [max 30 cr]; S-N only. Prereq-[1st yr or 3rd sem] grad student, #) Current research in ecology, evolution, and behavior.

EEB 8990. Graduate Seminar. (1-3 cr [max 30 cr]; Stdnt Opt. Prereq-#) Research topics in selected areas.


EEB 8994. Directed Research. (1-5 cr [max 10 cr]; S-N or Aud. Prereq-#)
Course Descriptions

ECON 8101. Microeconomic Theory. (2 cr; Stdnt Opt. Prereq-8105 or equiv, Math 2243 or equiv, &Math 5615 or concurrent registration in Math 8601, grad econ major or #). Decision problems faced by the household and firm; theories of choice under conditions of certainty and uncertainty. Partial equilibrium analysis of competition and monopoly. General equilibrium analysis. Welfare economics: economic efficiency of alternative market structures, social welfare functions. Dynamics: stability of markets, capital theory. Seven-week course.


ECON 8105. Macroeconomic Theory. (2 cr; Stdnt Opt. Prereq-5152 or equiv, Math 2243, Math 2263 or equiv or #). Dynamic general equilibrium models: solving for paths of interest rates, consumption, investment, prices. Models with uncertainty, search, matching, indivisibilities, private information. Implications for measurement and data reporting. Overlapping generations and dynasty models. Variational and recursive methods. This seven-week course meets with 4165.


ECON 8111. Introduction to Mathematical Economics. (2 cr; Stdnt Opt. Prereq-Math 2243 or equiv, &Econ 8101, &Math 5615 or equiv or #; Math 8422 recommended) Use of mathematical models in economic theory. Standard techniques.


ECON 8113. Introduction to Mathematical Economics. (2 cr; Stdnt Opt. Prereq-8112, Math 5616 or comparable abstract math course, &8103) Use of mathematical models in economic theory. May include special topics.

ECON 8118. Noncooperative Game Theory. (2 cr; Stdnt Opt. Prereq-Math 5616 or equiv or #) Solution concepts for noncooperative games in normal form, including Nash and perfect equilibrium and stable sets of equilibria. Extensive form games of perfect and incomplete information, sequential equilibrium, and consequences of stability for extensive form. Applications including bargaining and auctions. Seven-week course.

ECON 8119. Cooperative Game Theory. (2 cr; Stdnt Opt. Prereq-8104, Math 5616 or equiv or #) Basics of cooperative game theory, emphasizing concepts used in economics. Games with and without transferable utility; the core, the value, and other solution concepts. Recent results, including potentials, reduced games, core, and stable sets of equilibria. Extensive form games of perfect and incomplete information, sequential equilibrium, and consequences of stability for extensive form. Applications including bargaining and auctions. Seven-week course.

ECON 8121. History of Economic Thought. (2 cr; Stdnt Opt. Prereq-8104, 8106 or #) Selected topics, emphasizing development of theoretical topics. Seven-week course.

ECON 8124. History of Economic Thought. (2 cr; Stdnt Opt. Prereq-8104, 8106 or #) Selected topics, emphasizing development of theoretical topics. Seven-week course.

ECON 8131. Advanced Topics in Macroeconomics. (2 cr; max 4 cr; Stdnt Opt. Prereq-8104 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8132. Advanced Topics in Macroeconomics. (2 cr; max 4 cr; Stdnt Opt. Prereq-8104 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8133. Advanced Topics in Macroeconomics. (2 cr; max 4 cr; Stdnt Opt. Prereq-8104 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8181. Advanced Topics in Microeconomics. (2 cr; max 4 cr; Stdnt Opt. Prereq-8104 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8182. Advanced Topics in Microeconomics. (2 cr; max 4 cr; Stdnt Opt. Prereq-8104 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8185. Advanced Topics in Macroeconomics. (2 cr; max 4 cr; Stdnt Opt. Prereq-8104 or #) Faculty and student presentations based on recent literature. Seven-week course.
theory. Applications, including multivariate time series models and/or limited dependent variables models. Seven-week course.


ECON 8381. Advanced Topics in Economic Development. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8311 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8392. Workshop in Economic Growth and Development. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–8401 or #) Faculty and student presentations based on recent literature. Seven-week course.


ECON 8402. International Trade and Payments Theory. (2 cr; Stdnt Opt. Prereq–8401 or #) Tariffs, quotas, and other barriers to trade; gains from trade; trading blocs; increasing returns; growth. This is a seven-week course.

ECON 8403. International Trade and Payments Theory. (2 cr; Stdnt Opt. Prereq–8402 or #) International business cycles; exchange rates; capital movements; international liquidity. This is a 7-week course.

ECON 8404. International Trade and Payments Theory. (2 cr; Stdnt Opt. Prereq–8402, 8403 or #) Theoretical models of international trade. Trade data, empirical work on trade. Seven week course.

ECON 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

ECON 8501. Wages and Employment. (2 cr; Stdnt Opt. Prereq–8103, 8105 or #) Behavior of businesses and industries: productivity, firm size distributions, exit-entry dynamics, etc. Theories of the firm, industry structure and performance, invention and innovation, and technology adoption. Positive and normative theories of regulation. Seven-week course.

ECON 8502. International Trade and Payments Theory. (2 cr; Stdnt Opt. Prereq–8402 or #) Behavior of businesses and industries: productivity, firm size distributions, exit-entry dynamics, etc. Theories of the firm, industry structure and performance, invention and innovation, and technology adoption. Positive and normative theories of regulation. Seven-week course.

ECON 8503. Economic Growth and Development. (2 cr; Stdnt Opt. Prereq–8501 or #) Behavior of businesses and industries: productivity, firm size distributions, exit-entry dynamics, etc. Theories of the firm, industry structure and performance, invention and innovation, and technology adoption. Positive and normative theories of regulation. Seven-week course.

ECON 8504. International Trade and Payments Theory. (2 cr; Stdnt Opt. Prereq–8402, 8403 or #) Theoretical models of international trade. Trade data, empirical work on trade. Seven week course.

ECON 8505. Economic Growth and Development. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–8103 or #) Methods of analyzing dynamical systems; applying methods to new models of growth and development; deriving and evaluating models' quantitative implications in light of growth and development in a number of countries. Seven-week course.

ECON 8506. Government Regulation. (2 cr; Stdnt Opt. Prereq–8103, 8105 or #) Behavior of businesses and industries: productivity, firm size distributions, exit-entry dynamics, etc. Theories of the firm, industry structure and performance, invention and innovation, and technology adoption. Positive and normative theories of regulation. Seven-week course.

ECON 8512. Economic Growth and Development. (2 cr; Stdnt Opt. Prereq–8312 or #) Methods of analyzing dynamical systems; applying methods to new models of growth and development; deriving and evaluating models' quantitative implications in light of growth and development in a number of countries. Seven-week course.

ECON 8513. Economic Growth and Development. (2 cr; Stdnt Opt. Prereq–8312 or #) Methods of analyzing dynamical systems; applying methods to new models of growth and development; deriving and evaluating models' quantitative implications in light of growth and development in a number of countries. Seven-week course.

ECON 8534. FTE: Master's. (1 cr; No grade. Prereq–Master's student, adviser and DGS consent)

ECON 8535. Advanced Topics in Applied Microeconomics. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–8501 or #) Workshop in Applied Microeconomics

ECON 8541. Advanced Topics in Economic Development. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8501 or #; offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8542. Advanced Topics in Economic Development. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8532 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8549. Workshop in Economic Growth and Development. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–#) Workshop in Economic Growth and Development

ECON 8581. Advanced Topics in Labor Economics. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8502 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8582. Advanced Topics in Labor Economics. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8502 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8601. Industrial Organization and Government Regulation. (2 cr; Stdnt Opt. Prereq–8601 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8602. Industrial Organization and Government Regulation. (2 cr; Stdnt Opt. Prereq–8601 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8603. Industrial Organization and Government Regulation. (2 cr; Stdnt Opt. Prereq–8602 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8606. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

ECON 8607. Workshop in Applied Microeconomics. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–#) Workshop in Applied Microeconomics


ECON 8704. Financial Economics. (2 cr; Stdnt Opt. Prereq–8105, 8106 or #) Role of financial institutions in efficient allocation of risk; multiperiod and continuous-time securities markets; theory of firm under uncertainty; financial intermediation; derivation of empirical asset-pricing relationships; tests concerning alternative market structures. Seven-week course.

ECON 8705. Financial Economics. (2 cr; Stdnt Opt. Prereq–8704 or #) Role of financial institutions in efficient allocation of risk; multiperiod and continuous-time securities markets; theory of firm under uncertainty; financial intermediation; derivation of empirical asset-pricing relationships; tests concerning alternative market structures. Seven-week course.

ECON 8706. Financial Economics. (2 cr; Stdnt Opt. Prereq–8705 or #) Role of financial institutions in efficient allocation of risk; multiperiod and continuous-time securities markets; theory of firm under uncertainty; financial intermediation; derivation of empirical asset-pricing relationships; tests concerning alternative market structures. Seven-week course.

ECON 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].)

ECON 8781. Advanced Topics in Monetary Economics. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8702 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8782. Advanced Topics in Monetary Economics. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8702 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8791. Workshop in Macroeconomics. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–#) Workshop in Macroeconomics

ECON 8792. Workshop in Macroeconomics. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–#)


ECON 8881. Advanced Topics in Public Economics. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8803 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8882. Advanced Topics in Public Economics. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8803 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

ECON 8891. Workshop in Public Economics and Policy. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–#)

ECON 8892. Workshop in Public Economics and Policy. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–#)

ECON 8900. Individual Graduate Research. (1-7 cr [max 7 cr]; Stdnt Opt. Prereq–#) Individual Graduate Research

Education (EDUC)

College of Education and Human Development

EDUC 8353. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

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–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

EDUC 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].)

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 Development (EDHD)

College of Education and Human Development

EDHD 5001. Learning, Cognition, and Assessment. (3 cr; Stdnt Opt. with EPsy 3119. Prereq–MED/initial licensure student or CLA music ed or preteaching major or #; psych course recommended)

EDHD 5002. Developmental and Individual Differences in Educational Contexts. (3 cr; A-F or Aud. Prereq–MED or CLA music ed or preteaching major or #; psych course recommended)

EDHD 5004. Teaching Students With Special Needs in Inclusive Settings. (2 cr; A-F only. Prereq–Teacher preparation program in [CEHD or music education or agriculture education or DirectTrack] or #)

EDHD 5005. School and Society. (2 cr; A-F or Aud. Prereq–MED/initial licensure student or CLA music ed major or preteaching major or #)

EDHD 5006. Technology for Teaching and Learning. (1.5 cr; A-F or Aud. Prereq–MED/initial licensure student or CLA music ed major or preteaching major or #; basic computer skills)

EDHD 5007. Technology for Teaching and Learning. (1.5 cr; A-F or Aud. Prereq–MED/initial licensure student or CLA music ed major or preteaching major or #; basic computer skills)

EDHD 5009. Human Relations: Applied Skills for School and Society. (1-18 cr; A-F or Aud. Prereq–MED/init lic or CLA music ed or preteaching or #)

Issues of prejudice/discrimination in terms of history, power, social perception. Knowledge/skills acquisition in cooperative learning, multicultural education, group dynamics, social influence, leadership, judgment/decision making, prejudice reduction, conflict resolution, teaching in diverse educational settings.

Educational Policy and Administration (EDPA)

Department of Educational Policy and Administration

College of Education and Human Development

EDPA 5001. Formal Organizations in Education. (3 cr; Stdnt Opt.)

Classical/current theories of organizations. Applications to education and related fields.

EDPA 5011. Leading Organizational Change: Theory and Practice. (3 cr; Stdnt Opt.)

How theory is incorporated, affects the change process, and can improve schools/institutions of higher education. Characteristics that impact change processes/outcomes. Leadership/policy effects.

EDPA 5021. Historical Foundations of Modern Education. (3 cr; Stdnt Opt. with EDPA 3021, HUM 3021, HUM 3025, HUM 4023)

Analysis and interpretation of important elements in modern education derived from pre-classical sources: Greeks, Romans, Middle Ages, Renaissance, Reformation, Enlightenment, and Industrial Revolution.

EDPA 5023. History of Western Educational Thought. (3 cr; Stdnt Opt. with EDPA 3025, HUM 3025, HUM 4023)

Great educational classics of Western civilization: Plato, Aristotle, Quintilian, Montaigne, Milton, Locke, Rousseau, and others.

EDPA 5024. History of Ideas in American Education. (3 cr; Stdnt Opt.)

EDPA 5028. Education Imagery in Europe and America. (3 cr; Stdnt Opt)
Images and ideas of education expressed in the visual arts of Western civilization (antiquity to 20th century) in relation to concurrent educational thought and practice; symbolism, myth, propaganda, didacticism, genre, carets. (3 cr; A-F or Aud)

EDPA 5032. Comparative Philosophies of Education. (3 cr; Stdnt Opt)
Exploration of the principal philosophies in educational thought today, e.g., realism, idealism, pragmatism, and postmodernism. Practice in philosophical critique. (3 cr; A-F or Aud)

EDPA 5034. Case Studies for Policy Research. (3 cr; Stdnt Opt)
Qualitative case study research methods and their applications to educational policy and practice. Emphasis on use of case studies that employ open-ended interviewing as primary data collection technique. (3 cr; A-F or Aud)

EDPA 5057. Research in International Education. (3 cr; Stdnt Opt)
Key skills/proficiencies for rigorous graduate research. Quantitative/qualitative/mixed methods. How to be a critical consumer of policy-related, comparative/intercultural research. Conducting cross-cultural/comparative research. Related ethical issues. (3 cr; A-F or Aud)

EDPA 5061. Ethnographic Research Methods. (3 cr; Stdnt Opt)
Practice in aspects of field methodology below the level of full field study; detailed reading; analysis of studies in anthropology and education for methodological content. (3 cr; A-F or Aud)

EDPA 5064. Divergent Perspectives in Educational Policy and Practice. (3 cr; Stdnt Opt)
Examines fundamental and current issues in the field of education. Participants learn how to approach an issue from multiple perspectives, develop skills to identify and analyze component parts, and examine personal belief systems to place a given issue within a personal context. (3 cr; A-F or Aud)

EDPA 5070. Special Topics: School Leadership. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq—BA or BS or other baccalaureate degree)
Skills/knowledge necessary to respond to multiple challenges of reduced budgets, increased accountability requirements, and growing concerns about impact of technology investments in education. (1-5 cr; A-F or Aud)

EDPA 5080. Special Topics: Educational Policy and Administration. (1-3 cr [max 24 cr]; Stdnt Opt)
Topical issues in educational policy/administration. (1-3 cr [max 24 cr]; Stdnt Opt)

EDPA 5087. Seminar: Educational Policy and Administration. (1-3 cr; Stdnt Opt)
Shared responsibility of students/instructor in presentation of topics. (1-3 cr; A-F or Aud)

EDPA 5095. Problems: Educational Policy and Administration. (1-3 cr [max 24 cr]; Stdnt Opt)
Course or independent study on specific topic within department program emphasis. (1-3 cr [max 24 cr]; Stdnt Opt)

EDPA 5101. International Education and Development. (3 cr; Stdnt Opt)
Introduction to comparative and international development education, contemporary theories regarding the role of education in the economic, political, and sociocultural development of nations; examination of central topics and critical issues in the field. (3 cr; A-F or Aud)

EDPA 5102. Knowledge Constructions and Applications in International Development Contexts. (3 cr; Stdnt Opt)
Interrelationships of knowledge capital (noetic symbolic resources) and culture through intrinsic, cross/multicultural perspectives. Examining knowledge from information/data. National/international developments occurring along basic/applied knowledge paths. (3 cr; A-F or Aud)

EDPA 5103. Comparative Education. (3 cr; Stdnt Opt)
Examination of systems and philosophies of education globally with emphasis upon African, Asian, European, and North American nations. Foundations of comparative study with selected case studies. (3 cr; A-F or Aud)

EDPA 5104. Strategies for International Development of Education Systems. (3 cr; A-F or Aud. Prereq—Grad student)
Strategies for improving quality/efficiency of schooling in developing countries. Introduction to current research on what policy/programmatic interventions have proven most successful in increasing access, raising quality, and improving efficiency of education in developing countries. (3 cr; A-F or Aud)

EDPA 5121. Educational Reform in International Context. (3 cr; Stdnt Opt)
Critical policy analysis of educational innovation and reform in selected countries. Use theoretical perspectives and a variety of policy analysis approaches to examine actual educational reforms and their implementation. (3 cr; A-F or Aud)

EDPA 5122. Critical Issues in International Education and Educational Exchange. (3 cr; Stdnt Opt)
Analysis of comprehensive policy-oriented frameworks for international education; practices of U.S. and other universities; conceptual development of international education and its practical application to programs, to employment choices, and to pedagogy. (3 cr; A-F or Aud)

EDPA 5128. Anthropology of Education. (3 cr; Stdnt Opt. =ANTH 5128)
Insights from educational anthropology for educators to address issues of culture, ethnicity, and power in schools. (3 cr; A-F or Aud)

EDPA 5131. Educational Leadership and Training: Theory and Application. (3 cr; Stdnt Opt)
Examination of intercultural education; formal and nonformal education programs intended to teach about cultural diversity, promote intercultural communication and interaction skills, and teach students from diverse background more effectively. (3 cr; A-F or Aud)

EDPA 5132. Futures Research for Educational Leaders. (3 cr; A-F only. Prereq—Grad student)
Perspectives/methods of futures research. Historical/antecedent and contemporary influences on futures research. Futures research as social technology vs social (inexact) science. Primary toolbox of futures Research. Emerging potentials of futures research. (3 cr; A-F or Aud)

EDPA 5136. Scenario and Story Planning for Educational Innovators. (3 cr; A-F only. Prereq—Grad student)
How to create/use strategic scenarios/stories to anticipate/shape forces/events that could impact future educational design, policy, practice, and administration. Designing, analyzing, comparing multiple scenarios/stories, initial conditions, including assumptions, information content, and contexts. (3 cr; A-F or Aud)

EDPA 5141. Global Youth Policy and Leadership: Comparative Youth Policy and Leadership. (3 cr; A-F only. Prereq—CIDE student or #)
Comparative approach to public responses at global level to youth development and leadership issues. Social systems such as education, health, employment and recreation. Role of individuals, communities, governments, and international organizations directed to provide programs/services to young persons. (3 cr; A-F or Aud)

EDPA 5142. Youth Futures in International and Global Contexts. (3 cr; A-F only. Prereq—CIDE student or #)
Strategic trends in global youth development. Implications. Reconciling trends with normative scenarios with respect to presence, absence, and projected likelihood of suitable policies, workable collaborations, and funding. (3 cr; A-F or Aud)

EDPA 5144. Cultural Models, Simulations, and Games. (3 cr; Stdnt Opt. Prereq—Upper div or grad student)
Use of dynamic educational models, simulations, and games in international education/development courses. Storytelling, simulated intercultural encounters, imagination, knowledge construction/applications, time, ethics, computer simulations, games, systems. (3 cr; A-F or Aud)

EDPA 5301. Contexts of Learning: Historical, Contemporary, and Projected. (3 cr; A-F or Aud)
Contextual understanding of education as a social institution. Education is studied as one institution among the several that constitute its dynamic context. (3 cr; A-F or Aud)

EDPA 5302. Educational Policy: Context, Inquiry, and Issues. (3 cr; Stdnt Opt)
Review of social science concepts/research in considering educational policies/issues, process of inquiry that affects policy development, implementation, evaluation. Focus on pre-K-12. Role of educational leaders, administrators. (3 cr; A-F or Aud)

EDPA 5303. Managing the Learning Organization. (3 cr; A-F or Aud)
Examine schools, colleges, and other human service organizations centered on learning. Focuses on perspectives and skills needed to manage organizations effectively. (3 cr; A-F or Aud)

EDPA 5304. Educational Leadership for Equity, Opportunity, and Outcome. (3 cr; Stdnt Opt)
Implications of multiple contexts in which leadership occurs. Role of followers. Complexities of collaborative structures and of shared governance.
EDPA 5305. Leadership and Vision in School Technology. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) How to create a shared vision for comprehensive integration of technology into educational environments. Ways to foster environment/culture conducive to realization.

EDPA 5306. Staff Technology Development and Support. (1 cr; Stdnt Opt. Crl 5346. Prereq-Broadband Internet access, a newer computer) How to lead an organization in designing, implementing, evaluating, improving, and sharing approaches to staff development. Technology-related development. Facilitating staff development through use of technology.

EDPA 5307. School Management and Technology. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Various organizational/management issues impacted by information technology. Focuses on hardware, software, and database technologies designed to facilitate management/operations of school organizations.

EDPA 5308. Emerging Issues and School Technology. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Needs of schools/administrators to remain on forefront of information technologies. Focuses on anticipated technological trends years ahead.

EDPA 5309. Electronic Communication Tools and Environments for Schools. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Various electronic communication channels, information environments to facilitate educational organizations' operations/communication. Focuses on networked environments, integration with handheld computers, and outreach to internal/external stakeholders.

EDPA 5310. Data-Driven Decision Making I. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Data-driven decision making for schools/administrators. Focuses on data collection/analysis needs of educational organizations and on use of appropriate software/databases to collect, manage, analyze, and report school information.

EDPA 5311. Data-driven Decision Making II. (1 cr; Stdnt Opt. Prereq-5310, broadband Internet access, newer computer) Continuation of data-driven decision making for schools/administrators. Hands-on training in students’ own organizations in using technology to analyze data to make educational decisions.

EDPA 5312. School Technology Policy Issues. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Various administrative issues related to educational technology. Focuses on “digital divide” in schools/communities, federal educational technology policy initiatives, and state/federal educational technology legislation.

EDPA 5313. Legal and Ethical Issues in School Technology. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Social, legal, and ethical issues related to school technology. How to model responsible decision-making related to these issues.


EDPA 5315. School Technology Leadership Multimedia Project. (1 cr; Stdnt Opt. Prereq-5305 or 5306 or 5308. 250 MB RAM, [Windows T 2000 or XP or Mac OS 9 or 10], Pentium [2 or faster], internet connection, [Netscape or Internet Explorer], virus protection software, School Technology Leadership Project) Students focus on individualized school technology leadership topic of choice, deliver a multimedia presentation of project results. Regular consultation with faculty, peer mentors, and outside mentors.

EDPA 5321. The Principal as Leader of High-Performing Schools. (3 cr; Stdnt Opt) Role of principal: qualifications, duties, problems.

EDPA 5322. Leaders in the Superintendency and Central Office. (3 cr; Stdnt Opt) Role/responsibility of superintendent in school district. Real life experiences, leadership potential as CEO. Purposes, power, politics, practices of position. Interplay of internal school forces, community forces. Leadership in public, high-profile appointment.


EDPA 5326. Data Analysis for Educational Leadership. (2 cr; Stdnt Opt. Prereq-[5325 or equiv], #) Advanced technological/analytical tools associated with data-driven decision-making processes in K-12 school environments.

EDPA 5328. Introduction to Educational Planning. (3 cr; Stdnt Opt) Principles, tools, comparative practices, and emerging issues in K-12 and higher education settings; decision making models, strategic and project planning, barriers to effectiveness; and change management processes.

EDPA 5332. Leadership Development Seminar. (3 cr; Stdnt Opt) Assessment and development of skills required of the educator in planning, decision making, and human relations. Introduction to contemporary issues in educational administration.

EDPA 5336. Laboratory in Decision Making. (3 cr; Stdnt Opt) Contributions of recent research and theory to effective administration. Analysis of administrative behavior in realist settings; relations of administration to human behavior.

EDPA 5341. The American Middle School. (3 cr; Stdnt Opt) Focus on the uniqueness of the early adolescent and appropriate learning situations. For educators working with middle-level students.


EDPA 5346. Politics of Education. (3 cr; A-F or Aud. Prereq-postbac, MEd, or grad student) Political dimensions of policy making, implementation in education. Use of power/influence in shaping educational policies and in resolving conflicts over educational issues. Analysis of consequences/cross-impacts.

EDPA 5348. Leaders of Human Resources Administration. (2 cr; Stdnt Opt. Prereq-Designed for students working on licensure for dir of community educ or superintendent or K-12 principal or dir of special educ) Skills required for effective administrator/leader. Human resources administration. Employee recruitment, selection, orientation/support, supervision, performance appraisal of school district personnel.

EDPA 5352. Projective Leadership for Strategic Learning Communities. (3 cr; Stdnt Opt) Explores many trends and changes facing society, culture, and education from a strategic learning community perspective; helps students “futurize the present.”

EDPA 5356. Disability Policy and Services. (3 cr; Stdnt Opt) Policy, research, and current practices related to education, health, and social services that support children, youth, and adults with special needs, and that support their families. Federal, state, and local perspectives.

EDPA 5361. Project in Teacher Leadership. (3 cr; max 6 cr; S-N or Aud. +C1 5178. Prereq-MEd student in Teacher Leadership Program) Create, implement, evaluate, and present a leadership project designed to initiate positive change in educational environments. Review of related literature, proposal development, project development, implementation and evaluation, critical reflection, sharing learning outcomes.

EDPA 5364. Context and Practice of Educational Leadership. (3 cr; A-F or Aud) Current research/practice on educational leadership. Focuses on creating school cultures conducive to continuous improvement/change. Strategies for personal/organizational leadership in PK-12 settings.

EDPA 5368. Leadership for Special Education Services. (3 cr; Stdnt Opt. Prereq-Administrator or supervisor or professional responsible for managing general or special or alternative education program) Legislative, procedural, executive, and judicial actions that affect services, families, and children with special needs at federal, state, and local levels.

EDPA 5372. Youth in Modern Society. (3 cr; Stdnt Opt) Youth in advanced societies and as a social entity; functions and roles in industrial society, family, education, politics and government, economy and work, welfare and religion; organizations, social movements, and subcultures; empirical research and cross-cultural perspectives.


EDPA 5376. Organizational Approaches to Youth Development. (3 cr; Stdnt Opt) Defining youth development within framework of formal and informal organizations; organizational systems responsible for youth development in the community; policy issues surrounding these systems.
EDPA 5378. Experiential Learning: Theory and Practice. (3 cr; Stdnt Opt)

EDPA 5381. The Search for Children and Youth Policy in the U.S. (3 cr; Stdnt Opt)
Review of contemporary policy issues affecting children and youth in the U.S. and South Africa; identify national standards, norms and principles of youth development; conflicting expectations facing policy-makers; and search for the critical content of youth policy.

EDPA 5384. Collaboration in Heterogeneous Classrooms and Schools. (3 cr; A-F or Aud)
Policy, research, practice base for addressing range of student abilities/backgrounds in diverse schools. Collaborative approaches to curricular, instructional, social support.

EDPA 5385. Licensure Seminar: Program Policies and Inclusionary Leadership. (1 cr; S-N or Aud)
Preparation for licensure program. Program overview, assessment, reflective practice, APA writing, exit panel review, administrative appointment interview.

EDPA 5386. Leadership Portfolio Seminar. (1 cr; S-N or Aud. Prereq–5385 or &5385)
Development of electronic administrative licensure portfolio to earn endorsement for license as school superintendent. K-12 principal, director of special education, or director of community education.

EDPA 5387. Leadership for Teaching and Learning. (2 cr; Stdnt Opt. Prereq–Undergrad degree)
Administration of inclusive/coherent systems of teaching/learning. Design principles, best practices, exemplary programs. School/district administrator roles as leaders of learning systems.

EDPA 5388. Leadership for Master(Full) Scheduling. (2 cr; Stdnt Opt. Prereq–5387)
Scheduling models. Strategies for personalizing schools. Hands-on “infinite campus student system.” Master schedule is built online.

EDPA 5389. Community Education Leadership. (3 cr; Stdnt Opt)
Competencies of leadership, policy, and political influence. Legal/regulatory applications focusing on special education law.

EDPA 5392. Special Education Finance: Program Models, Policy, and Law. (2 cr; Stdnt Opt. Prereq–Knowledge of special education; [5324 or &5324] recommended)
How special education revenue is a resource used to accomplish student-related objectives. Special education revenue sources, compliance, budget monitoring, key special education policy, case law, program models from perspective of director of special education.

EDPA 5392. Leading School Finance Elections. (1 cr; S-N or Aud)
Comprehensive planning model for conducting school finance elections. Emphasizes systems, strategies, and campaign tactics.

EDPA 5394. Leadership in Community Education Finance and Law. (1 cr; S-N or Aud. Prereq–5324 recommended)
Interplay between finance and laws directly applicable to community education. MN Statute 124D, revenues/expenses, and UFARs approached from frame of resource development.

EDPA 5396. Field Experience in PK-12 Administration: Authentic Practice in Leadership. (3 cr [max 12 cr]; S-N or Aud. Prereq–#)
Field experience or internship arranged for students seeking licensure as PK-12 principal/supervisor. Content/credit depend on licensure requirements specified in individual field experience agreement.

EDPA 5501. Principles and Methods of Evaluation. (3 cr; Stdnt Opt. +EPSY 5243)
Introduction to program evaluation. Planning an evaluation study, collecting and analyzing information, reporting results; evaluation strategies; overview of the field of program evaluation.

EDPA 5521. Cost and Economic Analysis in Educational Evaluation. (3 cr; Stdnt Opt)
Use and application of cost-effectiveness, cost-benefit, cost-effectiveness, and cost-efficiency to evaluation of educational programs and programs.

EDPA 5524. Evaluation Colloquium. (1 cr [max 24 cr]; S-N or Aud. +EPSY 5246. Prereq–5501 or EPSY 5243)
Informal seminar of faculty and advanced students. Issues/problems of program evaluation.

EDPA 5528. Focus Group Interviewing Research Methods. (3 cr; Stdnt Opt)
Skills needed to conduct focus group interviews. Students conduct focus group study and report results at final class session.

EDPA 5701. U.S. Higher Education. (3 cr; Stdnt Opt)
U.S. higher/postsecondary education in historical/contemporary perspective. Emphasizes structure, history, and purposes of system as a whole.

EDPA 5704. College Students Today. (3 cr; Stdnt Opt. +EPSY 5451)

EDPA 5721. Racial and Ethnic Diversity in Higher Education. (2-3 cr [max 3 cr]; Stdnt Opt)
Review of research. Theoretical frameworks, methodological perspectives, and research strategies used to study students, staff, and faculty, historical perspectives.

EDPA 5724. Leadership and Administration of Student Affairs. (2-3 cr [max 3 cr]; Stdnt Opt. +EPSY 5421)
Scope, administration, coordination, and evaluation of programs in college and university student affairs.

EDPA 5727. Developmental Education Programs and Postsecondary Students. (2-3 cr [max 3 cr]; Stdnt Opt. Prereq–Bachelor’s degree)

EDPA 5728. Two-Year Postsecondary Institutions. (2-3 cr [max 3 cr]; Stdnt Opt)
Present status, development, functions, organization, curriculum, and trends in postsecondary, but nonbaccalaureate, institutions.

EDPA 5732. The Law and Postsecondary Institutions. (3 cr; Stdnt Opt)
Analysis of court opinions and federal regulations affecting postsecondary educational institutions.

EDPA 5734. Institutional Research in Postsecondary Education. (2-3 cr [max 3 cr]; A-F or Aud. Prereq–[5701, EPSY 5231 or EPSY 8261], grad student) or #
Scope, role, administration, research strategies, and evaluation of institutional research in postsecondary institutions. Overview of research methodologies, disciplinary foundations of institutional research. Use of institutional, state, and national databases in addressing full range of institutional missions/functions.

EDPA 5795. Plan B Research Design. (3 cr [max 6 cr]; A-F or Aud. Prereq–Grad student)
Foundation to design Plan B research project relevant to student’s professional interests. Literature review strategies to establish conceptual framework for project. Relates research question to design alternatives and to associated qualitative/quantitative analysis techniques. Issues such as human subjects and APA guidelines for preparing research papers.

EDPA 8002. Critical Issues in Contemporary Education. (3 cr; Stdnt Opt. Prereq–EdPA or PhD student)
Meanings of difference from sociological, psychological, historical and philosophical perspectives as related to current and emerging critical issues in education. Participants help design, facilitate, and present the course.

EDPA 8011. Doctoral Research Seminar I. (1 cr; S-N or Aud. Prereq–EdPA doctoral student)
Introduction/planning for individual program development, preliminary examinations, and dissertation prospectus. Modes of inquiry used in current research in education, databases relating to education, recent writings on literature synthesis, key contributions to education literature.

EDPA 8012. Doctoral Research Seminar II. (1 cr; S-N or Aud. Prereq–EdPA doctoral student)
Introduction to quantitative/qualitative research approaches/methods. Nature of research, role of researcher, philosophical perspectives on research, ethical issues in conducting research.

EDPA 8013. Doctoral Research Seminar III. (1 cr; S-N or Aud. Prereq–EdPA doctoral student)
Introduction to most important quantitative/qualitative approaches employed in educational policy research.

EDPA 8014. Doctoral Research Seminar IV. (1 cr; S-N or Aud. Prereq–EdPA doctoral student)
Preparation of thesis prospectus.

EDPA 8015. Research Design and Educational Policy. (3 cr; A-F only. Prereq–8001, EdPA PhD student)
Logic of research design, from research questions and audience considerations to selection of a suitable design for collecting/analyzing quantitative, qualitative, and mixed-method data.

EDPA 8020. Leadership: From Theory to Reflective Practice. (3 cr; A-F or Aud. Prereq–[5001 or equiv], doctoral student) or # Leadership theory. Emphasizes seminal scholars’ work from related social sciences. Applications of theory for practice of leadership. Knowledge, behaviors, values, and skills needed in educational and other public settings.

EDPA 8022. Education and Globalization: Anthropological Perspectives. (3 cr; A-F or Aud)
Anthropological comparative perspectives used to understand educational processes in a globalized world. What can be gained by adopting translocal view of educational phenomena.

EDPA 8087. Seminar: Educational Policy and Administration. (1-3 cr [max 24 cr]; Stdnt Opt)
Topical issues.
Course Descriptions

EDPA 8095. Problems: Educational Policy and Administration. (1-3 cr; max 24 cr; Stdnt Opt) Independent study on issues of educational policy/administration. Arranged with instructor.

EDPA 8096. Internship: Educational Policy and Administration. (1-9 cr; max 24 cr; Stdnt Opt) Internship on issues of educational policy/administration. Arranged with instructor.


EDPA 8121. Doctoral Seminar: Comparative and International Development Education. (1-6 cr; max 6 cr; S-N or Aud. Prereq—EdPA PhD candidate) Focuses on needs of students while writing the dissertation; general guidance in how to construct the thesis.

EDPA 8124. Classic Readings in Anthropology and Education. (5 cr; A-F or Aud) Major contributions to theory or working paradigms.

EDPA 8143. Integrative Seminar in Global Youth Policy and Leadership. (1 cr; max 3 cr; A-F only. Prereq—CIDE student or #) Integrates ideas/concepts from 5141 and 5142 into alternative knowledge, policy, and futures profiles. Students use WebCT Vista and beyond to interact with each other, with students abroad, and with global experts to apply perspectives, theories, methods, and research to real-world situations.


EDPA 8303. Modeling the Learning Organization. (3 cr; max 4 cr; Stdnt Opt) Computer software, perspectives on learning organization used to study global education, human service organizations.

EDPA 8304. Leadership and Ethics. (3 cr; Stdnt Opt) Review of major leadership theories, their application to problems of practice in educational organizations. Studies of leadership behavior illustrate major emerging issues in educational management.

EDPA 8321. Data Analysis for Educational Management. (3 cr; Stdnt Opt) Managers of educational organizations are faced with problems that require analysis of a wide range of information. Outlines a frame for data analysis and introduces a set of computer-based tools suited to the practice of educational administration.

EDPA 8335. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

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

EDPA 8502. Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives. (3 cr; Stdnt Opt. Prereq—5501 or EPSY 5243) Concepts, approaches, models, and theoretical frameworks for program evaluation that have developed since the 1960s.

EDPA 8595. Evaluation Problems. (1-6 cr [max 24 cr]; Stdnt Opt. EPSY 8295. Prereq—5501 or EPSY 5243) Independent study of an issue in theory or practice of program evaluation.

EDPA 8596. Evaluation Internship. (1-9 cr [max 24 cr]; Stdnt Opt. EPSY 8296. Prereq—5501 or EPSY 5243) Hands-on experience in conducting a program evaluation in a real-world setting under supervision of an evaluation professional.

EDPA 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no requirement for teaching, course preparation, or supervision. up to 12 combined cr; # for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

EDPA 8702. Administration and Leadership in Higher Education. (5 cr; Stdnt Opt. Prereq—5001, 5701) Leadership, governance, and administration in higher education through theoretical perspectives and practical analysis. Planning, change, decision making, organizational culture, budgets, audit.

EDPA 8703. Public Policy in Higher Education. (3 cr; A-F or Aud. Prereq—5001, 5701) Theories, analytic methods, and critical issues in postsecondary education policy at national/state levels. Equality of educational opportunity, affirmative action, system governance/coordination, research funding, student financial aid, public accountability.

EDPA 8721. Instruction and Learning in Higher Education. (2-3 cr [max 3 cr]; Stdnt Opt) Theory/practice of teaching strategies. Implications of student differences (learning style, ethnicity, gender, age) for teaching, evaluation and professional development of teaching. Context/nature of faculty work, ethical issues, teaching portfolio development.

EDPA 8724. Strategic Planning in Higher Education. (2-3 cr [max 3 cr]; Stdnt Opt. Prereq—5701) Strategic planning principles, their application to higher education; pitfalls encountered by planners in higher education. Selected tools of strategic planning/management, strategic planning case studies.

EDPA 8728. Economics of Higher Education. (2-3 cr [max 3 cr; Stdnt Opt) Institutional responses to changing external economic factors. Economic effects resulting from higher education’s output in teaching, research, and service. Research on institutional and governmental policies.


EDPA 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))

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

EDPA 8996. Evaluation Internship: Educational Policy and Administration. (1-9 cr; max 24 cr; Stdnt Opt) Independent study on issues of educational policy/administration. Arranged with instructor.

EDPA 8998. Thesis Credit: Doctoral. (1-24 cr; max 100 cr; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

EDPSY 5101. Intelligence and Creativity. (3 cr; A-F or Aud) Contemporary theories of intelligence and intellectual development and contemporary theories of creativity and their implications for educational practices and psychological research.

EDPSY 5112. Knowing, Learning, and Thinking. (4 cr; A-F or Aud) Principles of human information processing, memory, and thought; mental operations in comprehension and problem solving; developing expertise and automaticity; emphasis on applied settings.

EDPSY 5113. Psychology of Instruction and Technology. (3 cr; Stdnt Opt) Introduction to adult learning and instructional design. Application of core foundational knowledge to development of effective learning environments for adults. Topics include philosophy, learning theories, instructional models, development and experience, individual differences, evaluation, assessment, and technology.

EDPSY 5114. Psychology of Student Learning. (3 cr; A-F or Aud) Principles of educational psychology: how learning occurs, why it fails, and implications for instruction. Topics include models of learning, development, creativity, problem-solving, intelligence, character education, motivation, diversity, special populations.

EDPSY 5115. Psychology of Adult Learning and Instruction. (3 cr; Stdnt Opt) Survey of adult learning/instruction. Emphasizes instructional design, learning theories, experience, individual differences, evaluation, tests/measurement, technology. Implications for curriculum/instructional design in higher education, continuing education, professional/business related training.

EDPSY 5118. Language: Psycholinguistic Research and Educational Application. (3 cr; A-F or Aud) Psycholinguistic study of language. Psycholinguistic processes involved in language use, mechanisms that guide these processes. Failures of these mechanisms. How language operates.

EDPSY 5155. Human Relations Workshop. (4 cr; Stdnt Opt) Experiential course addressing issues of prejudice and discrimination in terms of history, power, and social perception. Includes knowledge/skills acquisition in cooperative learning, multicultural education, group dynamics, social influence, effective leadership, judgment and decision-making, prejudice reduction, conflict resolution.

EDPSY 5141. Aggression in Schools. (3 cr; A-F or Aud. Prereq—5XXX course in [developmental or educational] psychology) Development of aggression in schools. Aggression defined, compared to cooperative/prosocial behavior. Theories, methods, gender/individual differences.

EDPSY 5142. Play in Development and Education. (3 cr; A-F only. Prereq—Course in child or developmental psychology) Development/functions of play in humans with comparisons made to other species, especially non-human primates. Play as it relates to developmentally appropriate practice.
EPSY 5151. Cooperative Learning. (3 cr; Stdnt Opt)
Participants learn how to use cooperative learning in their setting. Topics include theory and research, teacher's role, essential components that make cooperation work, teaching social skills, assessment procedures, and collegial teaching teams.

EPSY 5152. Psychology of Conflict Resolution. (3 cr; Stdnt Opt)
Overview of the field of conflict resolution. Major theories, research, major figures in the field, factors influencing quality of conflict resolution are covered. The nature of conflict in the history of field, and intrapersonal, interpersonal, intergroup conflict, negotiation, mediation are discussed.

EPSY 5153. Social Development in PreK to Secondary Schools. (3 cr; A-F only. Prereq—Course in psychology)
Social development in educational settings, from preschool through high school.

EPSY 5157. Social Psychology of Education. (3 cr; A-F or Aud)
Overview of social psychology and its application to education. Participants study the major theories, research, and major figures in field. Class sessions include lectures, discussions, simulations, role-plays, and experiential exercises.

EPSY 5191. Education of the Gifted and Talented. (5 cr; A-F or Aud)
Theories of giftedness, talent development, instructional strategies, diversity and technological issues, implications for educational practices and psychological inquiry, and international considerations.

EPSY 5200. Special Topics: Psychological Foundations. 0.4-1 cr (max 30 cr); Stdnt Opt
Focus on special topics in psychological and methodological concepts relevant to advanced educational theory, research, and practice not covered in other courses.

EPSY 5216. Introduction to Research in Educational Psychology and Human Development. (3 cr; A-F or Aud. Prereq—5261 or intro statistics course)
Designing/conducting a research study. Reviewing literature, formulating research problem, using different approaches to gather data, managing/analyzing data, reporting results.

EPSY 5231. Principles of Educational and Psychological Measurement. (4 cr; Stdnt Opt. Prereq—5261 or equiv)
Concepts, principles, and methods in educational/psychological measurement. Reliability, validity, item analysis, score interpretation, measurement models, and test theory. Emphasizes construction, interpretation, use, and evaluation of assessments regarding achievement, aptitude, interests, attitudes, personality, and exceptionality.

EPSY 5222. Measurement and Analysis: K-12 Education Accountability. (4 cr; Stdnt Opt. Prereq—5251 or [5221, 5261] or [PSY 3305, PSY 5662] or #)

EPSY 5231. Introductory Statistics and Measurement in Education. (4 cr; Stdnt Opt. =EPSY 5234, ED 5234, ED 5238, PSY 5662)
Students develop an understanding of basic statistics and measurement concepts and tools and apply them to the collection, analysis, and interpretation of data.

EPSY 5243. Principles and Methods of Evaluation. (3 cr; Stdnt Opt. =EDPA 5501)
Introductory course in program evaluation; planning an evaluation study, collecting and analyzing information, reporting results; overview of the field of program evaluation.

EPSY 5244. Survey Design, Sampling, and Implementation. (3 cr; Stdnt Opt. Prereq—[5221 or 5251 or 5261 or equiv] [CEHD grad student or MEd student])
Survey methods, including mail, phone, and Web-based/e-mail surveys. Principles of measurement, constructing survey forms, pilot testing, sampling, data analysis, reporting. Students develop a survey proposal and a draft survey, pilot the survey, and develop sampling/data analysis plans.

EPSY 5246. Evaluation Colloquium: Psychological Foundations. (1 cr [max 8 cr]; S-N or Aud. =EDPA 5524, Prereq—5243 or EDPA 5501)
Informal seminar of faculty and advanced students interested in the issues and problems of program evaluation.

EPSY 5247. Qualitative Methods in Educational Psychology. (3 cr; Stdnt Opt. Prereq—Grad student)
Introduction to qualitative methods of inquiry. Contrasting different research traditions (e.g., case study, phenomenology, ethnography, social interactionism, critical theory). Practice with field notes, observations, and interviewing. Use of NVIVO to track/code data.

EPSY 5261. Introductory Statistical Methods. (3 cr; Stdnt Opt. =EPSY 3264, EPSY 5231)

EPSY 5262. Intermediate Statistical Methods. (3 cr; Stdnt Opt. Prereq—5261 or 5261 or equiv)

EPSY 5271. Becoming a Teacher of Statistics. (3 cr; Stdnt Opt. Prereq—5261 or equiv)
Current methods of teaching first courses in statistics. Innovative teaching methods, materials, and technological tools. Types of first courses, reform recommendations, goals for student learning, recommended content, teaching methods, technology, student assessment.

EPSY 5272. Statistics Teaching Internship. (3 cr; S-N or Aud. Prereq—Grad student, #)
Supervised teaching experience.

EPSY 5281. Introduction to Computer Operations and Data Analysis in Education and Related Fields. (3 cr; Stdnt Opt. =EPSY 5281—Statistics course)
How to use the computer to access/analyze information. National, state, local, and specialty Web sites that contain data of interest to social scientists. Using EXCEL, SPSS, SAS, and R for data analysis.

EPSY 5300. Special Topics in Educational Psychology. (1-9 cr [max 9 cr]; Stdnt Opt)
Current issues in educational psychology or related areas not normally available through regular curriculum offerings.

EPSY 5400. Special Topics in Counseling Psychology. (1-4 cr [max 8 cr]; S-N or Aud.)
Theory, research, and practice in counseling and student personnel psychology. Topics vary.

EPSY 5401. Counseling Procedures. (3 cr; Stdnt Opt. Prereq—Upper div student)
Emphasis on the counseling relationship and principles of interviewing. Case studies, role playing, and demonstration. For individuals whose professional work includes counseling and interviewing.

EPSY 5412. Introduction to Developmental Counseling and Guidance. (3 cr; Stdnt Opt. Prereq—)
Contemporary models of counselors as advocates for all students. Emphasizes prevention and systems intervention with counselors involved in the developmental guidance curriculum, school counseling, staff and community collaboration, individual student planning, and learning success with diverse populations.

EPSY 5415. Child and Adolescent Development and Counseling. (4 cr; A-F or Aud. Prereq—Grad student or MEd student or K-12 counseling endorsement or licensure) student

EPSY 5421. Leadership and Administration of Student Affairs. (3 cr; Stdnt Opt. =EDPA 5724)
Theoretical approaches, administrative structure, and evaluation methods used in college/university student affairs.

Principles and practices of group work for educators and the helping professions. Discussion of various types of groups (e.g., counseling support, task, psychosocial). Applications to various settings and populations (e.g., schools and community agencies).

EPSY 5432. Foundations of Individual/Organizational Career Development. (3 cr; Stdnt Opt)
Introduction to individual and organizational career development theory and practice. Examines critical issues in work patterns, work values, and workplaces in a changing global society, with implications for career planning, development, and transitions, emphasizing personal and organizational change. For nonmajors: serves students in adult ed, HRD, IR, college student advising, and other related fields.

EPSY 5433. Counseling Women Over the Life Span. (3 cr; Stdnt Opt. Prereq—Counseling or career development course)
Counseling skills and interventions to facilitate career development of girls and women of different life stages and backgrounds (school girls to older women); developmental issues from a systematic integrative life planning framework; facts, myths, and trends regarding women's changing roles.

EPSY 5434. Counseling Adults in Transition. (3 cr; Stdnt Opt. Prereq—Advanced undergrad or grad student in the helping professions)
Psychological, physical, and social dimensions of adult transitions (e.g., family and personal relationships, career). Adult development theories, stress and coping, and helping skills and strategies as they relate to adult transition.

EPSY 5451. College Students Today. (3 cr; Stdnt Opt. =EDPA 5704)
Issues involving diverse populations of students in colleges/universities. Student development theory, students' expectations/interests, how college affects student outcomes. Role of curricular/extracurricular activities and of student-faculty interactions.

EPSY 5461. Cross-Cultural Counseling. (3 cr; A-F or Aud)
Course Descriptions

EPSY 5601. Survey of Special Education. (2 cr; Stdnt Opt)
Introduction to programs and services provided to people with disabilities in school and community settings. Emphasis on the needs of families, to the roles and responsibilities of teachers, and to related service providers.

EPSY 5604. Transition From School to Work and Community Living for Persons With Special Needs. (3 cr; Stdnt Opt)
Use of strategies/models for improving transition of youth from school to work and community living. Course content that specifically addresses all phases of student assessment, individualized transition planning. Parent, family, and student involvement in designing post school options. Community-based services (employment, residential living, social and recreational services, etc). Comprehensive interagency approaches.

EPSY 5609. Family-centered Services. (2 cr; A-F or Aud)

EPSY 5612. Understanding of Academic Disabilities. (3 cr; A-F or Aud)
Introduction to issues related to the education of students with academic disabilities (learning disabilities, mild mental intellectual disabilities, and emotional/behavioral disabilities) including history, definition, assessment, classification, legislation, and intervention approaches.

EPSY 5613. Foundations of Special Education I. (3 cr; A-F or Aud; Prereq—Child development course, 5601 or equiv)
Emphasis on the organization of educational programs and services for people with disabilities and their families. First course for students seeking to become licensed teachers in special education.

EPSY 5614. Foundations of Special Education II. (3 cr; A-F or Aud; Prereq—5613)
Emphasis on assessment, planning, and implementing educational programs for people with disabilities. Second course for students seeking to become licensed teachers in special education.

EPSY 5615. Advanced Academic Interventions. (3 cr; A-F or Aud; Prereq—5612)
Designing, implementing, and evaluating individual educational plans (IEPs) for special education service in learning disabilities/behavioral disorders, and mild mental/intellectual disabilities.

EPSY 5616. Behavior Analysis and Classroom Management. (3 cr; Stdnt Opt)
Introduction to assumptions, principles, and procedures of behavioral approach to analyzing behavior and programs for classroom management. Emphasis on specifying problems, conducting observations, intervening, and evaluating behavioral change.

EPSY 5618. Specialized Interventions for Students With Disabilities in Reading and Written Language. (3 cr; A-F or Aud; Prereq—Enrollment in [EDU or LD or DDM or D/HI] or #)
Historical/contemporary perspectives, empirical evidence related to reading/written language instruction/assessment designed to improve outcomes of students with disabilities. Field work in tutoring.

EPSY 5621. Functional/Basic Academic Interventions in Mental Retardation. (3 cr; A-F or Aud; Prereq—5613, 5614)
Methods and materials course emphasizing functional approaches to promoting academic learning in students with mild to moderate mental retardation and moderate to severe mental retardation.

EPSY 5622. Programs and Curricula for Learners with Severe Disabilities. (3 cr; Stdnt Opt; Prereq—5616)
Emphasis on developing programs and curricula for students with moderate, severe, and profound developmental delays, as well as severe multiple disabilities. Special consideration given to preparing children and youth for integrated community environments.

EPSY 5624. Biomedical and Physical Aspects of Developmental Disabilities. (2 cr [max 5 cr]; A-F or Aud)

EPSY 5625. Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction. (2 cr; A-F or Aud)
Overview of the issues, problems, and practical applications in designing early intervention services for young children with disabilities and their families.

EPSY 5626. Seminar: Developmental Disabilities and Instructional Management. (3 cr; Stdnt Opt; Prereq—5622 or #)
Data-based strategies for school and nonschool instruction of learners with developmental disabilities including assessment, design, implementation, and evaluation of educational instruction; curriculum content, concept and task analysis, classroom arrangements, natural and instructional cues, corrections, and consequences.

EPSY 5635. Education of Students with Physical and Health Disabilities. (3 cr; A-F or Aud; Prereq—5650 or #)
Introduction to students with physical and health disabilities and their characteristics; the educational implications of physical disabilities; assessment procedures and appropriate educational interventions for learners with physical and health disabilities.

EPSY 5636. Education of Multihandicapped Learners with Sensory Impairments. (2 cr [max 3 cr]; Stdnt Opt; Prereq—5613, 5614)
Characteristics of learners with visual and auditory impairments; design of instructional programs to remediate or circumvent disabilities, including use of prosthetic devices; related areas of performance affected by sensory impairments.

EPSY 5641. Foundations of Education for Individuals Who Are Deaf/Hand of Hearing. (3 cr; Stdnt Opt; Prereq—5650 or #)
Historical and current issues related to education of individuals who are deaf or hard of hearing. Implications of causes of hearing loss, social and cultural relationships, philosophies of education, characteristics and legislative guidelines and their applicability to education of individuals who are deaf or hard of hearing.

EPSY 5642. Early Childhood Intervention for Infants, Toddlers, and Preschoolers Who Are Deaf/Hand of Hearing. (3 cr; Stdnt Opt; Prereq—Preservice teacher in deaf education licensing program or #)

EPSY 5644. Language Development and Programming for Deaf/Hand of Hearing Children. (3 cr; Stdnt Opt)

EPSY 5646. Reading and Writing Practices with Deaf/Hard of Hearing Children. (3 cr; Stdnt Opt; Prereq—5644 or general educ methods in tchg reading and writing skills, or #)
Gain knowledge and skills to assess, plan, and implement instruction for children and youth with hearing loss. Emphasis is placed on research, theoretical, and programmatic issues in developing reading and writing skills, curricular adaptations, and effective instructional approaches.

EPSY 5647. Aural and Speech Programming for Persons Who Are Deaf/Hand of Hearing. (3 cr; Stdnt Opt)
Study of the speech and hearing mechanisms, causes of hearing loss, and rehabilitation. Emphasis on instructional practices, aural rehabilitation in the educational setting, adaptive technology, and adaptations to optimize functional skills with individuals who are deaf or hard of hearing.

EPSY 5648. Communication Systems for Children With Disabilities. (2 cr; Stdnt Opt)
Applied study of assessment, selection, and application of alternative communication systems for students with hearing loss and additional disabilities.

EPSY 5649. Models of Instructional Programming With Deaf and Hard of Hearing Students. (3 cr; Stdnt Opt; Prereq—5641, 5644 or #)
Design/development of portfolios for various models of educational service delivery systems for individuals with hearing loss. Emphasizes consultation skills, curriculum management/modifications, material/technology applications, and support service adaptations.

EPSY 5656. Social and Interpersonal Characteristics of Students with Disabilities. (3 cr; A-F or Aud)
Emphasis on children and youth of school age and on the ways in which their emotional, social, and behavioral disorders affect their functioning in school and on ways in which their behaviors disturb others.

EPSY 5657. Interventions for Social and Emotional Disabilities. (3 cr; A-F or Aud; Prereq—5616, 5656)
Developing comprehensive behavioral programs for students with social and emotional disabilities. Instructing students with social and emotional disabilities.

EPSY 5661. Introduction to Autism Spectrum Disorder. (3 cr; A-F only; Prereq—5616, Autism Spectrum Disorder certificate student)
Knowledge/skills needed to promote learning/success for school age children with Autism Spectrum Disorder. Definition, etiology, and characteristics of ASD. Current research/issues. Emphasizes collaborative problem solving approach that facilitates effective family-professional partnerships and educational programming for this population.

EPSY 5671. Literary Braille. (3 cr; A-F or Aud)
Mastery of literary braille code including all contractions and short-form words used in Grade 2 English Braille: American Usage. Use of specialized braille writing equipment including, braille writer, slates, and stylus, and computer programs with six-key input.

EPSY 5672. Advanced Braille Codes. (2 cr; A-F or Aud; Prereq—5671 or #)
Mastery of the Nemeth code for braille mathematics transcription including elementary math computation, algebra, geometry, trigonometry, and symbolic logic notation. Introduction to foreign languages, computer notation, music, and raised line drawing techniques.
EPSY 5674. Techniques of Orientation, Mobility, and Independence for Students with Visual Disabilities. (3 cr; A-F or Aud. Prereq-5675 or #) Introduction to basic techniques to gain skills in pre-cane techniques, orientation to learning environments, and adaptations for activities of daily living and independence. Introduction to mobility maps, consideration of cane, guide dog, and telepasic aids to mobility.

EPSY 5676. Case Management for Children with Visual Disabilities. (3 cr; A-F or Aud. Prereq-5671, 5673, 5675) Advanced course evaluating and managing cognitive, psychosocial, physical, and academic needs of students. Consideration of parent, teacher, and student in counseling and educational program management.

EPSY 5681. Education of Infants, Toddlers, and Preschool Children with Disabilities: Methods and Materials. (3 cr; A-F or Aud. Prereq-5625) Overview of the methods and materials available to maximize the developmental and educational outcomes for young children, birth to age 5, with disabilities and their families in home, school, and child-based settings.

EPSY 5701. Practicum: Field Experience in Special Education. (1-6 cr [max 12 cr]; A-F or Aud. Prereq-[EPSY 5614, POE or SpEd grad or licensure student]) or #) Observations and supervised support of teaching practice in schools or agencies serving children with disabilities in integrated programs.

EPSY 5702. Practicum in Autism Spectrum Disorder. (3 cr; A-F only. Prereq-5616, 5661, 5669, one of [5622 or 5644 or SLHS 5606], enrolled in Autism Spectrum Disorder certificate program) #) Four hundred hours of supervised work in settings where individuals with Autism Spectrum Disorder are served. On-site supervision is provided by qualified professionals. A University supervisor conducts on-site observations. Bi-weekly seminars.

EPSY 5703. Practicum in Applied Behavior Analysis. (3 cr; A-F only. Prereq-5616, 5657, Psy 4011, Applied Behavior Analysis Certificate student) #) Four hundred hours of supervised experience in applied behavior analytic intervention with individuals with significant challenging behavior and learning difficulties. On-site supervision is provided by qualified professionals. A University supervisor conducts on-site observations. Bi-weekly seminars.

EPSY 5720. Special Topics: Special Education. (1-4 cr [max 12 cr]; Stdent Opt. Prereq-#) Lab and fieldwork approach, often assuming a product orientation, e.g., generation of action plan, creating set of observation field notes, collecting data in some form. Provides opportunities for educational personnel to study specific problems and possibilities related to special education.

EPSY 5740. Special Topics: Interventions and Practices in Educational and Human Service Programs. (1-4 cr [max 8 cr]; Stdent Opt. Prereq-#) Concepts, issues, and practices related to the community inclusion of children, youth, and adults with developmental disabilities through weekly seminar and extensive supervised experience working with individuals within the community.

EPSY 5751. Student Teaching: Deaf and Hard of Hearing. (1-6 cr [max 10 cr]; Stdent Opt. Prereq-#) Students participate in educational programming for infants, children, and youth who are deaf or hard of hearing. On-site, directed experiences under supervision of master teachers of deaf/hard of hearing students.

EPSY 5752. Student Teaching: Learning Disabilities. (1-6 cr [max 10 cr]; S-N or Aud. Prereq-#) Supervised experience in teaching or related work in schools or other agencies serving children and adolescents with learning disabilities.

EPSY 5753. Student Teaching: Early Childhood Special Education. (1-6 cr [max 8 cr]; S-N or Aud. Prereq-# completion of all course requirements for license in ECSE) Supervised experience in teaching or related work in schools, agencies, or home settings with infants, toddlers, and preschoolers with disabilities and their families.

EPSY 5754. Student Teaching: Social and Emotional Disabilities. (1-6 cr [max 6 cr]; A-F or Aud. Prereq-Completion of all licensure courses for social and emotional disorders, #) Teach students with social and emotional disorders at public schools and other appropriate sites. Attend a weekly seminar on student teaching competencies.

EPSY 5755. Student Teaching: Developmental Disabilities, Mild/Moderate. (1-6 cr [max 6 cr]; A-F or Aud. Prereq-Completion of all licensure coursework, #) Supervised student teaching, or special practicum project, in schools or other agencies serving students at elementary/secondary levels who have mild to moderate developmental disabilities.

EPSY 5756. Student Teaching: Developmental Disabilities, Moderate/Severe. (1-6 cr [max 6 cr]; A-F or Aud. Prereq-Completion of all licensure coursework, #) Supervised student teaching, or special practicum projects, in schools or other agencies serving students at elementary/secondary levels who have moderate to severe developmental disabilities.

EPSY 5757. Student Teaching: Physical and Health Related Disabilities. (1-6 cr [max 8 cr]; A-F or Aud. Prereq-#) Supervised student teaching and related work (direct instruction and consultation) in schools or other agencies serving children and adolescents who have physical disabilities.

EPSY 5758. Student Teaching: Visual Impairments. (1-6 cr [max 6 cr]; A-F or Aud. Prereq-#) Supervised student teaching, or special practicum project, in schools or other agencies serving children and adolescents who have visual impairments.

EPSY 5800. Special Topics in School Psychology. (1-9 cr [max 9 cr]; Stdent Opt) Current issues in school psychology or areas not normally available through regular curriculum offerings.

EPSY 5801. Assessment and Decision Making in School and Community Settings. (3 cr; A-F or Aud) Introduction to psychological and educational assessment for individuals who work with children, especially those experiencing academic and behavior problems. Study of standardized group and individual tests of intelligence, achievement, socio-emotional functioning, perception, reading, mathematics, adaptive behavior, and language.

EPSY 5849. Observation and Assessment of the Preschool Child. (3 cr [max 4 cr]; Stdent Opt) Introduction to assessment principles and practices, including observational assessment methods, for young children (birth to 5). Intended primarily for teachers in training and others interested in basic information regarding assessment and its relationship to intervention services for young children.


EPSY 5852. Prevention and Early Intervention. (3 cr; Stdent Opt) Theory/research base for school-based primary/secondary programs to promote academic/social competence of children/youth (birth to grade 12).

EPSY 5871. Interdisciplinary Practice and Interagency Coordination in Education and Human Services. (3 cr; Stdent Opt) Principles and procedures of interdisciplinary practice and interagency coordination. Examine the relative strengths of interdisciplinary approaches, develop skills for collaborating with others, and examine different approaches to interagency coordination.

EPSY 5991. Independent Study in Educational Psychology. (1-8 cr [max 20 cr]; A-F or Aud. Prereq-#) Self-directed study in areas not covered by regular courses. Specific program of study is jointly determined by student and advising faculty member.

EPSY 8114. Seminar: Cognition and Learning. (3 cr [max 9 cr]; Stdent Opt) Advanced study in critical analysis and application of contemporary psychological theory and research in cognition and learning for education.

EPSY 8115. Psychology of Instruction and Technology. (3 cr; Stdent Opt) Seminar including, but not limited to, learning and instructional theories, advanced and emerging technologies, and measurement and evaluation.

EPSY 8117. Writing Empirical Paper and Research/Grant Proposals in Education and Psychology. (3 cr; Stdent Opt. Prereq-#) Scientific writing skills. Focuses on logic/argumentation. Each student produces an empirical paper or research proposal. Breaks down the writing process into components: one component per week. Each week, students write a section of their paper/proposal and critique others.

EPSY 8132. Personality Development and Socialization. (3 cr; Stdent Opt. Prereq-Personality or child psycho course) Major research and theoretical work. Developmental and educational influences on personality.

EPSY 8215. Advanced Research Methodologies in Education. (3 cr; Stdent Opt. Prereq—5220, 5247, 5261, 8262, #) Quantitative research methods, including models of scientific inquiry, role of theories/research design, role of measurement error in quantitative data-based inference, and qualitative methods of inquiry. Focuses on advanced quantitative/qualitative methodologies used in methodologically-oriented studies in educational measurement, evaluation, and stats.

EPSY 8216. Seminar: Research Processes in Psychological Foundations of Education. (3 cr; A-F or Aud. Prereq-to doctoral program in psych foundations or #) Advanced examination of research processes in educational psychology. Invited faculty discuss specific research designs. Students refine/implement research projects and present them in class.

EPSY 8231. Psychomotor Scaling. (3 cr; Stdent Opt. Prereq—5221 or equiv, 8261-8262 or equiv) Elementary and advanced topics in unidimensional and multidimensional scaling: measurement theory and statistics, rating scales and other category scaling methods, magnitude estimation, paired comparisons, multi-attribute scaling, and multidimensional scaling.

For definitions of course numbers, symbols, and abbreviations, see page 214. 281
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EPSY 8222. Advanced Measurement: Theory and Application. (4 cr; Stdnt Opt. +PSY 5845. Prereq—[5261 or Psy 5862 or equiv], [8261 or 8262 or equiv]) Generalizability theory, item response theory, factor models for test items, binomial model. Application to problems of designing, linking assessments. Includes a computer lab.

EPSY 8247. Advanced Interviewing and NVIVO. (3 cr; Stdnt Opt. Prereq—5247 or qualitative course or #) Practice in designing, conducting, and analyzing interviews. Students design interview protocols, video/audio tape themselves conducting interviews, analyze their techniques, and critique others. Students use NVIVO to analyze data they have collected.

EPSY 8261. Statistical Methods I: Probability and Inference. (3 cr; Stdnt Opt. Prereq—5264 or 5261 or equiv) Advanced theory, derivations of quantitative statistics. Descriptive statistics, probability, normal distribution. One-/two-sample hypothesis tests, confidence intervals. One-way analysis of variance, follow up tests.

EPSY 8262. Statistical Methods II: Regression and the General Linear Model. (3 cr; Stdnt Opt. Prereq—[8260, 8261] or equiv) Analysis of variance designs (two-/three-way), repeated measures, correlation, simple/multiple regression methods, non-parametric procedures, multivariate analyses.


EPSY 8266. Statistical Analysis Using Structural Equation Methods. (3 cr; Stdnt Opt. Prereq—8263 or 8264) Quantitative techniques using manifest and latent variable approaches for analysis of educational and social science data. Introduction to structural equation modeling approaches to multiple regression, factor analysis, and path modeling. Developing, estimating, and interpreting structural equation models.


EPSY 8271. Statistics Education Research Seminar: Studies on Teaching and Learning Statistics. (3 cr [max 9 cr]; Stdnt Opt) Introduction to classic/current research related to teaching/learning of statistics. Research from psychology, education, and statistics. Students focus on a particular research question and review the literature related to that question.


EPSY 8281. Advanced Statistical Computing and Data Analysis. (3 cr; Stdnt Opt. Prereq—8251 or equiv, 8251 or equiv) Cross-disciplinary course. Students learn to use SAS statistical package to perform data management, data analysis, and report writing.


EPSY 8290. Special Topics: Seminar in Psychological Foundations. (1-6 cr [max 15 cr]; Stdnt Opt. Prereq—#) Students formulate research designs. Learning and cognition, social psychology, measurement, and statistics.

EPSY 8295. Evaluation Problems. (1-6 cr [max 24 cr]; Stdnt Opt. +EPSY 8595. Prereq—5243 or EdPa 5501, #) Individually directed study of an issue in the theory or practice of program evaluation.

EPSY 8296. Evaluation Internship. (1-9 cr [max 24 cr]; Stdnt Opt. +EPSY 8596. Prereq—5243 or EdPa 5501, #) Hands-on experience in conducting a program evaluation in a real-world setting under supervision of an evaluation professional.

EPSY 8300. Special Topics in Educational Psychology. (1-4 cr [max 9 cr]; Stdnt Opt) Issues or related coursework in areas not normally available through regular curriculum offerings.


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

EPSY 8400. Topics: Counseling and Student Personnel Psychology. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq—#) Current issues in counseling and student personnel psychology, or related coursework in areas not normally available through regular curriculum offerings.

EPSY 8402. Individual Counseling: Theory and Applications. (3 cr; A-F or Aud. Prereq—Grad Ed psy major with CSPP subprog or #) Traditional and contemporary theories of counseling and psychotherapy. Applications to various settings and populations.

EPSY 8403. Social/Cultural Contexts: Counseling and Skills. (3 cr; A-F or Aud. Prereq—Grad Ed psy major with CSPP subprog or #) Broad personal dimensions of race, ethnicity, gender, class, beliefs, disability, age, sexual orientation, and geographic origin. Societal and personal biases and stereotypes; multicultural concepts and culturally appropriate counseling procedures.

EPSY 8404. Group Counseling: Theory, Applications, and Skills. (3 cr; A-F or Aud. Prereq—Ed psy MA or PhD student with CSPP subprog or #) Theories, research, and procedures of group counseling and of groups such as psychoeducational groups. Applications to various settings and populations. Ethical issues in group work. Practice of group skills and techniques, including group participation and observation.


EPSY 8407. Assessing and Counseling Clients With Psychological Disorders. (4 cr; A-F only. Prereq—CSPP PhD or MA student or #) Etiology, symptom patterns, and assessment/treatment for various psychological disorders. DSM diagnoses. Empirically validated psychological assessment and counseling methods. Field-based enquiry.

EPSY 8411. Advanced Counseling Research. (4 cr; A-F or Aud. Prereq—Ed psy PhD student with CSPP subprog or #) Focus on critically reviewing counseling research, qualitatively and quantitatively integrating research, and designing valid research.

EPSY 8412. Seminar: Advanced Counseling Theory and Ethics. (4 cr; A-F or Aud. Prereq—Ed psy PhD student with CSPP subprog or #) Comparative analysis of theoretical models and methods used in contemporary counseling and psychotherapy; ethical standards and models of ethical decision making for professional roles.

EPSY 8413. Personality Assessment of Adolescents and Adults. (3 cr; A-F or Aud. Prereq—[Psy 5604H or Psy 8111 or Psy 8112], doctoral student) Assessment interviews, MMPI-2, MMPI-A, DSM4, written assessment reports.
EPSY 8431. Master’s Research Seminar: CSPP. (4 cr; A-F or Aud. Prereq-5261 or equiv. EPsy MA student with CSPP subprog or #) Survey of research methods, data-based decision making, basic research design skills, and research simulation.

EPSY 8435. Organization of School Counseling Comprehensive Programs. (3-6 cr [max 6 cr]; A-F or Aud. Prereq-CSPP grad student in school counselor prog or #) Integrates learning from all courses in MA program with research in comprehensive guidance program. Critical review of research, analyses of current trends/issues. Theories of management/organization in educational and other service settings. Literature review of comprehensive guidance programs. Students develop/demonstrate knowledge of comprehensive school counseling programming in K-12 school settings.


EPSY 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, advisor and DGS consent) Psychological Aspects of Counseling Supervision. (5 cr; Studnt Opt. Prereq-Ed psy PhD student with CSPP subprog or #) Theories, review of relevant research, demonstration, and in-class practice of supervision skills.

EPSY 8501. Counseling Pre-Practicum. (3 cr; A-F or Aud. Prereq-[CSPP or genetic counseling] grad student) Overview of basic helping skills through demonstration, in-class practice.

EPSY 8502. Field Placement in Counseling and Student Personnel Psychology. (2 cr; S-N or Aud. Prereq-8501 or #) Students participate under supervision in practitioner activities within a counseling work environment.

EPSY 8503. Counseling Practicum I. (1-4 cr [max 4 cr]; A-F or Aud. Prereq-8502 or #) Beginning-level supervised practice in counseling with individuals and groups, emphasizing ethical issues with systematic evaluation of student’s counseling practice through direct observations, video, and audio tapes.

EPSY 8504. Counseling Practicum II. (1-4 cr [max 4 cr]; A-F or Aud. Prereq-8503 or #) Intermediate level supervised practice in counseling with individuals and groups, emphasizing ethical issues with systematic evaluation of student’s practice through direct observations, video, and audio tapes.

EPSY 8509. Supervision Practicum: CSPP. (2 cr; Studnt Opt. Prereq-[Ed psy PhD student with CSPP subprog] or #) Students involved in counseling supervision of beginning courses.

EPSY 8512. Internship: CSPP. (1-12 cr [max 12 cr]; S-N only. Prereq-EdPsy PhD student with CSPP subprog) Supervised internship in counseling psychology.

EPSY 8513. University Counseling Practicum I. (4-6 cr [max 6 cr]; S-N or Aud. [PSY 8514, Prereq-EdPsy grad student with CSPP subprog, #) Science of counseling psychology. Supervised practice in University Counseling and Consulting Services with career, academic, and personal clients.

EPSY 8514. University Counseling Practicum II. (4-6 cr [max 6 cr]; S-N or Aud. [PSY 8515, Prereq-8513, #) Integrates science of counseling psychology with supervised practice in University Counseling and Consulting Services with career, academic, and personal clients.

EPSY 8521. Practicum in Student Affairs and Student Development. (1-4 cr [max 6 cr]; A-F or Aud. Prereq-EdPsy MA or PhD student with CSPP subprog or #) Supervised practice in university and college student development offices.

EPSY 8522. Counseling Practicum: Advanced. (3 cr [max 12 cr]; A-F only. Prereq-[Grad EPsy PhD student with CSPP subprog] or #; instructor consent required after 2 repeats) Advanced skills practicum in counseling, counseling psychology, or student development.

EPSY 8600. Special Topics: Social Work Practicum I. (1-3 cr [max 9 cr]; Studnt Opt) Current trends (e.g., schoolwide discipline, models of collaboration, and diversity) investigated by formulating research projects. Students write a media piece describing an issue and its impact on the community.

EPSY 8612. Seminar: Students with Academic Difficulties. (3 cr; A-F or Aud) Survey, analysis, and application of relevant theories and research related to current issues. Students in course develop skills in scholarly inquiry, writing, and debate.


EPSY 8651. Seminar on Social and Emotional Disabilities. (3 cr; A-F or Aud) Review and critical analysis of current trends and future directions of education of students with social and emotional disabilities.

EPSY 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 3rd/4th registrations, up to 4th/5th registrations, up to 6th/7th registrations) Advanced seminar to prepare doctoral students for dissertation research.

EPSY 8677. Seminar: Information Acquisition for Persons with Disabilities. (3 cr [max 6 cr]; A-F or Aud) Research findings from diverse disciplines on impact of hearing and visual disabilities on ability to acquire and/or access information.

EPSY 8684. Research in Special Education. (3 cr; Studnt Opt) Design and implementation of research related to the unique developmental characteristics of exceptional learners.

EPSY 8686. Doctoral Research Methods. (3 cr; A-F or Aud) Principles and methods of research and data analysis in educational and psychological research.

EPSY 8701. Doctoral Core Seminar: Special Education I. (3 cr [max 6 cr]; A-F or Aud. Prereq-EdPsy PhD student with spec ed subprog or #) Required for students with a family/life span focus on social development, behavioral interaction, and ethical considerations.

EPSY 8702. Doctoral Core Seminar: Special Education II. (3 cr [max 6 cr]; A-F or Aud. Prereq-8701 or #) Required for students focusing on communication/language/academics.

EPSY 8706. Single Case Designs in Intervention Research. (3 cr; Studnt Opt) Design and analysis of single-case experiments to examine effects of interventions on individual behavior in school, home, and community.

EPSY 8707. Principles of Behavior Analysis and Learning. (3 cr; A-F only. Prereq-[Grad student, foundational course in [learning or psychology]] or #) Historical development of behavioral science. Thinking about learning/behavior, applying principles to common human experiences. Scholarly leadership skill development.

EPSY 8708. Functional Behavior Assessment. (3 cr; A-F only. Prereq-[Grad student, one [learning or psychology] course] or #) Applications of principles of behavior. Historical/contemporary approaches. Functional analysis. Treatment of challenging behavior/learning problems.

EPSY 8772. Seminar in Early Intervention. (2 cr; Studnt Opt) Explores research from diverse disciplines related to education of infants, toddlers, and preschool children with disabilities and their families. Discusses practical application of this research.

EPSY 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])

EPSY 8800. Special Topics in School Psychology. (1-4 cr [max 9 cr]; Studnt Opt) Issues or related coursework in areas not normally available through regular curriculum offerings.

EPSY 8811. Assessment in School Psychology I: Foundations of Academic Assessment. (3 cr; A-F or Aud. Prereq-Grad ed psy major with school psy subprog or #) Theories and models of psychosocial assessment of children and adolescents within home, school, and community. Conceptual and empirical foundations of eco-behavioral assessment that lead to efficient but comprehensive assessment of children presented from problem-solving perspective.


EPSY 8813. Assessment Practicum in School Psychology. (2 cr [max 4 cr]; A-F or Aud. Prereq-8821, grad ed psy major with school psy subprog or #, &8811 or &8812) Students administer, score, and interpret standardized tests of intellectual, adaptive, and social-emotional assessment, and assess educational progress using both formal and informal instructional assessment strategies. All measures complement other facets of assessment presented in 8811 and 8812.

EPSY 8815. Systems Intervention and Consultation. (3 cr; A-F or Aud) Principles/models of consultation/interventions for social-emotional problems exhibited by school-aged children. Emphasizes universal intervention, competence enhancement approaches. All interventions presented from a system-level perspective.

EPSY 8816. Individual Intervention and Consultation. (3 cr; A-F or Aud) In-depth study/analysis of instructional interventions/procedures necessary to work with school personnel in developing schoolwide, classroom, individual instructional interventions. Practice in developing/applying interventions with individual students.
Course Descriptions

**EPsy 8818. Intervention Practicum in School Psychology.** (1 cr; max 2 cr; A-F or Aud. Prereq–Grad ed psy major with school psy subprog, &8815 or &8816)

Students design, implement, and evaluate interventions for individuals or groups of children and for system-level concerns under supervision of practicing school psychologists. Students observe school psychologists collaborate with educators and parents in intervention-related activities.


School psychology as professional field of specialization in psychology/education. Historical, theoretical, and research basis of school psychology. How school systems operate. Common roles/functions of school psychologists. In-class discussion, didactic/field-based assignments.

**EPsy 8822. Research in School Psychology.** (3 cr [max 6 cr]; A-F only. Prereq–[[8860, 8861, 5616] or equiv], grad ed psy major with school psy subprog or #)

Integrative, developmental discussions/activities about research in school psychology. Consumer, synthesizing, distributing, and conducting research. Students formulate their own research agenda.

**EPsy 8823. Ethics and Professional Standards in School Psychology.** (3 cr; A-F or Aud. Prereq–&8821)

Ethics, laws, and current ethical issues applied to study/practice of school psychology. Ethical principles, state/federal laws governing educational practices. How mandates are applied to work of school psychologists in general/special populations (e.g., special education, ESL, ethnic/racial minorities). Students apply learning as researchers and practicing school psychologists in schools.

**EPsy 8831. Practicum: School Psychological Services.** (1-3 cr [max 6 cr]; Stdnt Opt. Prereq–& Grad ed psy major with school psy subprog)

Field placements in schools. Experiences may include consultation, assessment, direct service to individuals or groups, and report writing. Supervised on-site as well as by University through required participation in seminar.


Supervised experience in assessment and intervention planning of children referred to psychoeducational settings; training in broad range of approaches to problems of adjustment in school-age children and their families, schools, and community settings.

**EPsy 8841. Practicum: Instruction and Supervision in School Psychology.** (2 cr [max 4 cr]; A-F or Aud. Prereq–& Grad ed psy major with school psy subprog or #)

Review of best practice literature and strategies for evaluating supervision skills. Students give lectures to and supervise school psychology students in order to learn firsthand the issues related to providing supervision and to understand responsibilities related to academic careers.

**EPsy 8842. Internship: School Psychological Services.** (1-10 cr [max 10 cr]; S-N or Aud. Prereq–& Grad ed psy major with school psy subprog, #)

Advanced field placement. Full-time supervised experience for one year or part-time for no more than two years.

**EPsy 8850. Doctoral Seminar in School Psychology: Research, Training, Practice, Policy Issues, and Action Plans.** (3 cr; A-F only. Prereq–[Grad student in school psychology coursework in school psychology] or advanced PhD student from related department, #)

Critical issues in school psychology, led by students or visiting professionals. Outside reading/research. Scientific findings/implications for training, practice, policy, and research. Students create professional development plan.

**EPsy 8888. Thesis Credit: Doctoral.** (1-24 cr [max 100 cr]; Prereq–Grad ed Psy 8818 per semester or summer, 24 cr required)


Critical issues in learning and cognition, statistics and measurement, counseling, school psychology, social psychology of education, and special education.

**EPsy 8993. Directed Study: Educational Psychology.** (1-10 cr [max 20 cr]; A-F or Aud. Prereq–#)

Arranged independently with individual faculty members.

**EPsy 8994. Research Problems: Educational Psychology.** (1-6 cr [max 18 cr]; A-F or Aud. Prereq–#)

Research methodology, techniques, and literature. Students participate in formulating/executing research proposal.

**Electrical and Computer Engineering (EE) Department of Electrical and Computer Engineering**

**Institute of Technology**

**EE 5121. Transistor Device Modeling for Circuit Simulation.** (3 cr; Stdnt Opt. Prereq–& [5115, 5161, IT grad student] or %)

Basics of MOS, bipolar theory. Evolution of popular device models from early SPICE models to current industry standards.

**EE 5141. Introduction to Microsystem Technology.** (4 cr; Stdnt Opt. Prereq–& [5161, 3601, IT grad student] or %)

Microelectromechanical systems composed of microsensors, microactuators, and electronics integrated onto common substrate. Design, fabrication, and operation principles. Labs on micromachining, photolithography, etching, thin film deposition, metallization, packaging, and device characterization.

**EE 5163. Semiconductor Properties and Devices I.** (3 cr; Stdnt Opt. Prereq–& [5161, 3601, IT grad student] or %)


**EE 5164. Semiconductor Properties and Devices II.** (3 cr; Stdnt Opt. Prereq–& [5161, 5165, IT grad student] or %)


**EE 5171. Microelectronic Fabrication.** (4 cr; Stdnt Opt. Prereq–IT grad student or %)

Fabrication of microelectronic devices. Silicon integrated circuits, GaAs devices. Lithography, oxidation, diffusion, interconnection, packaging. Process integration of various technologies, including CMOS, double poly bipolar, and GaAs MESFET.

**EE 5173. Basic Microelectronics Laboratory.** (1 cr; Stdnt Opt. Prereq–& [5171 or 5871], IT grad student or %)

Students fabricate a polysilicon gate, single-layer metal, NMOS chip, performing 80 percent of processing, including photolithography, diffusion, oxidation, and etching. In-process measurement results are compared with final electrical test results. Simple circuits are used to estimate technology performance.

**EE 5181. Introduction to Nanotechnology.** (4 cr; Stdnt Opt. Prereq–& [3161, 3601, IT grad student] or %)


**EE 5231. Linear Systems and Optimal Control.** (3 cr; Stdnt Opt. Prereq–[3015, IT grad student] or %)


**EE 5235. Robust Control System Design.** (3 cr; Stdnt Opt. Prereq–IT grad, 3015, 5231 or %)

Development of control system design ideas; frequency response techniques in design of single-input/single-output (and MI/MI) systems. Robust control concepts. CAD tools.

**EE 5239. Introduction to Nonlinear Optimization.** (3 cr; Stdnt Opt. Prereq–[3025, Math 2373, Math 2374, IT grad student] or %)


**EE 5251. Optimal Filtering and Estimation.** (3 cr; Stdnt Opt. Prereq–& [5451, IT grad student] or %)


**EE 5301. VLSI Design Automation I.** (3 cr; Stdnt Opt. Prereq–[2301, IT grad student] or %)


**EE 5302. VLSI Design Automation II.** (3 cr; Stdnt Opt. Prereq–[5301, IT grad student] or %)


**EE 5323. VLSI Design I.** (3 cr; Stdnt Opt. Prereq–[2301, 3115, IT grad student] or %)


**EE 5324. VLSI Design II.** (3 cr; Stdnt Opt. Prereq–& [5323, IT grad student] or %)

CMOS arithmetic logic units, high-speed carry chains, fast CMOS multipliers. High-speed performance parallel shifters. CMOS memory cells, array structures, read/write circuits. Design for testability, including scan design and built-in self test. VLSI case studies.
EE 5327. VLSI Design Laboratory. (3 cr; Stdnt Opt. Prereq-[4501, [5234 or &5235], IT grad student or %) Complete design of an integrated circuit. Designs evaluated by computer simulation.

EE 5329. VLSI Digital Signal Processing Systems. (3 cr; Stdnt Opt. Prereq-[5525 or &5233], IT grad student or %) Programmable architectures for signal/media processing. Data-flow representation. Architecture transformations. Low-power design. Architectures for two’s complement/redundant representation, carry-save, and for passive digitized scheduling/allocation for high-level synthesis.

EE 5333. Analog Integrated Circuit Design. (3 cr; Stdnt Opt. Prereq-[3115, IT grad student or %) Fundamental circuits for analog signal processing. Design issues associated with MOS/BJT devices. Design/testing of circuits. Selected topics (e.g., modeling of basic IC components, design of operational amplifier or comparator or analog sampled-data circuits).

EE 5364. Advanced Computer Architecture. (3 cr; Stdnt Opt. Prereq-[4535 or CSci 4203], IT grad student or %) Instruction set architecture, processor microarchitecture. Memory and I/O systems. Interactions between computer software and hardware. Methodologies of computer design.

EE 5371. Computer Systems Performance Measurement and Evaluation. (3 cr; Stdnt Opt. Prereq-[5863, Prereq-[([4546 or 5581] and CSci 4203 or 5201], IT grad student or %) Tools/techniques for analysing computer hardware, software, and system performance. Benchmark programs, measurement tools, performance metrics. Deterministic/probabilistic simulation techniques, random number generation/testing. Bottleneck analysis.

EE 5381. Telecommunications Networks. (3 cr; Stdnt Opt. Prereq-[4501, 5531, IT grad student or %) Fundamental concepts of modern telecommunications networks, mathematical tools required for their performance analysis. Layered network architecture, point-to-point protocols/links, delay models, multiaccess communication/routing.


EE 5561. Image Processing and Applications. (3 cr; Stdnt Opt. Prereq-[4545, 5581, IT grad student or %) Two-dimensional digital filtering/transforms. Application to image enhancement, restoration, compression, and segmentation.

EE 5581. Information Theory and Coding. (3 cr; Stdnt Opt. Prereq-[5551, IT grad student or %) Source/channel models, codes for sources/channels. Entropy, discrete-time information, capacity, rate-distortion functions. Coding theorems.

EE 5583. Error Control Coding. (3 cr; Stdnt Opt. Prereq-[5202, Math 2373 or equiv], IT grad student or %) Error-correcting codes. Concepts, properties, polynomial representation. BCH, Golay, Reed-Muller-Reed-Solomon codes. Convolutional codes. Iterative codes.


EE 5601. Introduction to RF/Microwave Engineering. (3 cr; Stdnt Opt. Prereq-[3501, IT grad student or %) Fundamentals of EM theory and transmission lines concepts. Transmission lines and network analysis. CAD tools. Lumped circuit component designs. Passive circuit components. Connectivity to central communication theme.

EE 5602. RF/Microwave Circuit Design. (3 cr; Stdnt Opt. Prereq-[5501 or equiv], IT grad student or %) Transmission lines, network analysis concepts. CAD tools for passive/active designs. Diode based circuit designs (detectors, frequency multipliers, mixers). Transistor based circuit design (amplifiers, oscillators, mixer/doubler).

EE 5611. Plasma-Aided Manufacturing. (4 cr; A-F or Aud. Prereq-[IT 5501, IT 5531, ME 5532 or equiv, [upper div IT or grad student]]) or %) Manufacturing using plasma processes. Plasma properties as a processing medium. Plasma spraying and microelectronics processing. Process control and system design; industrial speakers. Cross-disciplinary experience between heat transfer design issues and manufacturing technology.

EE 5613. RF/Microwave Circuit Design Laboratory. (2 cr; Stdnt Opt. Prereq-[5501 or &5601], IT grad student or %) Scattering parameters, planar lumped circuits, transmission lines, RF/microwave substrate materials, matching networks/tuning elements, resonators, filters, combiners/dividers, couplers. Integral lab.

EE 5616. Antenna Theory and Design. (3 cr; Stdnt Opt. Prereq-[5501 or &5601], IT grad student or %) Antenna performance parameters, vector potential/radiation integral, wire antenna structures, broadband antenna structures, microstrip/aperture antenna, antenna measurements.


EE 5624. Optical Electronics. (4 cr; Stdnt Opt. Prereq-[5501 or Phys 3002], IT grad student or %) Fundamentals of lasers, including propagation of Gaussian beams, optical resonators, and theory of laser oscillation. Polarization optics, electro-optic, acousto-optic modulation, nonlinear optics, phase conjugation.


EE 5628. Fiber Optics Laboratory. (1 cr; Stdnt Opt. Prereq-[5501 or &5602], IT grad student or %) Experiments in fiber optics. Dielectric waveguides, modes in optical fibers, fiber dispersion/attenuation, properties of light sources/detectors, optical communication systems.

For definitions of course numbers, symbols, and abbreviations, see page 214. 285


EE 5655. Magnetic Recording. (3 cr.; Stdmt Opt. Prereq–IT grad student or %) Magnetic fundamentals, recording materials, idealized models of magnetic recording heads, sinusoidal magnetic recording, digital magnetic recording, magnetic recording heads/media, digital recording systems.


EE 5845. Computer Systems Performance Analysis. (2 cr.; Stdmt Opt. EE 5729 or 5732) or %) Basic performance measurement/simulation techniques necessary for experimental computer science/engineering. Hands-on performance evaluation techniques using simulations/measurements of existing systems. Using measured data to compare computer system workloads against new hardware/software feature improves systems performance.

EE 5940. Special Topics in Electrical Engineering I. (1-4 cr. [max 12 cr.]; Stdmt Opt) Special topics in electrical and computer engineering. Topics vary.

EE 5950. Special Topics in Electrical Engineering II. (1-4 cr. [max 12 cr.]; Stdmt Opt) Special topics in electrical and computer engineering. Topics vary.

EE 5960. Special Topics in Electrical Engineering III. (1-4 cr. [max 12 cr.]; Stdmt Opt) Special topics in electrical and computer engineering. Topics vary.

EE 5970. Special Topics in Electrical Engineering IV. (1-4 cr. [max 12 cr.]; Stdmt Opt. Prereq–EE or CompE grad student or %; only available for Rochester Campus) Special topics in electrical and computer engineering. Topics vary.


EE 8100. Advanced Topics in Electronics. (1-3 cr. [max 12 cr.]; Stdmt Opt. Prereq–%) Topics vary according to needs and staff availability.

EE 8141. Advanced Heterojunction Transistors. (3 cr.; Stdmt Opt. Prereq–EE 5866 or %) Recent developments in device modeling with emphasis on bipolar junction transistors. High-level effects in base and collector regions and their interrelationship.


EE 8190. Electronics Seminar. (1 cr. [max 3 cr.]; S-N or Aud. Prereq–%) Current literature, individual assignments.

EE 8210. System Theory Seminar. (1 cr. [max 3 cr.]; S-N or Aud) Current literature, individual assignments.

EE 8213. Advanced System Theory. (3 cr.; Stdmt Opt. Prereq–IT grad student or %) Generalized linear systems; applications, structural properties, computational approaches, classification, functional behavior, and synthesis.


EE 8230. Control Theory Seminar. (1 cr. [max 3 cr.]; S-N or Aud) Current literature, individual assignments.


EE 8300. Advanced Topics in Computers. (1-3 cr. [max 12 cr.]; Stdmt Opt. Prereq–%) Topics vary according to needs and staff availability.

EE 8310. Advanced Topics in VLSI. (1-3 cr. [max 12 cr.]; Stdmt Opt. Prereq–%) Topics vary according to needs and staff availability.

EE 8320. Advanced Topics in Design Automation. (1-3 cr. [max 12 cr.]; A-F or Aud. Prereq–Grad student or %) State-of-the-art automated design tools for electronic system design. Topics vary.


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

EE 8337. Analog Circuits for Wire/Wireless Communications. (3 cr.; A-F or Aud. Prereq–5533) Basic background, advanced design concepts necessary to design integrated CMOS RF circuits. Emphasizes CMOS and RF. Where appropriate, mention is made of bipolar circuits and applications to other communications areas.

EE 8360. Computer Systems Seminar. (1 cr. [max 3 cr.]; S-N or Aud) Current literature, individual assignments.


EE 8370. Computer Aided Design Seminar. (1 cr. [max 3 cr.]; S-N or Aud. Prereq–EE or CompE + CSCi) grad major or %) Current literature, individual assignments.

EE 8444. FTE: Doctoral. (1 cr.; No grade. Prereq–Doctoral student, adviser and DGS consent)

EE 8500. Seminar: Communications. (1 cr. [max 3 cr.]; S-N or Aud) Current literature, individual assignments.
ENGL 5090. Readings in Special Subjects. (3-4 cr [max 9 cr]; Stdnt Opt. Prereq–Creative writing MFA student or #) General background preparation for advanced study. Diverse selection of literatures written in English, usually bridging national cultures and time periods. Readings specified in Class Schedule.

ENGL 5110. Readings in Middle English Literature and Culture. (3 cr [max 9 cr]; Stdnt Opt. Prereq–Grad student or #) Wide reading in literary period of relevant scholarship/criticism. Topics vary. See Class Schedule.

ENGL 5400. Readings in Post-Colonial Literature. (3 cr [max 9 cr]; Stdnt Opt. =ENGL 5400H, Prereq–Grad student or #) Selected readings in post-colonial literature. Topics specified in Class Schedule.


ENGL 5597. Harlem Renaissance. (3 cr; Stdnt Opt. =AFRO 4597, Prereq–Grad student or #) Multi-disciplinary review of Jazz Age’s Harlem Renaissance: literature, popular culture, visual arts, political journalism, major black/white figures.

ENGL 5630. Theories of Writing and Writing Instruction. (3 cr; Stdnt Opt. Prereq–Grad student or #) Introduction to major theories that inform teaching of writing in college and upper-level high school curriculums. Topics specified in Class Schedule.

ENGL 5711. Introduction to Editing. (4 cr; Stdnt Opt) Editor–writer relationship, manuscript reading, author querying, rewriting, style. Some discussion of copy editing. Students develop editing skills by working on varied writing samples.


ENGL 5992. Directed Readings, Study, or Research. (1-3 cr [max 45 cr]; Stdnt Opt. Prereq–Grad student or #) Sample topics: literature of World War II, writings of the Holocaust, literature of English Civil War, advanced versification.
ENT 8110. Seminar: Medieval Literature and Culture. (3 cr [max 12 cr]; Stdt Opt) Sample topics: Chaucer; “Piers Plowman”; Middle English literature, 1300-1475; medieval literary theory; literature/class in 14th century; texts/histories in late Middle Ages.

ENT 8120. Seminar in Early Modern Literature and Culture. (3 cr [max 12 cr]; A-F or Aud) British writers/topics, from Reformation to French Revolution. In first half of period (which divides at 1640), a typical topic is Spenser and epic tradition; in second half, women historians before Wollstonecraft.


ENT 8180. Seminar in 20th-Century British Literature and Culture. (3 cr [max 12 cr]; A-F or Aud) Sample topics: modernism, Bloomsbury Group, working-class/immigrant literature. Topics specified in Class Schedule.


ENT 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

ENT 8400. Seminar in Post-Colonial Literature, Culture, and Theory. (3 cr [max 12 cr]; Stdt Opt) Sample topics: Marxism and nationalism; modern India; feminism and decolonization; “the Empire Writes Back”; Islam and the West. Topics specified in Class Schedule.

ENT 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

ENT 8510. Studies in Criticism and Theory. (3 cr [max 12 cr]; Stdt Opt) Developments within critical theory that have affected literary criticism, by altering conceptions of its object (“literature”) or by challenging conceptions of critical practice. Topics specified in Class Schedule.

ENT 8520. Seminar: Cultural Theory and Practice. (3 cr [max 12 cr]; Stdt Opt) Sample topics: semiotics applied to perspective paintings, numbers, and money; analysis of a particular set of cultural practices by applying various theories to them. Topics specified in Class Schedule.


ENT 8600. Seminar in Language, Rhetoric, Literacy, and Composition. (3 cr [max 9 cr]; Stdt Opt) Students read/conduct research on theories/literature relevant to cross-disciplinary fields committed to writing and to teaching writing.


ENT 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 4 for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

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

ENT 8992. Directed Reading in Language, Literature, Culture, Rhetoric, Composition, or Creative Writing. (1-9 cr [max 15 cr]; Stdt Opt. Prereq-#, %)

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions


ENT 5321. Ecology of Agricultural Systems. (3 cr; A-F or Aud. +AGRO 5321. Prereq-[[5xxx or above] course in [Agric or AnSc or Hort], [5xxx or above] course in [Ent or PPa or Soil]] or #) Ecological approach to problems in agricultural systems. Formal methodologies of systems inquiry are developed/applied.

ENT 5341. Biological Control of Insects and Weeds. (3-4 cr [max 4 cr]; A-F or Aud. Prereq-5001, Biol 1009, EEB 3001 or grad) Biological control of arthropod pests and weeds. Analysis of relevant ecological theory and case studies; biological control agents. Lab includes natural enemy identification, short experiments, and computer exercises.


ENT 5361. Aquatic Insects. (4 cr; A-F or Aud. Prereq-#) Taxonomy, natural history of aquatic insects including their importance in aquatic ecology, water resource management, recreation, and conservation. Emphasizes family-level identification of immatures/adults. Field trips scheduled to local aquatic habitats. A collection is required.


ENT 5900. Basic Entomology. (1-6 cr [max 12 cr]; Sdstn Opt. Prereq-#) For graduate students who need to make up certain deficiencies in their biological science background.

ENT 5910. Special Problems in Entomology. (1-6 cr [max 10 cr]; Sdstn Opt. Prereq-#) Individual field, lab, or library studies in various aspects of entomology.

ENT 5920. Special Lectures in Entomology. (1-3 cr [max 3 cr]; Sdstn Opt) Lectures or labs in special fields of entomological research. Given by visiting scholar or regular staff member.

ENT 8006. Supervised Laboratory or Extension Teaching Experience. (1-3 cr [max 3 cr]; A-F or Aud. Prereq-5006 or equiv or #) Training/experience conducting lab or extension based educational activities in Entomology. Students select a faculty member to serve as their sponsor, and develop lecture outlines or instructional aids such as Web sites, Web-based training sites, print materials, demonstration aids, and demonstration projects. Students prepare/conduct lab or extension presentations. Overviews of Web-based instructional aids.


ESP 8061. Scientific Communication and Ethics. (1 cr; S-N or Aud) Students develop/use critical elements of scientific communication, within an ethical framework. Elements in writing scientific manuscripts and research proposals. Oral communication for scientific, outreach, and classroom presentations.

ESP 8200. Colloquium in Social Insects. (1-3 cr [max 3 cr]; Sdstn Opt. Prereq-3020 or 3200) Current research on bees, wasps, ants, and termites. Student critiques and research reports.

ESP 8210. Colloquium in Insect Evolution. (1-3 cr [max 3 cr]; Sdstn Opt. Prereq-5371 or #) Research issues in systematics and evolution. Comparative biology, biogeography, and molecular evolution. Students may re-enroll as topics alternate. Students critique papers from primary literature.

ESP 8240. Colloquium in Insect Ecology. (1 cr; max 2 cr; Sdstn Opt. Prereq-5041 or 5045 or #) Advanced topics.

ESP 8300. Graduate Seminar. (1 cr; S-N or Aud. Prereq-#) Oral and written reports on and discussion by students of selected topics from current literature.

ESP 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent) Directed research.

ESP 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

ESP 8594. Research in Entomology. (1-16 cr [max 36 cr]; S-N or Aud) Directed research.

ESP 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade) Prereq-Doctoral-student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

ESP 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])

ESP 8888. Thesis Credit: Doctoral. (0-24 cr) Max 100 cr; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

Environmental Sciences, Policy, and Management (ESPM)

Division of Environmental Sciences, Policy, and Management

College of Food, Agriculture and Natural Resource Sciences

ESP 5001. Treaty Rights and Natural Resources. (3 cr; A-F or Aud. =ESPM 5001. Prereq-Grad student or #)

Readings, class discussion about treaty rights reserved by indigenous Americans with respect to use of natural resources. Emphasizes Midwest issues. Web-assisted course.


ESP 5021. Ecological Vegetation Management: a Consulting Approach. (3 cr; Sdstn Opt. +ESPM 5021. Prereq-Grad student or #) Application of ecological concepts such as succession/competition to ecosystems under management. Wetlands, riparian zones, urban interfaces, agriculture, agroforestry, Northern/boreal conifer, hardwood forests, grasslands (prairie). Management objectives, methods, impacts. Evaluating practices for sustainability. Social issues. Regional (Great Lakes area), national, global case studies.

ESP 5031. Applied Global Positioning Systems for Geographic Information Systems. (3 cr; A-F or Aud. =ESPM 5031. Prereq-Grad student or #) GPS principles, operations, techniques to improve accuracy. Datum, projections, and coordinate systems. Differential correction, accuracy assessments discussed/applied in lab exercises. Code/carrier phase GPS used in exercises. GPS handheld units, PDA based ArcPad/GPS equipment. Transferring field data to/from desktop systems, integrating GPS data with GIS.

ESP 5061. Water Quality and Natural Resources. (3 cr; Sdstn Opt. Prereq-Grad student or #) Recent literature in field. Complements 4061. Ecology of aquatic ecosystems, how they are valuable to society and changed by landscape management. Case studies, impaired waters, TMDL process, student engagement in simulating water quality decision making.

ESP 5101. Conservation of Plant Biodiversity. (3 cr; A-F or Aud. =ESPM 5101. Prereq-Grad student or #) Introduction to principles underlying assessment/conservation of plant biodiversity at individual, population, and community levels. Case studies in management of biodiversity to restore or maintain ecosystem function. Genetics, timber harvesting, invasive species, plant reproduction.

ESPM 5111. Hydrology and Water Quality Field Methods. (3 cr; A-F or Aud. =ESPM 3111). Prereq-Grad student or #)

ESPM 5131. Environmental Biophysics and Ecology. (3 cr; A-F or Aud. Prereq-[[Biol 1009 or equivalent], Math 2171, Phys 1101, [upper div or grad student]] or #)
Basic concepts of environmental variables such as temperature, humidity, wind, and radiation. Mechanics of heat/mass transfer between a living organism and its surrounding environment. Set of practical examples to integrate concepts and transport processes.

ESPM 5202. Environmental Conflict Management, Leadership, and Planning. (3 cr; A-F or Aud. =ESPM 3202W). Prereq-Grad or #)
Negotiation of natural resource management issues. Use of collaborative planning. Case study approach to conflict management, strategic planning, and building leadership qualities. Emphasizes analytical concepts, techniques, skills.

ESPM 5207. Natural Resource-based Sustainable Development in Costa Rica. (3 cr; Stdt Opt. =ESPM 3207, Prereq-Grad student, #)
Field trips. From conventional to organic bird-friendly coffee production/marketing. Sustainable management of high-/low-/tropical forests and of biodiversity. Lectures, seminars, labs, field work, written project.

ESPM 5211. Survey, Measurement, and Modeling for Environmental Analysis. (3 cr; Stdt Opt. =ESPM 3211). Prereq-Grad student or #)
Introduction to survey, measurement, and modeling concepts/methods for study of natural resources and environmental issues. Emphasizes survey design for data collection, estimation, and analysis for issues encompassing land, water, air, vegetation, animal, soil, and human/social variables.

ESPM 5241. Natural Resource and Environmental Policy: History, Creation, and Implementation. (3 cr; Stdt Opt. =ESPM 3241W). Prereq-Grad or #)
Basic concepts of political/administrative processes involved in natural resource policy and program development. Case study approach to policy/legislative process, participants in policy development, and public programs. Federal/state laws/regulations, international issues.

ESPM 5242. Methods for Natural Resource and Environmental Policy. (3 cr; A-F or Aud. =ESPM 4242). Prereq-[3241 or equiv], [3261 or equiv], [sr or grad student])
Methods, formal and informal, for analyzing environmental/natural resource policies. How to critically evaluate environmental/natural resource policies using economic/non-economic decision-making criteria. Application of policy analysis principles/concepts to environmental/natural resource problems. Recognizing politically-charged environment in which decisions over use, management, and protection of these resources often occur.

ESPM 5245. Sustainable Land Use Planning and Policy. (3 cr; A-F or Aud. =ESPM 3245). Prereq-Grad student or #)
Overview of policies that affect recreation at local, state, and federal levels. Landscape-level planning. Collaborative relationships as means to implement sustainable/social policy. Class project involving all aspects of implementing recreation policy, from public meetings to hands-on evaluation of options.

ESPM 5251. Natural Resources in Sustainable International Development. (3 cr; A-F or Aud. =ESPM 3251, LAS 3251, Prereq-Grad student or #)
International perspectives on resource use in developing countries. Integration of natural resource issues with social, economic, and policy considerations. Agriculture, forestry, agroforestry, non-timber forest products, water resources, certification, development issues. Latin American case studies.

ESPM 5256. Natural Resource Law and the Management of Public Lands and Waters. (3 cr; A-F or Aud. =ESPM 4256). Prereq-[3241, sr or grad student])

ESPM 5261. Economics and Natural Resources Management. (4 cr; A-F or Aud. =ESPM 3261). Prereq-Grad student or #)

ESPM 5295. GIS in Environmental Science and Management. (4 cr; A-F or Aud. Prereq-Grad student or #)
Application of spatial data inventory/analysis in complex environmental planning problems. Spatial data collection, GIS/database development methods, including GPS, DLG, TIGER, NWI data, and spatial analysis. Topics identified by non-University partners.


ESPM 5480. Topics in Natural Resources. (1-4 cr; max 6 cr; Stdt Opt. Prereq-Sr or grad student) Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule.

ESPM 5482. Biosafety Science and Policy. (3 cr; Stdt Opt)
Science/policy for governing environmental/health safety of genetic engineering through Minnesota, national, and international cases.


ESPM 5555. Wetland Soils. (3 cr; A-F or Aud. =SOIL 5555. Prereq-1125 or 2125 or equiv or #; 4451 recommended)
Morphology, chemistry, hydrology, formation of mineral/organic soils in wet environments. Soil morphological indicators of wet conditions, field techniques of identifying hydric soils for wetland delineation. Pump ponds. Wetland benefits, preservation, regulation, mitigation. Field trips, lab, field hydric soil delineation project.

ESPM 5575. Wetlands Conservation. (3 cr; Stdt Opt. =ESPM 3575). Prereq-#; sr or grad student or #)


ESPM 5602. Regulations and Corporate Environmental Management. (3 cr; A-F only. =ESPM 3602, MGMT 3602). Prereq-APEC 1101 or ECON 1101) Concepts, major issues relating to industrial ecology and industry as they are influenced by current standards/controls at local, state, and national levels.

ESPM 5603. Environmental Life Cycle Analysis. (3 cr; A-F only. Prereq-[Math 1142 or [Math 1271, Math 1282]], [Econ 1101 or ApEc 1101]) Concepts, major issues relating to inventory and subsequent analysis of production systems. Production system from holistic point of view, using term commonly used in industrial ecology: “the metabolic system.”

ESPM 5604. Environmental Management Systems and Strategy. (3 cr; A-F only. =ESPM 3604) Environmental problems such as climate change, ozone depletion, and loss of biodiversity.


ESPM 5606. Pollution Prevention: Principles, Technologies, and Practices. (3 cr; A-F only. =ESPM 3606. Prereq-CHM 1001 or #)
Implementing a pollution prevention project, e.g., cleaner production, design for the environment, life-cycle management. Ways industries can reduce their industrial emissions/costs by preventing pollution.

ESPM 5607. Industrial Biotechnology and the Environment. (3 cr; A-F only. =ESPM 4607. Prereq-BIOL 1009, CHEM 2121, grad student) Biotechnology pertaining to biobased products development and their environmental impact.

ESPM 5608. Bioremediation. (2 cr; A-F only. =ESPM 4608. Prereq-[BIOL 1001 or BIOL 1009, CHEM 1011]) Use of organisms in remediation of waste/pollution problems related to biobased product industries. Types, characteristics, and identification of useful microorganisms. Applications of microbes to benefit industrial processes of wood/fiber.

ESPM 5703. Agroforestry in Watershed Management. (3 cr; Stdt Opt. =ESPM 3703). Prereq-Grad student or #)
Biological, physical, and environmental attributes of agroforestry as pertains to watershed management. Coupling production with watershed protection benefits. Implications for policy, economics, and human dimensions in sustainable development. Examples/case studies from North America and developing countries.
Course Descriptions


Experimental and Clinical Pharmacology (ECP)

College of Pharmacy

ECP 5610. Pharmacoepidemiology. (2 cr; Stdnt Opt. Prereq-PubH 5320, PubH 5330 or #) Application of epidemiologic principles to study, use, and beneficial/adverse outcomes of drugs in human populations.

ECP 5620. Drug Metabolism and Disposition. (3 cr; A-F or Aud. Prereq-Grad student or #) 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. Components used to predict in vivo drug disposition from in vivo studies.

ECP 8100. Seminar. (1 cr [max 8 cr]; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Selected topics in experimental and clinical pharmacology.

ECP 8200. Research Problems. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq-Grad SACP major in ECP Track or #) Individually designed research experience directed at contemporary problems related to drug use.

ECP 8210. Clinical Therapeutics. (3 cr; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Topics in clinical pharmacology that illustrate continuum of pathophysiology of a disease state; its contemporary treatment, problems or controversial issues with treatment approaches, strategies to advance therapy. Lectures, readings.

ECP 8220. Experimental and Clinical Pharmacology. (3 cr; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Theory/application of contemporary methods for analysis of concentration-time data and exposure-response relationships.

ECP 8400. Pharmacometrics. (3 cr; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Theory/application of contemporary methods for analysis of concentration-time data and exposure-response relationships.

ECP 8410. Population Pharmacokinetic Modeling. (2 cr; A-F or Aud) Theoretical background for using mixed effects model in population analysis. Building fixed/random effects into a pharmacostatistical model. Project allows students to become familiar with a contemporary population pharmacokinetic analysis program.

ECP 8420. Clinical Trial Simulation. (2 cr; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Theory/application of contemporary methods of using simulations to design more efficient/informative clinical trials.

ECP 8430. Advances in Pharmacometrics Modeling and Simulation. (1 cr [max 6 cr]; S-N only. Prereq-Grad student in ECP or PHM or #) Modeling/simulation at interface between physiological/pharmacological processes. Current literature, discussion groups. Computer applications using relevant software programs.

ECP 8900. Advanced Topics in Experimental and Clinical Pharmacology. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Topic varies depending on faculty teaching course.

ECP 8992. Directed Readings in Experimental and Clinical Pharmacology. (1-2 cr [max 4 cr]; Stdnt Opt)

ECP 8993. Directed Study in Experimental and Clinical Pharmacology. (1-4 cr [max 4 cr]; Stdnt Opt)

Family Medicine and Community Health (FMCH)

Medical School

FMCH 5201. Clinical Family Medicine. (12 cr [max 108 cr]; No grade. Prereq-Family practice resident or #) Supervised care for patients of all ages on a continuous, primary, preventive, and general diagnostic basis. Diagnosis, methods of treatment, and problem-solving devices for benefit of patient and family, emphasizing health hazard appraisal. New and refined methods of recording, documentation, and retrieval of clinical data.

FMCH 5345. Curriculum Design and Teaching Strategies for Medical Education I. (3 cr; A-F or Aud. Prereq-concurrent enrollment in 5346, #) Identifying/developing course goals. Developing course, teacher, learner evaluations. Students must also take 5346, which follows immediately after 5345.

FMCH 5346. Curriculum Design and Teaching Strategies for Medical Education II. (1 cr; A-F or Aud. Prereq-5345, #) Taken with 5345. Practicum of lecture, demonstration, small-group discussion, clinical teaching, and computer-assisted instruction. Academic ethics, policies, copyright issues, tenure, academic freedom, problem-based learning.

FMCH 5564. Family Practice Seminar. (1 cr [max 9 cr]; O-N or Aud. Prereq-MD or DO degree) Knowledge, skills, and attitudes in biomedical and behavioral sciences that form foundation for academic discipline of family medicine; medical decision making, common problems and procedures, family theory and assessment, clinical pharmacy, human sexuality.

FMCH 5565. Principles of Geriatrics I. (1 cr [max 5 cr]; P-N or Aud. Prereq-Medical School or dental school or GNP School graduate) First in two-course sequence. Survey of major topics in geriatric medicine. Epidemiology, etiology, diagnosis, and treatment of major geriatric syndromes and illnesses.

FMCH 5566. Principles of Geriatrics II. (1 cr [max 5 cr]; P-N or Aud. Prereq-Medical School or dental school or GNP school graduate) Second in two-course sequence. Survey of major topics in geriatric medicine. Epidemiology, etiology, diagnosis, and treatment of major geriatric syndromes and illnesses.

FMCH 5950. Clinical Issues in Human Sexuality. (2 cr; O-N or Aud. Prereq-Enrollment in health sci grad programs in CSPP, Psy, PubH, SW or FSOS or #) Assessment and treatment techniques pertaining to common sexual problems.

FMCH 5955. Directed Study. (1-10 cr [max 10 cr]; O-N or Aud. Prereq-#; qualified students may arrange for work on a tutorial basis) Studies on special topics as arranged between student and faculty.

FMCH 5960. Basic Research Methods in Family Practice. (3 cr; A-F or Aud. Prereq-Post-MD fellow, #) History and current status of research in family medicine, research resources available in the department. How to ask/define a research question, conduct a literature search, select a research methodology, meet federal requirements for protection of human subjects in research, critically read the medical literature and facilitate its discussion, and prepare a grant proposal.

FMCH 5961. Family Medicine Fellows and Junior Faculty Integration Seminar. (1-9 cr [max 2 cr]; A-F or Aud. Prereq-#; Family medicine faculty or fellow, #) Preparation for roles in academia. Achieving success as a clinical investigator. Funding opportunities, authorship, collaboration, publishing, grant preparation.

Family Policy Minor (FPOL)

Department of Family Social Science

College of Education and Human Development

FPOL 8000. Family Policy Perspectives. (3 cr; A-F or Aud) Policies that effect families, from perspective of several academic disciplines. Faculty from academic units across the University teach theory/policy analysis skills from their disciplines. How to analyze public/private policies for their impact on families. Advocacy. Current policy making activities at the legislature, county boards, and other public sector policymaking bodies.

Family Social Science (FSOS)

Department of Family Social Science

College of Education and Human Development

FSOS 5014. Quantitative Family Research Methods I. (3 cr; Stdnt Opt. Prereq-Grad student or #) Family research methods, issues associated with multiple levels of analysis. Conducting family-focused data analyses using basic/intermediate methods (through ANOVA and multiple regression), including power analysis. Ethical issues involved in family research such as IRB/HIPAA regulations.

FSOS 5015. Family Research Laboratory. (1 cr; S-N or Aud. Prereq-Grad student or #) Application of basic family research methods into experiential learning using statistical software. Analyses that correspond with problem situations in 5014 and that involve secondary data analyses. Using statistical software for basic family research. Preparation to work with quantitative family data sets.

FSOS 5032. Family Systems Theories and Interventions. (3 cr; Stdnt Opt. Prereq-Grad student or #) Systemic/cybernetic frameworks as they apply to diverse families. Thinking systemically about families across multiple ecological systems. How to identify crucial epistemological issues in theoretical/applied areas of family science. Theoretical frameworks. Experiential role-playing, guest presenters, videos, field work, research projects, reading clubs, class discussion.
FSOS 101. Family Systems. (3 cr; S-N or Aud. Prereq—Soc Work 200, or equiv, or #; 2 or more stat courses) or (1-2 cr [max 12 cr]; Stdnt Opt. Prereq—#; WCFE 206 recommended) Critical examination of research studies. Targeted class discussion.

FSOS 103. Family Communication. (3 cr; S-N or Aud. Prereq—Soc Work 200, or equiv, or #; 2 or more stat courses) or (1-2 cr [max 12 cr]; Stdnt Opt. Prereq—#; WCFE 206 recommended) Critical examination of research studies. Targeted class discussion.

FSOS 104. Research Methods in Family Social Science. (3 cr; S-N or Aud. Prereq—Soc Work 200, or equiv, or #; 2 or more stat courses) or (1-2 cr [max 12 cr]; Stdnt Opt. Prereq—#; WCFE 206 recommended) Critical examination of research studies. Targeted class discussion.

FSOS 201. Family Communication. (3 cr; S-N or Aud. Prereq—Soc Work 200, or equiv, or #; 2 or more stat courses) or (1-2 cr [max 12 cr]; Stdnt Opt. Prereq—#; WCFE 206 recommended) Critical examination of research studies. Targeted class discussion.


FSOS 2426. Alcohol and Drugs: Families and Culture. (3 cr; Stdnt Opt. +FSOS 3426) Overview of alcohol and drug abuse in the context of family and culture.


FSOS 8001. Conceptual Frameworks in the Family. (3 cr; Stdnt Opt. Prereq—Family course or #) Major theoretical models about families, emphasizing sociocultural historical context.

FSOS 8003. Current Issues in Family Science. (3 cr; S-N or Aud. Prereq—FSOS 8001, or equiv) Content, theories, and methodologies in family science. Emphasizes findings of recent emerging areas of research. Readings covering a wide range of topics. Critical examination of research studies. Targeted class discussion.

FSOS 8005. Multicultural Issues in Family Social Science. (3 cr; S-N or Aud. Prereq—FSOS 8001, or equiv) Multicultural perspectives of individuals representing various ethnicities, socio-economic levels, religions, and sexual orientations.

FSOS 8007. Ethical Issues and Moral Dilemmas in Family Life. (3 cr; Stdnt Opt) Multidisciplinary perspectives of ethics, social norms, family law, family policy, family economics, and family decision-making. Focuses on differing perspectives of individuals representing various ethnicities, socio-economic levels, religions, and sexual orientations.

FSOS 8013. Qualitative Family Research Methods. (3 cr; S-N or Aud. Prereq—FSOS 8001, or equiv) Approaches to qualitative family research evaluation. Phenomenological, feminist, grounded theory, content analytic, ethnomet hodological, ethnographic, program evaluation. Theory, research examples, student projects.

FSOS 8014. Quantitative Family Research Methods II. (3 cr; Stdnt Opt. Prereq—[Soc Work 200 or equiv] or [two stat courses] or #) Quantitative research process, from developing a research question to putting findings to use. Major course project (development of a federally fundable research grant application) is basis for class discussion. Focuses on family research. Applying research knowledge to study of families.

FSOS 8031. Family of Origin. (3 cr; S-N or Aud. Prereq—Preference given to marriage and family therapy students) In-depth study of each family’s complexity and processes relevant to family life. Diversity issues related to gender, sexuality, orientation, and disability. Issues related to divorce, single parenthood, and remarriage are covered. Family strengths and family problems are integrated.

FSOS 8033. Problems in Families. (3 cr; Stdnt Opt. Prereq—#) Family therapy assessment/treatment approaches to problems such as depression, alcoholism, and sexual abuse, and to challenges of varying family structures, such as single-parent/remarried families.

FSOS 8034. Marriage and Family Therapy Supervision. (3 cr; Stdnt Opt. Prereq—# or #) Theories of supervision, structures for supervision, methods of supervision, evaluation process, legal/ethical issues. Therapist-client-supervisor relationships, potential problems, contextual issues.

FSOS 8035. Assessment of Couples and Families. (3 cr; A-F or Aud. Prereq—# or #) Issues in research and clinical assessment. Assumptions and values underlying assessment approaches and techniques discussed, evaluated, and administered. Ethical, legal, and practical issues.

FSOS 8036. Couple and Family Therapy Research. (3 cr; A-F or Aud. Prereq—#) Strengths and limitations of current couple and family outcome research, including qualitative and quantitative.

FSOS 8037. Ethical, Legal, and Professional Issues in Mental Health Practice: Issues with Couples and Families. (2-10 cr [max 10 cr]; A-F or Aud. Prereq—#) Theories and concepts in mental health practice that has completed 1 course on therapy with children) Boundaries and triangles, gender inequities, family law, confidentiality and reporting requirements, dual roles, client diversity, and values.

FSOS 8039. Clinical Interventions for Couples. (3 cr; A-F or Aud. Prereq—# or #) Interventions into problems faced by couples at various ages and stages of their relationship. Developing and implementing effective strategies for problem solving, relationship maintenance, and partner growth, including integration of sex therapy into ongoing couple therapy.

FSOS 8043. Family Therapy Development: A Systemic Perspective. (3 cr; Stdnt Opt. Prereq—# or #) Concepts and principles of systems and ecosystems and their applications in family science; emphasizes theoretical integration and development of research models with appropriate methodologies.

FSOS 8047. Integrative Research Seminar. (3 cr; Stdnt Opt. Prereq—# or #) For advanced doctoral students primarily in family social science who are working on independent research projects and who have completed a seminar in constructive criticism and support in integrating theories, methods, and applications in order to create a totality that is logically coherent and conceptually and methodologically sound.

FSOS 8061. Family Stress, Coping, and Adaptation. (3 cr; Stdnt Opt. Prereq—# or # or #) Helping families become more resilient to stress by decreasing vulnerability to crises and traumatic stress disorders. Students develop research project or intervention proposal on family stress, coping, adaptation, crisis, trauma, or resilience.

FSOS 8104. Family Policy Seminar. (3 cr; Stdnt Opt) Distinguishing family policy research from other family research. Conceptual frameworks, methods, and roles family policy research can play in policy-making and knowledge-building processes.

FSOS 8105. Family Gerontology. (3 cr; Stdnt Opt. Prereq—# or #) Integrates gerontology and family studies; new lines of inquiry, qualitative and quantitative, into aging families. Family gerontological research, family relationships, family and long-term care institutions, theoretical frameworks and research methods, and research and interventions.


FSOS 8107. Family Values Research: Theories and Critical Methods. (3 cr; Stdnt Opt. Prereq—# or # or #) Critical methods. Social policies and family economic well-being. For advanced students.

FSOS 8108. Directed Study in Community-Based Research. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq—#) Special seminars on timely topics.

FSOS 8109. Directed Study in Community-Based Research. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq—#) Special seminars on timely topics.

FSOS 8135. Directed Study in Community-Based Research. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq—#) Special seminars on timely topics.

FSOS 8150. Topics in Family Social Science. (1-6 cr [max 6 cr]; A-F only. Prereq—FSOS grad student or #) Special seminars on timely topics.

FSOS 8160. Topics in Marriage and Family Therapy. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq—#) Special seminars on timely topics.


FSOS 8200. Orientation for Family Social Science. (1 cr; S-N or Aud. Prereq—#) Under faculty supervision, students teach an undergraduate course in family social science for which they have appropriate academic preparation and professional experience.

FSOS 8275. Clinical Consultation with Couples and Families. (3 cr; S-N or Aud. Prereq—#) Required for grad FSOS majors in marriage and family therapy prog.

FSOS 8295. Family Therapy Practicum. (1-12 cr [max 12 cr]; S-N or Aud. Prereq—#) Special seminars on timely topics.

FSOS 8296. Family Therapy Internship. (1-21 cr [max 21 cr]; S-N or Aud. Prereq—#) Full-time clinical placement doing marriage and family therapy in a community setting.
Analyzing continuous-time models.


FINA 8890. Seminar: Finance Topics. (2 cr; Stdnt Opt. Prereq-[8802, 8812, 8822, 8823] or equiv.) Problems or developments of special interest to the student.

FINA 8892. Independent Study in Finance. (1-8 cr; Stdnt Opt. Prereq-Business admin PhD student or #) Problems or developments of special interest to the student.

FINA 8894. Directed Research in Finance. (1-8 cr; Stdnt Opt. Prereq-Business admin PhD student specializing in finance or #) Individualized directed research on a project of interest to the student, approved and advised by faculty.

**Finance (FINA)**

**Department of Finance**

Curtis L. Carlson School of Management

**Financial Mathematics (FM)**

School of Mathematics

**Institute of Technology**


FM 5011. Mathematical Background for Finance I. (4 cr; Stdnt Opt. Prereq-[5001, 5002] with grade of at least B or [MFM program director approval, grad MFM major]) Mathematics needed for MFM program. Focuses on finance.


FM 5021. Mathematical Theory Applied to Finance I. (4 cr; Stdnt Opt. Prereq-[5011 or &5011], grad MFM major, program director approval) Bridge between theory and application.

**Finnish (FIN)**

**College of Liberal Arts**

FIN 5670. Topics in Finnish Studies. (3 cr; Stdnt Opt) Interdisciplinary social science topics on Finnish people, culture, and society. Taught in English.

**Fisheries and Wildlife (FW)**

**Department of Fisheries, Wildlife, and Conservation Biology**

College of Food, Agricultural and Natural Resource Sciences


FW 5292. Special Lectures: Fisheries. (1-5 cr; Stdnt Opt. Prereq-[FW 4292, Prereq-Grad student or #) Lectures in special fields of fisheries given by visiting scholar or regular staff member.

FW 5392. Special Lectures: Wildlife. (1-5 cr; Stdnt Opt. Prereq-[FW 4392, Prereq-Grad student or #) Lectures in special fields of fisheries given by visiting scholar or regular staff member.
FW 5401. Fish Physiology and Behavior. (3 cr; Stdnt Opt. Prereq.–[3156 or 5156], grad student or #) Introduction to of major themes of modern comparative physiology. Focuses on how they interface with study of fish behavior.

FW 5411. Aquatic Toxicology. (3 cr; Stdnt Opt. Prereq–Intro chem, intro ecol, #) Pollution assessment approaches, biological effects, fate/flow of contaminants in aquatic systems, major types of pollutants.

FW 5455. Sustainable Aquaculture. (3 cr; Stdnt Opt. Prereq–[Intro biology, intro chemistry] or #) How aquaculture affects the environment and human well-being in Minnesota and world-wide. Role of aquaculture as world’s fastest growing food sector and in hatcheries to support fishing and rebuild endangered species. Organic aquaculture, other innovations.


FW 5601. Fisheries Population Analysis. (3 cr; A-F or Aud. Prereq.–[4001 or Stat 5021], Biol 3407, [Math 1142 or Math 1271]) Introduction to theory/methods for estimating vital statistics of fish populations. Using microcomputer/statistical software to describe, analyze, model attributes of fish populations. Case studies from literature of marine/freshwater fisheries management.

FW 5603W. Habitats and Regulation of Wildlife. (3 cr; A-F or Aud. Prereq–Bio 3407) Environmental interactions of wildlife at population/community levels. Environmental threats from human activities. Habitat management practices. Objectives, policies, regulations in population management.


FW 5625. Wildlife Handling and Immobilization for Research and Management. (2 cr; S-N or Aud. Prereq–General biology, [grad student or vet med student or FW sr]) Practical techniques to maximize human/animal safety and to improve effective operations. Preparation procedures, legal responsibilities, capture drugs/delivery systems, safety measures, ethical issues, basic veterinary procedures for handling wildlife. Field course. Uses live animals.

FW 8200. Seminar. (1-4 cr [max 8 cr]; S-N or Aud) Oral and written student reports on selected topics from current literature in fisheries biology and management and wildlife. Lectures by and discussions with faculty and visiting specialists.

FW 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent) Directed research.

FW 8394. Research in Fisheries. (1-4 cr [max 4 cr]; Stdnt Opt) Directed research.

FW 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent) Directed research.

FW 8448. Fishery Science. (3 cr; Stdnt Opt. Prereq–Grad student [in fisheries or wildlife conserv or conserv biol or ecology] or #) Applying ecological theory to study/manipulation of fish populations. Dynamics of growth, mortality, and yield of fish stocks. Field assessment methodology. Simulation applied to management problems. Web-assisted projects. Students produce a publishable (print or electronic) project.

FW 8450. Data Analysis. (4 cr; A-F or Aud. Prereq–5xxx statistics course) Advanced statistical methods are used to teach exploration/analysis of univariate/multivariate data. Descriptive statistics, estimation and inference, regression and smoothing, multivariate techniques, resampling.

FW 8452. Conservation Biology. (3 cr; A-F or Aud) Seminar examining population- to system-level biological issues (genetics; demographic processes; community, ecosystem, and landscape scale interaction; restoration ecology; ex situ strategies for restoration and recovery) and societal issues (social, economic, cultural perspectives; sustainable development strategies; roles of institutions; international and U.S. policies).

FW 8459. Stream and River Ecology. (3 cr; Stdnt Opt. Prereq–Limnology course or #) Structure/dynamics of running waters from ecosystem perspective. Historical perspective, basic hydrology/fluvial geomorphology, terrestrial-aquatic interactions, detrital dynamics, metabolism, drift, trophic relations, biotic/abiotic interactions, ecosystem experiments and natural alterations, stability/succession, ecosystem dynamics in a watershed.

FW 8461. Advanced Topics in Fish Physiology. (3 cr; Stdnt Opt. Prereq–Vertebrate physiology course or #) Lectures, discussion, current literature. Complements 5459.

FW 8462. Advanced Topics in Fish Behavior. (1 cr; Stdnt Opt. Prereq–5459 or behavior course or #) Current literature. Complements 5459.

FW 8465. Fish Habitats and Restoration. (3 cr; Stdnt Opt. Prereq–Intro ecology course or #) Mechanisms underlying physiology/behavior that shape fish community structure in specific north temperate habitats. Techniques and planning procedures for restoring lakes/stream.


FW 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

FW 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr totally required [Plan A only])

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

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

FSCN 8318. Current Issues in Food Science. (2 cr [max 4 cr]; A-F or Aud. Prereq-4111, 4121, %) Current issues, how they impact food industry.

FSCN 8330. Advanced Topics in Food Science. (1-3 cr [max 6 cr]; Stdnt Opt) Recent research or special topics.

FSCN 8330. Research Topics. (1 cr [max 6 cr]; Stdnt Opt) Seminar in which faculty member or group of faculty/graduate students discuss research projects, review/discuss current research literature.


FSCN 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

FSCN 8334. Reaction Kinetics of Food Deterioration. (2 cr; Stdnt Opt. Prereq-Chem 3501) Basis for use of applied chemical kinetics to deteriorative reactions occurring in processing and storage of foods and drugs. Systems include enzymatic reactions, lipid oxidation, nonenzymatic browning, acid base catalysis, and microbial growth and death. Application of these kinetics to study of accelerated shelf-life testing of foods, drugs, and biologies.


FSCN 8391. Independent Study: Food Science. (1-4 cr [max 6 cr]; Stdnt Opt. Prereq-#) Includes written reports.

FSCN 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

FSCN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

FSCN 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])

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

Foreign Study—SPAN (FSSP)

College of Liberal Arts
FSSP 5960. Preparatory Seminar for SPAN Overseas Research. (4 cr; A-F or Aud. FSSP 5960. Prereq-%) Preparatory seminar for SPAN overseas research.

FSSP 5970. Seminar for SPAN Overseas Research. (4 cr; A-F or Aud. FSSP 5970. Prereq-%) Seminar for SPAN overseas research.

FSSP 5980. Seminar for SPAN Overseas Research. (1-4 cr [max 4 cr]; A-F or Aud. FSSP 5970. FSSP 5970. Prereq-%)

Forest Resources (FR)

Department of Forest Resources
College of Food, Agricultural and Natural Resource Sciences
FR 5104. Forest Ecology. (4 cr; A-F or Aud. FR 5104. Prereq-[[Biol 1001 or 1009], grad student] or # 1 semester college chemistry recommended) Form/function of forests as ecological systems. Characteristics/dynamics of species, populations, communities, landscapes, and ecosystem processes. Examples applying ecology to forest management. Weekly discussions on research topics, exercises, current issues in forest resource management. Required weekend field trip.

FR 5105. Forest Ecosystem Health and Management. (3 cr; A-F or Aud. F R 5105. Prereq-5104 or Biol 3407 or EE 3001 or equiv) Principles of forest ecosystem health and its management applied to areas ranging from wilderness to urban forest, and forest allocations.


FR 5118. Trees: Structure and Function. (3 cr; A-F or Aud. FR 5118. Prereq-Grad student or #) Introduction to forest ecosystems. How physical factors affect ecological processes and management decisions.

FR 5131. Geographical Information Systems (GIS) for Natural Resources. (4 cr; A-F or Aud. FR 5131. Prereq-Grad student or #) Introduction to GIS. Focuses on natural resources. Data structures, sources, collection, and quality. Lab exercises introduce geodesy, map projections, spatial analyses, and cartographic modeling.

FR 5142. Tropical Forest Ecology. (3 cr; Stdnt Opt. Prereq-3xx xy ecology course) Ecological principles related to form, function, and development of wet/dry tropical forests at organismal, community, and ecosystem scales. Ecophysiology, succession, productivity, biodiversity, sustainability, agroforestry, social forestry, and management alternatives. Natural distribution of forest types. Causes, consequences, and extent of deforestation.


FR 5153. Forest and Wetland Hydrology. (3 cr; Stdnt Opt. Prereq-Basic hydrology course, [upper div or grad student]] or #) Current topics, methods/models in forest/wetland hydrology. Hydrologic role of forests, wetlands, riparian systems, snowfall/rainfall regimes. How activities such as deforestation, wetland drainage, and stream channel alterations, affect hydrologic response of watersheds. Runoff/streamflow response from undisturbed/ altered forest/wetland watersheds. Problem-solving exercises.

FR 5161. Northern Forest Field Course. (2 cr; A-F or Aud. Prereq-#)

Field identification of common trees, shrubs, and nonwoody vascular plants. Plant communities, soil site relationships, wildlife values. Natural history of northern/boreal forests in terms of soils, ecological characteristics of trees, community-environmental relationships, stand development, succession, and regeneration ecology. Land survey, tree/forest stand measurement, forest sampling techniques. Taught at Cloquet Forestry Center.

FR 5203. Forest Fire and Disturbance Ecology. (3 cr; A-F or Aud. FR 5203. Prereq-[Grad student or #], course fee) Ecology, history, management, and control of fire, wind, insect infestation, browsing, and other disturbances in forests. Disturbance regimes of boreal, northern hardwood, and other major forest types of North America. Influence of disturbance on wildlife habitat, urban/wildland interfaces, forest management, and stand/landscape dynamics. Guest speakers on fire organization, training, and operations. Two-day field trip.


Course Descriptions

FREN 5502. Structure of French: Morphology and Syntax. (3 cr; Stdnt Opt. + FREN 5501 or #) Linguistic study of contemporary French word forms (inflectional and derivational morphology); introduction to French syntax (linguistic study of grammar) and characteristic syntactic constructions.

FREN 5531. Sociolinguistics of French. (3 cr; Stdnt Opt. + FREN 3531. Prereq = 3531, Ling 3001 or 5001, grad) Explores variation in the use of French associated with factors such as medium (oral/written), style (formal/informal), region, social and economic groups.

FREN 5541. Oral Discourse of French. (3 cr; Stdnt Opt. Prereq–3015, grad student, Ling 5001 recommended) Nature of contemporary spoken French discourse. Focuses on spontaneous, multi-speaker discourse. Readings include examples of various linguistic approaches to such discourse. Emphasizes syntactic analysis. Phonological/lexical particularities. ‘Macro’ level analyses such as discourse analysis and conversation analysis.

FREN 5995. Directed Teaching. (1-6 cr) [max 24 cr]; S-N or Aud. Prereq–#) Directed teaching.

FREN 8110. Topics in Early Medieval French Literature. (3 cr [max 9 cr]; Stdnt Opt) Introduction to epic, romance, allegory, and theater in Old French readings (12th-13th centuries). Specific topics/texts studied vary. Taught in French.

FREN 8111. Introduction to Old French. (3 cr; Stdnt Opt) Studies in medieval French: instruction in reading Old French, sources of bibliography, and topics in medieval studies (language and literature). Taught in French.

FREN 8114. Old Provençal Language and Literature. (3 cr; Stdnt Opt) Language and literature of Old Occitan (Old Provençal), chiefly troubadours’ poems. Some language instruction, reading of poems and other works, and consideration of nature and origins of “courty love.” Knowledge of French, Spanish, or Italian desirable. Taught in English.


FREN 8210. Narrative, History, and Memory: Topics. (3 cr [max 9 cr]; Stdnt Opt) Significance of narrative paradigm in literature, history, and cultural memory. Specific topics/texts treated vary. Taught in French.


FREN 8250. Critical Issues: Poetry. (3 cr [max 12 cr]; Stdnt Opt) Significant critical issues relating to poetic writing of selected authors or periods.

FREN 8260. Critical Issues: Theatre. (3 cr [max 12 cr]; Stdnt Opt) Significant critical issues relating to dramatic writing of selected authors or periods.

FREN 8270. Critical Issues: Prose. (3 cr [max 12 cr]; Stdnt Opt) Significant critical issues relating to prose writing of selected authors or periods.

FREN 8271. The Novel of the Ancien Regime. (3 cr; Stdnt Opt) Considers major novels of the 17th and 18th centuries in connection with developments in such areas as esthetic theory, intellectual currents, social transformations, and reading practices.

FREN 8290. Critical Issues: Perspectives on an Author. (3 cr [max 12 cr]; Stdnt Opt) In-depth study of major author’s writing, critical tradition this writing has occasioned, and theoretical issues upon which this writing may be brought to bear.

FREN 8291. Jean Genet’s Writings and French Institutions. (3 cr; Stdnt Opt) Jean Genet’s writings at the crossroads of several disciplines (politics, psychoanalysis, religion, and law). Genet’s novels, dramas, and political essays explore the power of institutional settings and strategies imagined by individuals to short-circuit their impact.

FREN 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent) FREN 8371. The Rule of Reason, The Reign of Madness: Readings in Early Modern France. (3 cr; Stdnt Opt) Relationship between construction of reason and madness in philosophy, legitimation of political rule, and the institution of literature in early modern France.

FREN 8410. Topics in Quebecois Literature. (3 cr [max 9 cr]; Stdnt Opt) Quebecois in relation to other North American literatures and to Francophone literature produced elsewhere in the world. Specific topics/texts vary. Taught in French.


FREN 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent) FREN 8511. History of the French Language. (3 cr; Stdnt Opt) History of French from its origins in Latin to the present day. Aspects of diachronic phonology (sound change), morphology, syntax. Taught in French.

FRIT 5257. Passionate Beings: Literary and Medical Problematics in Italy and France from 1800 to the Present. (4 cr; Stdnt Opt) Literary and medical representations of the passions in France and in Italy from 1800 to the present. Texts range from theatrical works to medical treatises on the passions as ways for exploring notions of subjectivity, responsibility, order. Taught in English.

FRIT 5850. Topics in French and Italian Cinema. (3 cr; Stdnt Opt. Prereq–Knowledge of [French or Italian] helpful but not required) Focuses on a theme, period, filmmaker, or other topic of interest in French or Italian cinema. See Class Schedule. Taught in English.


Gay, Lesbian, Bisexual, and Transgender Studies (GLBT)

Department of Gender, Women, and Sexuality Studies

College of Liberal Arts

GLBT 5993. Directed Study. (1-12 cr [max 12 cr]; Stdnt Opt)

Gender, Women, and Sexuality Studies (GWSS)

Department of Gender, Women, and Sexuality Studies

College of Liberal Arts

GWSS 5101. Feminist Approaches to Ethnography. (5 cr; Stdnt Opt) Preparation for feminist ethnographic research in the social sciences. Using recent works by feminist ethnographers, focus is on the methods, politics, and ethics, as well as gender, race, class, and cross-cultural issues pertaining to fieldwork.

GWSS 5102. Feminist Approaches to History. (3 cr; Stdnt Opt. Prereq–8 cr WoSt or grad or #) Analysis and practice of feminist history. Theories, methods, and sources that address the interrelationship of gender, race, class, and sexuality.

GWSS 5103. Feminist Pedagogies. (3 cr; Stdnt Opt. Prereq–grad or #) Theory and practice of feminist pedagogies by comparing and evaluating various multicultural feminist theories of education/teaching and the application of specific theories, techniques, and teaching strategies.
GWSS 5104. Transnational Feminist Theory. (3 cr; Stdnt Opt)
Third World and transnational feminisms. Interrogating the categories of "women," "feminism," and "Third World." Varieties of power/oppression that women have endured/resisted, including colonization, nationalism, globalization, and capitalism. Concentrates on postcolonial context.

GWSS 5105W. Gendered Rhetoric of Science and Technology. (3 cr; Stdnt Opt. Prereq-[Rhet 5108, Rhet 5530]; 8 cr WoSt or grad or #)
How gendered power structures are implicated in science and technology as well as influence scientific and technological thinking and communication strategies.

GWSS 5107. Gender, Culture, and Science. (3 cr; Stdnt Opt)
Critical study of some of the major issues concerning the relations of gender and scientific inquiry produced in the past 20 years.

GWSS 5212. Philosophy and Feminist Theory. (3 cr; Stdnt Opt. +GWSS 4212, PHIL 4622, PHIL 5622. Prereq-8 cr in [philosophy or women's studies] or #)
Encounters between philosophy/feminism. Gender's influence in traditional philosophical problems/methods. Social role of theorist/theorizing as they relate to politics of feminism.

GWSS 5190. Topics: Theory, Knowledge, and Power. (3 cr; Stdnt Opt)
Topics specified in Class Schedule.

GWSS 5201. Global Processes and the Politics of Sexuality. (3 cr; Stdnt Opt. Prereq-12 cr WoSt or feminist studies grad student or #)
Comparative examination of the social construction of sexuality. Formal/informal norms/regulations, categories of deviance, representation of sex in the media/arts, role of sexuality in relation to agency/subjectivity.

GWSS 5290. Topics: Biology, Health, and Environmental Studies. (3 cr; Stdnt Opt)
Topics specified in Class Schedule.

GWSS 5300. Communication and Gender. (3 cr; A-F or Aud. +COMM 5406. Prereq-one women's studies course or #)
How gender affects verbal communication. Development of analytical skills through readings, exercises, research that raise awareness of the power of language and the influence of gender prescriptions.

GWSS 5390. Topics: Visual, Cultural, and Literary Studies. (3 cr; Stdnt Opt)
Topics specified in Class Schedule.

GWSS 5393. Chicana/Latina Feminisms. (3 cr; Stdnt Opt. Prereq-8 cr WoSt and/or Chic or grad or #)
The historical and social development of Chicana and Latina feminisms in general and their various specific types.

GWSS 5404. Working Class Women's Cultures. (3 cr; Stdnt Opt. Prereq-12 cr WoSt or #)
Myths and realities surrounding working class women and their cultures. Use sociological and literary material in an effort to learn about working class women and hear their own voices.

GWSS 5515. Chicanas: Women and Work. (3 cr; Stdnt Opt. Prereq-#)
Chicanas, their various relationships to family/community. Local, national, and global work forces. Questions/issues related to growing integration of women's system of production.

GWSS 5590. Topics: Political Economy and Global Studies. (3 cr [max 12 cr]; Stdnt Opt)
Topics specified in Class Schedule.

GWSS 5501. Women and the Law. (3 cr; Stdnt Opt. Prereq-9 cr WoSt or pre-law grad or #)
Legislative system as it relates to women: historical/legal/approach to issues related to constitutional rights of women.

GWSS 5503. Queering Theory. (3 cr; Stdnt Opt. +GWSS 4403)
Lesbianism and lesbian identities as products of cultural practices, relations, and meanings that are historically specific/changing.

GWSS 5590. Topics: Social Change, Activism, Law, and Policy Studies. (3 cr [max 12 cr]; Stdnt Opt)
Topics specified in Class Schedule.

GWSS 5690. Topics: Women, Society, and Race in the United States. (3 cr [max 6 cr]; Stdnt Opt)
Topics specified in Class Schedule.

GWSS 5790. Topics: Sexuality Studies. (3 cr [max 6 cr]; Stdnt Opt)
Topics specified in Class Schedule.

GWSS 5993. Directed Study. (1-12 cr [max 12 cr]; Stdnt Opt)
GWSS 5994. Directed Instruction. (1-12 cr [max 36 cr]; Stdnt Opt)
GWSS 5995. Directed Research. (1-8 cr [max 36 cr]; Stdnt Opt)

GWSS 8101. Intellectual History of Feminism. (3 cr; Stdnt Opt)
Major trends in feminist intellectual history from 14th century to the present, especially in the United States and Europe.

GWSS 8102. Advanced Studies in Sexuality. (3 cr; Stdnt Opt. Prereq-Priority given to feminist studies grad students)
Contemporary theoretical scholarship/research on selected issues related to sexuality, gender, and the body.

GWSS 8103. Feminist Theories of Knowledge. (3 cr; Stdnt Opt. +PHIL 8133)
Interdisciplinary seminar. Feminist approaches to knowledge and to criticism of paradigms of knowledge operative in the disciplines. Feminist use of concepts of subjectivity, objectivity, and intersubjectivity. Feminist empiricism, standpoint theory, and contextualism. Postmodern and postcolonial theorizing.

GWSS 8108. Feminist Theories and Methods I. (3 cr; Stdnt Opt. Prereq-Feminist studies PhD or grad minor student or #)

GWSS 8109. Feminist Theories and Methods II. (3 cr; Stdnt Opt. Prereq-Feminist studies PhD or grad minor student or #)

GWSS 8190. Topics: Feminist Theory. (1-3 cr [max 12 cr]; A-F or Aud)
Topics in feminist theory.

GWSS 8201. Feminist Theory and Methods in the Social Sciences. (3 cr; Stdnt Opt)
Seminar on recent theories, including feminist versions of positivist, interpretivist, critical theoretical, and postmodernist models of social science knowledge. Methodologies congenial to feminist practices of inquiry, including use of narrative in theory, feminist ethnography, discourse analysis, and comparative methods in history.

GWSS 8290. Topics: Social Sciences and Public Policy. (1-3 cr [max 3 cr]; Stdnt Opt)

GWSS 8301. Feminist Literary Criticism. (3 cr; Stdnt Opt)
Recent developments and major issues in feminist studies of literature. Introduction to array of scholars and scholarship in field of feminist literary theory and criticism, emphasizing broad range of feminist theoretical analysis taking place in various University departments.

GWSS 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master's student, adviser and DGS consent)

GWSS 8390. Topics: Literary Studies. (1-3 cr [max 3 cr]; Stdnt Opt)

GWSS 8401. Gender, Space, and Resistance. (3 cr; Stdnt Opt)

GWSS 8866. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

GWSS 8888. Thesis Credit: Doctoral. (1-24 cr [max 24 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

GWSS 8993. Directed Study. (1-6 cr [max 9 cr]; Stdnt Opt)

GWSS 8994. Directed Instruction. (1-8 cr [max 36 cr]; Stdnt Opt)

GWSS 8995. Directed Research. (1-8 cr [max 36 cr]; Stdnt Opt)

GWSS 8996. Feminist Studies Colloquium. (1 cr [max 4 cr]; S-N or Aud. Prereq-Grad major or minor in feminist studies)

GWSS 8997. Feminist Research and Writing. (3 cr; Stdnt Opt. Prereq-8109, passed written consent)

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

Genetics, Cell Biology and Development (GCD)

Department of Genetics, Cell Biology, and Development

College of Biological Sciences


GCD 8008. Mammalian Gene Transfer and Expression. (2 cr; A-F or Aud. Prereq=##) Current gene transfer technology. Applications of genetic modifications in animals, particularly transgenic animals and human gene therapy.

GCD 8073. Advanced Human Genetics. (3 cr; Stdt Opt. Prereq-8121 or #) Application of molecular, biochemical, chromosomal, and population genetics to human variation and disease. Abnormal chromosome number and structure; abnormal enzyme, structural protein, receptor and transport; analysis of inheritance patterns; behavioral genetics; genetic basis of common disease. Current research articles in human genetics.

GCD 8103. Human Histology. (5 cr; Stdt Opt.:GCD 6103. Prereq-Undergraduate biology, chemistry, math, and physics course; #) Light/electron microscopic anatomy of tissues and their organization into human organs. Emphasizes integrating structure, its relationship to function at levels from molecules to organs. Lecture, lab.

GCD 8131. Advanced Genetics. (3 cr; Stdt Opt. Prereq-3022 or Biol 4003, BioC 5021 or BioC 4531 or #) Literature-based course covering modern genetic analysis, including mutant screens, characterization of multiple alleles, gene mapping and cloning, genome sequencing, intergenic interactions, transposable elements, genetic mosaics, and molecular mechanisms of recombination.


GCD 8151. Cell Structure and Function. (3 cr; Stdt Opt. Prereq-[[4034 or 8121 or BioC 8002], Biol 4004 or MBMB or MCDB&G grad student], #) Structure, function, and biochemistry of cellular organelles. Cellular interactions in eukaryotes. Emphasizes membranes, secretion, trafficking, cytoskeleton, cell motility, nucleus, cell cycle, apoptosis, cell signaling, and signal transduction mechanisms.

GCD 8161. Advanced Developmental Biology. (3 cr; Stdt Opt. Prereq-[[4034 or 8121 or BioC 8002], 8151 or Biol 4003], Biol 4004 or #) Current concepts of and experimental approaches taken to understand basic mechanisms of development. Model organisms. Embryology, cell fate determination, differentiation, pattern formation, polarity, cell migration, and cell-cell interactions. Analysis of original research articles.

GCD 8171. Literature Analysis. (2 cr; A-F or Aud. Prereq-Grad MCDG major) Critical reading and evaluation of current literature. May include evaluation of both excellent and flawed papers. Intensive in-depth discussions of selected papers in molecular biology, genetics, cell biology, and developmental biology.

GCD 8181. Stem Cell Biology. (3 cr; Stdt Opt. Prereq-[[4034 or 8121 or BioC 8002], [4161 or 8161]] or #) Students read/evaluate primary literature on stem cell research and applications. Critical analysis, written summaries/critiques, oral presentations.

GCD 8212. Selected Topics in Cell and Developmental Biology. (3 cr; Stdt Opt. Prereq-[[8121 or BioC 8002], 8151, [4161 or 8161 or #]) Reading and discussion of papers from current literature. Topics selected from research areas of cell biology and developmental biology and experimental approaches taken in these fields. Topics vary annually.


GCD 8900. Seminar. (1 cr [max 4 cr]; S-N or Aud. Prereq-Grad MCDG major or #) Current scientific research.

GCD 8910. Journal Club. (1 cr [max 4 cr]; S-N or Aud. Prereq-Grad MCDG major or #) Critical evaluation of selected current literature.

GCD 8912. Genetic Counseling in Practice. (4 cr; A-F or Aud. Prereq-MCDG MS student with genetic counseling specialization or #) Practical genetic counseling, communicating genetics and medical information to the family, helping families with decision making.

GCD 8913. Psychosocial Issues in Genetic Counseling. (3 cr; A-F or Aud. Prereq-MCDG MS student with genetic counseling specialization or #) Interviewing skills, supportive counseling, and case study analysis specific to genetic counseling.

GCD 8914. Ethical and Legal Issues in Genetic Counseling. (3 cr; A-F or Aud. Prereq-MCDG MS student with genetic counseling specialization or #) Professional ethics, ethical and legal concerns with new genetic technologies.

GCD 8920. Special Topics. (1-4 cr [max 8 cr]; Stdt Opt. Prereq-Grad MCDG major or #) Special topics.

GCD 8993. Directed Studies. (1-5 cr [max 15 cr]; Stdt Opt. Prereq-MCDG MS student with genetic counseling specialization or #) Independent research determined by student’s interests, in consultation with faculty mentor.

GCD 8994. Research. (1-5 cr [max 20 cr]; S-N or Aud. Prereq-MCDG MS student with genetic counseling specialization or #) Independent research determined by student’s interests, in consultation with faculty mentor.

GIS 5530. GIS Internship. (1.5 cr [max 6 cr]; S-N only. Prereq=##; strong GIS/mapping skills) Intensive hands-on experience using GIS to solve practical problems.


GIS 5572. ArcGIS II. (3 cr; Stdt Opt. Prereq-[[GEOG 5561 or equiv, in MGIS program] or #]) In-depth exploration of topics from 5571, as well as dynamic segmentation, address matching, and macro language programming.

GIS 5573. Desktop Mapping. (1.5 cr; Stdt Opt. Prereq-Geog 5561 or equiv, Geog 5511 or equiv, status in MGIS program or #) Introduction to desktop mapping systems such as ArcView, MapInfo and Maptitude. Emphasizes the application of these systems to the display and analysis of geographical data.

GEOG 5574. GIS and the Internet. (1.5 cr; Stdt Opt. Prereq-Geog 5561 or equiv, status in MGIS program or #) The role of the Internet in GIS applications. Topics include GIS data sources on the Internet, the role of the Internet in information dissemination, Internet capabilities for interactive mapping and issues surrounding the development of GIS-related Web sites.

GEOG 5575. Surveying and the Global Positioning System (GPS). (2 cr; Stdt Opt. Prereq-Geog 5561 or equiv, status in MGIS program or #) Introduction to GPS (Global Positioning System) and other surveying techniques of use to GIS professionals. Topics include geodesy, data adjustment, datums, ellipsoids, coordinate systems, and transformations.

GEOG 5577. Spatial Data Administration. (2 cr; Stdt Opt. Prereq=##) Theory/application for administration of geographic databases. Quality assurance, development planning/management, maintenance, access/distribution, documentation.

GEOG 5578. GIS Programming. (3 cr; Stdt Opt. Prereq-MGIS student or #) Opportunities/flexibility that computer programming offers to application of GIS technologies. Programming techniques using Visual Basic, Python, and ArcObjects. Students apply GIS principles/concepts to programs using ESRI software.

GEOG 5590. Special Topics in GIS. (1-3 cr [max 6 cr]; A-F or Aud. Prereq=##) Special topics in geographic information science (GIS). Topics vary according to student needs, technological developments in field.

GEOG 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

GEOG 8501. Survey of Geographic Information Science: Past, Present, and Future Trends and Activities. (3 cr; Stdt Opt. Prereq-MGIS student or #) Major trends and activities in geographic information science; university, local, state, and federal-level initiatives. History of GIS and its various disciplinary roots as well as major GIS-related resources (e.g., data sources, Web resources).
GEOG 5411. Geography of Health and Health Care. (4 cr; Stdnt Opt. = GEOG 5411W) Application of health geography, spatial analysis, political economy, and other geographical approaches to analyze problems of health and health care. Topics include distribution and diffusion of disease; impact of environmental, demographic, and social change on health; distribution, accessibility, and utilization of health practitioners and facilities.

GEOG 5421. Introduction to Atmospheric Science. (3 cr; Stdnt Opt. = EES 5421) Prerequisite: Familiarity with fundamentals of physics, calculus, and statistics, including differential and integral calculus and basic differential equations and basic thermodynamics, mechanics, and the electromagnetic spectrum) Calculus-based introduction to atmospheric dynamics, radiation, thermodynamics, chemical composition, and cloud processes. Applications to climate, meteorology, the hydrologic cycle, air quality, and biogeochemical cycles.

GEOG 5423. Climate Models and Modeling. (3 cr; Stdnt Opt. =Pre-req: 3401 or #) Survey of development and research with simple and complex (three-dimensional) climate models. Environmental processes and their numerical representation in climate models; evaluation of model sensitivity and accuracy; coupling between atmosphere, biosphere, hydrosphere, and cryosphere; assessment of model predictions for climate change.

GEOG 5426. Climatic Variations. (3 cr; Stdnt Opt. Pre-req: 125 or 3401 or #) Theories of climate change and change at decadal to centuries time scales; analysis of temporal and spatial fluctuations especially during the period of instrumental record.

GEOG 5431. Plant and Animal Geography. (3 cr; Stdnt Opt. = GEOG 5431) Introduction to plant-land use interactions. Focuses on patterns of plant/animal distributions at different scales over time and space. Evolutionary, ecological, and applied biogeography. Palaeobiogeography, vegetation-environment relationships, vegetation dynamics/ disturbance ecology, human impact on plants/animals, nature conservation. Discussions, group/individual projects, local field trips.

GEOG 5441. Quaternary Landscape Evolution. (3 cr; Stdnt Opt. Pre-req: 3401 or grad student or #) Topics in Quaternary geology and climate change. The role of climate in the Quaternary. Evolution of landscape patterns during the Quaternary Period, with emphasis on North America.


GEOG 5512. Cartography: Topics. (3 cr; Stdnt Opt. Pre-req: 3511 or 5511 or #) Selected topics include the system of cartographic communication, map reading, map analysis, cartography, and cartographic analysis. Advanced study of geographic information systems (GIS) for geography and non-geography students. Topics include geospatial application, data models, and software methods and output techniques. Lectures, reading, and hands-on experience with GIS software.

GEOG 5566. Advanced Geographic Information Science and Analysis. (3 cr; Stdnt Opt. Pre-req: 5561 or #) Advanced study of geographic information systems (GIS). Topics include spatial data models, topology, data encoding, data quality, database management, spatial analysis tools, and visualization techniques. Hands-on experience using an advanced vector GIS package.

GEOG 5567. American Cities I: Population and Housing. (4 cr; Stdnt Opt. Pre-req: PA 5201W, Pre-req: Grad or #) Emergence of North American cities: residential building cycles, density patterns; metropolitan housing stocks, supply of housing services; population and household types; neighborhood-level patterns of housing use; housing prices; intraurban migration; housing submarkets inside metro areas; emphasis on linking theory, method, case studies.


GEOG 5574. Quantitative Methods for Spatial Analysis. (2-7 cr [max 10 cr]; S-N or Aud. Pre-req: #) Provides intensive hands-on experience in contemporary map production and design, ranging from GIS application to digital prepress. Strong computer skills essential.


GEOG 5576. Principles of Geographic Information Science. (4 cr; Stdnt Opt. Pre-req: #) Introduction to the study of geographic information systems (GIS) for geography and non-geography students. Topics include GIS application, data models, and software methods and output techniques. Lectures, reading, and hands-on experience with GIS software.


GEOG 5586. Advanced Geographic Information Science and Analysis. (3 cr; Stdnt Opt. Pre-req: 5561 or #) Advanced study of geographic information systems (GIS). Topics include spatial data models, topology, data encoding, data quality, database management, spatial analysis tools, and visualization techniques. Hands-on experience using an advanced vector GIS package.

GEOG 5587. Principles of Geographic Information Science. (4 cr; Stdnt Opt. Pre-req: #) Introduction to the study of geographic information systems (GIS) for geography and non-geography students. Topics include GIS application, data models, and software methods and output techniques. Lectures, reading, and hands-on experience with GIS software.

For definitions of course numbers, symbols, and abbreviations, see page 214. 301
Course Descriptions

GEOG 5775. Geographic Education. (3 cr; Stdtnt Opt. Prereq—Three courses in geography or history or social sciences or education or #) Teaching geography from middle school up; pedagogical use of geographical themes; methods for effective teaching of multiple cognitive domains -- facts, theories, analytical skills, and evaluations; designing audio-visual aids, independent projects, simulations, etc. to meet National Standards in geography.

GEOG 5900. Topics in Geography. (3 cr [max 9 cr]; Stdtnt Opt. Prereq or grad, #) Special topics and regions. Course offered by visiting professors in their research fields.

GEOG 8001. Problems in Geographic Thought. (3 cr; A-F or Aud) Currents of geographic thought in biophysical, GIS human, cultural, and human-environment subfields. Focuses on concepts/paradigms through which geographers have attempted to unify/codify the discipline, around which debate has flourished, and about which interdisciplinary histories can be traced.


GEOG 8005. Proseminar: Population Geography. (3 cr; Stdtnt Opt. Prereq—#) Conceptual literature and empirical studies on fertility, mortality, and migrations in different parts of the world.

GEOG 8006. Proseminar: Research Methods in Geography. (3 cr; Stdtnt Opt. Prereq—#) Introduction to research design, strategies, methods of data collection, analysis, interpretation, and representation in contemporary geographic research.

GEOG 8007. Proseminar: Theories of Development and Change. (3 cr; Stdtnt Opt. Prereq—#) Recent research themes and questions in geography and related social sciences on Third World development; development theories, conceptually grounded case studies, and grassroots-based research.

GEOG 8020. Research Seminar: Economic Geography. (3 cr; Stdtnt Opt. Prereq—#) Contemporary research. Advanced topics, which vary with interests of faculty offering course.

GEOG 8101. Proseminar: Population Geography. (3 cr; Stdtnt Opt. Prereq—#) Conceptual literature and empirical studies on fertility, mortality, and migrations in different parts of the world.

GEOG 8106. Seminar: Social and Cultural Geography. (3 cr; Stdtnt Opt. Prereq—#) Role of space and place in conceptions of social and cultural life, social relations, and social identities; class, space, and place; geography of race and racism; environmental racism; geography of gender and sexuality; nationalism, national identity, and territory.

GEOG 8107. Geographic Writing. (3 cr; S-N or Aud. Prereq—#) Analysis of organization and presentation of geographic research. Critiques of selected examples of geographic writing.

GEOG 8200. Proseminar: Urban Geography. (2-3 cr [max 3 cr]; A-F or Aud) Contemporary research. Topics vary with the interests of faculty.

GEOG 8201. Explorations in the Geography of Minnesota. (3 cr; S-N or Aud. Prereq—#) Physical environment, agriculture, forestry, mining, land use, population, recreation, cities/towns, transportation. Sources of information about the state. Students make short oral/written reports. Might provide springboard for a Plan B paper, thesis, or dissertation. Two or three Saturday field trips.


GEOG 8212. Africa. (3 cr; Stdtnt Opt. Prereq—#) Advanced topics. Topics vary with interests of faculty offering course.

GEOG 8213. East Asia and China. (3 cr; Stdtnt Opt. Prereq—#) Contemporary research. Advanced topics. Topics vary with interests of faculty offering course.

GEOG 8214. South Asia. (3 cr; Stdtnt Opt) Advanced topics. Topics vary with interests of faculty offering course.


GEOG 8230. Theoretical Geography. (3 cr; Stdtnt Opt. Prereq—#) Advanced topics. Topics vary with interests of faculty offering course. Contemporary theoretical/philosophical themes transcending subdisciplines of human/physical geography.

GEOG 8240. Medical Geography. (3 cr; Stdtnt Opt. Prereq—5411 or #) Geographic inquiry concerning selected problems of health and health care.

GEOG 8260. Seminar: Physical Geography. (3 cr; Stdtnt Opt. Prereq—#) Topics of contemporary research. Topics vary with interests of faculty offering course.

GEOG 8270. Seminar: Climatology. (3 cr Prereq—#) Sample topics: climate modeling; climatic variability; climate change and predictability; severe local storms; drought; energy balance; urban climate; statistical climatology.

GEOG 8280. Biogeography. (3 cr [max 9 cr]; Stdtnt Opt. Prereq—#) Forest dynamics, dendrochronology, tree rings and climate, environmental disturbance, paleobiogeography, field/lab methods in biogeography.

GEOG 8290. Seminar in GIS and Cartography. (3 cr; Stdtnt Opt. Prereq—#) Selected concepts/methods. Topics, which vary yearly, include spatial analysis methods in GIS; advanced visualization methods; data quality and error propagation in GIS; generalization methods in GIS and cartography; role of time in GIS; interactive/animated cartography; incorporation of uncertainty.


GEOG 8301. Advanced Qualitative Methods. (3 cr; A-F or Aud) Techniques available to scholars who use qualitative methods. Participant observation. Formal/informal interviews; life/oral histories, focus interviews. Documentary and material culture analysis. Practical experience, theoretical/ethical questions.

GEOG 8302. Research Development. (3 cr; S-N or Aud. Prereq—#) Students in geography and related social sciences are guided in key steps to effective research proposal writing.

GEOG 8333. FTE: Masters. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

GEOG 8336. Development Theory and the State. (3 cr; A-F or Aud) Why certain intervener/status in third world countries have been able to guide their economies in the face of external pressure while most have failed to induce development. Internal/external conditions that facilitated such departure from underdevelopment. Comparative national/provincial case studies: Taiwan, South Korea, Botswana, Brazil, India. Applying theoretical approaches to policy issues.

GEOG 8350. Seminar: World Population. (3 cr; Stdtnt Opt. Prereq—#) Contemporary research in world population development and problems. Topics vary with interests of faculty offering course.

GEOG 8405. Seminar: Graduate Student Professional Development. (1 cr [max 2 cr]; S-N or Aud. Prereq—Geog or MGIS grad student or #) Strategies for success in graduate program. Preparation for a career as a geographer. Completing/defending the dissertation. Publishing, job search, tenure process, oral presentations, non-academic career paths.

GEOG 8420. Teaching Practicum. (1 cr [max 3 cr]; S-N or Aud. Prereq—[Geog or MGIS] grad student or #) Teaching methodologies, learning objectives, course content, classroom techniques, student/course evaluation. Specific application to instruction in Geography.

GEOG 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)
GEOG 8666. Doctoral Pre-Thesis Credits.  
1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

GEOG 8777. Thesis Credits: Master’s.  
1-18 cr [max 50 cr]; No grade. Prereq–Master’s student, adviser and DGS required consent for 1st/2nd registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

GEOG 8888. Thesis Credit: Doctoral.  
1-24 cr [max 100 cr]; No grade. Prereq–Doctoral student, adviser and DGS consent

Geological Engineering (GEOE)

Department of Civil Engineering

Institute of Technology

GEOE 5331. Experimental Geomechanics.  
(3 cr; A-F or Aud.  
+CE 5331. Prereq–IT upper division or grad student, 4301, CE 4301, or #) Machine stiffness; closed-loop testing. Small-strain theory. Measurement of deformation; strain gages, LVDTs, accelerometers, and associated circuits. Direct and indirect testing. Material behavior: experiments on anisotropic, damaged, and fluid-filled solids.

GEOE 5321. Geomechanics.  
(3 cr; A-F or Aud.  
+CE 5321. Prereq–IT upper division or grad student, 4301, CE 4301 or #) Review of elasticity theory and solution of some elastic boundary value problems relevant to geomechanics. Wave propagation in unbounded elastic media. Elements of fracture mechanics and applications. Elements of poroelasticity and applications.

GEOE 5331. Geomechanics Modeling.  
(3 cr; A-F or Aud.  
+CE 5331. Prereq–IT upper division or grad student, 4301 or CE 4301) Soil and rock response in triaxial testing; drained and undrained behavior; elastic and plastic properties. Modeling stresses, strains, and failure in geomechanics problems.

(4 cr; A-F or Aud. Prereq–[AEM 2021, AEM 3031] or #) Introduction to contemporary methods for nondestructive characterization of objects of civil infrastructure (e.g., highways, bridges, geotechnical sites). Imaging technologies based on propagation of elastic waves: ultrasonic and resonant frequency methods, seismic surveys, acoustic emission monitoring. Lecture, lab.

GEOE 8300. Seminar: Geomechanics.  
1-3 cr [max 4 cr]; S-N or Aud.  
+CE 8300) Presentations on various topics.

GEOE 8301. Fracture of Geomaterials.  
(3 cr; A-F or Aud.  

GEOE 8302. Soil/Rock Plasticity and Limit Analysis.  
(4 cr; A-F or Aud.  

(3 cr; A-F or Aud.  

GEOE 8321. Thermoporoelasticity.  
(4 cr; A-F or Aud.  

(3 cr; A-F or Aud.  

GEOE 8331. Modeling Geomechanical Processes.  
(3 cr; A-F or Aud.  

GEOE 8333. Finite Element Masters’.  
(1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

GEOE 8336. Boundary Element Methods I.  
(3 cr; A-F or Aud.  

GEOE 8337. Boundary Element Methods II.  
(3 cr; A-F or Aud.  
+CE 8337. Prereq–8336, CE 8336 or #) Transient and nonlinear problems.

GEOE 8341. Dynamics of Soils and Foundations.  

GEOE 8351. Advanced Groundwater Mechanics I.  
(3 cr; A-F or Aud.  
+CE 8351. Prereq–CE 4531, IT grad student or #) Solute transport; shallow flow in leaky aquifers; complex variable methods in groundwater flow; analytic element method: potentials for line sinks, line doublet, line dipoles, area sinks, and special analytic elements; singular Cauchy integrals; analytic elements in domains with closed boundaries.

GEOE 8352. Advanced Groundwater Mechanics II.  
(3 cr; A-F or Aud.  
+CE 8352. Prereq–4531 or CE 4531, IT grad student or #) Applying complex methods, including conformal mapping, in groundwater mechanics; solving problems with free boundaries using the hodograph method; drains in aquifers with free boundaries; superposition of solutions with drains; singular Cauchy integrals; boundary elements.

GEOE 8361. Engineering Model Fitting.  
(3 cr; A-F or Aud.  
+CE 8361. Prereq–IT grad student or #) Parameter estimation and inverse modeling for civil and geological engineering. Formulating engineering model fitting problems; comparing and selecting various fit criteria; implementing numerical algorithms; analyzing and interpreting results using both statistical and qualitative tools; designing future measurement plans.

GEOE 8444. FTE: Doctoral.  
(1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

GEOE 8666. Doctoral Pre-Thesis Credits.  
1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

GEOE 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])

GEOE 8888. Thesis Credit: Doctoral.  
1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required

Geology and Geophysics (GEO)

Department of Geology and Geophysics

Institute of Technology

GEO 5001. Earth Systems Science for Teachers.  
(3 cr; Stdt Opt.  

GEO 5102. Climate Change and Human History.  
(3 cr; Stdt Opt.  
+GEO 5002, Prereq–1001 or equiv or #) Causes of long-/short-term climate change. Frequency/magnitude of past climate changes, their geologic records. Relationship of past climate changes to development of agrarian societies and to shifts in power among kingdoms/city-states. Emphasizes last 10,000 years.
Course Descriptions

GEO 5108. Principles of Environmental Geology. (3 cr; Stdnt Opt. Prereq–Geology majors; core curriculum through 4501 or #; nonmajors: 1001 or #) Human impact on geological environment and effect of geology/geologic processes on human life from an ecosystem and biogeochemical cycles perspective. Geologic limits to resources and carrying capacity of Earth. Land use planning, environmental impact assessment, ecogeologic world models. Field project and trip.


GEO 5302. Isotope Geology. (3 cr; A-F or Aud. Prereq–2303 or #) Theory and uses of radioactive, radiogenic, and stable isotopes in geology. Radiocative dating, geothermometry, and tracer techniques in geologic processes.


GEO 5353. Electron Microprobe Theory and Practice. (3 cr; Stdnt Opt. Prereq.–[One yr chem, one yr physics] or #) Characteristics of solid materials with electron beam instrumentation, including reduction of X-ray data to chemical compositions.


GEO 5503. Advanced Petrology. (3 cr; Stdnt Opt. Prereq–2302, CHEM 1021, [MATH 1532 or MATH 1572 or MATH 1572]) Quantitative approach to modern igneous/metamorphic petrology. Emphasizes thermodynamics of minerals/metals and with applications to phase diagrams, thermobalance, melting relationships, and energetics of petrologic mass transfer.

GEO 5601. Advanced Sedimentology. (4 cr; Stdnt Opt. Prereq–4602 or #) Modern techniques of sedimentary basin analysis focusing on interactions among the lithosphere, atmosphere, and hydrosphere. Sedimentary facies of modern and ancient systems, petrology of clastic and carbonate deposits, tectonic and paleoclimatic interpretations, paleocurrent analysis, diagenetic effects on subsurface fluid flow, and volcanic sedimentation.


GEO 5705. Limnogeology and Paleoenvironments. (3 cr; Stdnt Opt. Prereq–#) Within-lake, hydrogeologic, and landscape (geological/biological) processes that lead to formation of various proxy records of paleoenvironment. Systems approach to physical, geochemical, biogeochemical, and biotic proxies. Basic principles, case studies. Emphasizes how proxy records relate to paleoclimate.

GEO 5713. Tracers and Karst Hydrogeology. (3 cr; Stdnt Opt. Prereq–5701, #) Karst hydrogeology and application of tracers to determine source, age, and mixing parameters of water in various natural reservoirs. Physical and chemical principles and processes operating in karst hydrogeology; use of natural and synthetic chemical and isotopic labels or tracers to follow movement and mixing of water through hydrologic cycle.

GEO 5802. Scientific Visualization. (3 cr; Stdnt Opt. Prereq–CSci 1107 or CSci 1113) Visualization hardware and software, three-dimensional graphics, representation of scientific data, modeling, use interface techniques, output, commonly used algorithms, animation, case studies and examples.


GEO 8435. Principles of Rock Magnetism. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq–4204 or #) Permanent magnetizations, their classification and origins. Fundamentals of fine particle magnetism; magnetic minerals; separation of multicomponent magnetizations; effects of chemical change on magnetization; magnetic proxies of climatic and environmental change; biomagnetism.


GEO 8534. Igneous Petrology. (3 cr; Stdnt Opt. Prereq–4301 or #) Igneous rocks and processes, emphasizing geochemistry of melts and minerals. Content varies with instructor and student interest.


GEO 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)


GEO 8601. Introduction to Stream Restoration. (2 cr; A-F or Aud. = EEB 8601. Prereq–Grad student in CE or GEO or EEB or WRS or FW or BAE or FR or HORT or ENR or LA or SRSE or #) Background material essential for participating in a stream restoration project. How to assimilate geologic, hydrologic, and ecological data at the watershed and reach scales to plan a restoration project and evaluate/critique existing stream restoration projects.

GEO 8602. Stream Restoration Practice. (2 cr; S-N only. = EEB 8602. GEO 8601 or CE 8601) Field experience, group design project. Students provide a stream restoration context for each other’s elective coursework, complete critical assessments of stream restoration projects, and design a stream restoration site.

GEO 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 4% for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

GEO 8712. Transport Phenomena and Analytical Geohydrology. (3-4 cr [max 4 cr]; Stdnt Opt. Prereq–5701 or CE 5502 or #) Microscopic flow parameters, momentum, mass and energy transport through porous media. Geologic factors in aquifer performance, equations for groundwater flow, and analysis of pump tests.


GEO 8777. Thesis Credits: Master’s. (1-18 cr [max 12 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])
For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

Gerontology (GERO)

School of Public Health

GERO 5100. Topics in Gerontology. (1.5-4 cr [max 10 cr]; Stdnt Opt)
Timely topics related to the biology, sociology, and psychology of aging and applied aging services.

GERO 5105. Multidisciplinary Perspectives on Aging. (3 cr; Stdnt Opt)

GERO 5110. Biology of Aging. (3 cr; Stdnt Opt)
Biological changes that occur with aging. Methods for studying aging, descriptions of population aging, theories on why we age. Process of aging in each body system, variation between individuals/populations. Clinical implications of biological changes with age. Guest lecturers from different disciplines.

GERO 5111. Studying Aging and Chronic Illness. (2 cr; Stdnt Opt. Prereq-Introductory course in epidemiology or #)
Methodological issues unique to studies of older populations. Focuses on measurement of epidemiological characteristics. Health conditions/disorders of older Americans.

GERO 5112. Aging: Policy and Demography. (3 cr; A-F or Aud. Prereq-Grad-level research methods, basic statistics course or #)

GERO 5115. Introduction to Geriatrics. (2 cr; S-N only)
Online course. Major topics in geriatrics. How to diagnose/treat conditions common in caring for older people.

GERO 5191. Independent Study: Gerontology. (1-4 cr [max 16 cr] Prereq-Approval of [adviser, DGS for gerontology minor])
Qualified students work on a tutorial basis.

GERO 5200. Seminar in Gerontology. (2 cr; Stdnt Opt. Prereq-#)
Meets weekly. Students present and discuss new or completed research projects on aging; conduct formal reviews using NIH formats; critique published papers using formal review criteria employed by gerontologic journals; become familiar with large database in aging and describe how that database has been used in research for secondary analyses.

Global Studies (GLOS)

Institute of International Studies

College of Liberal Arts

GLOS 5103. Empire and Modernity. (3 cr; A-F or Aud. Prereq-[3101, 3144 or #])
How modern world has been constituted by colonial encounter. Role of colonialism in construction of west. Images of non-western societies. Modernity in colonial/postcolonial societies. Problems/potential of universal categories such as democracy, gender, history, human rights. Globalization at the margins.

The relations of Mexico and the United States from an international perspective with a central focus on the cultural interchange in the border lands between the two countries. Uses both literary and historical materials.

GLOS 5301. Environment & Empire. (3 cr; A-F or Aud. Prereq-[3101, 3144 or #])

GLOS 5403. Human Rights Advocacy. (3 cr; Stdnt Opt. Prereq-Grad student or #)

GLOS 5410. Interactive Global and Local Studies. (3 cr; A-F or Aud. Prereq-#)
Global studies topics, locally in the Twin Cities and Minnesota, and internationally through linked communication with classes at cooperating universities in other countries. Students communicate with counterparts abroad through e-mail to develop comparative/interactive elements. Possible topics: role of river in local history, grain storage/processing, manufacturing/trade, growth of metropolitan area.

GLOS 5602. Other Worlds: Globality and Culture. (3 cr; A-F or Aud. Prereq-[3101, 3144, grad student] or #)
Interconnectedness of world. Considering not one world, but many. Colonialism, consumption, diasporic conditions, global media, nationalism, supra-national governance. How globality is experienced/contested locally/specifically.

GLOS 5603. Socialist/Post-socialist Transformations. (3 cr; A-F or Aud. +HIST 5251) Transformations underway in post-socialist societies of Eastern Europe, former Soviet Union. Ramifications of abandonment of state socialism, introduction of market relations. Effect of former system, new market system on cultural institutions/identities.

GLOS 5643. Colonialism and Culture. (3 cr; A-F or Aud. +ANTH 5043) Making of culture as colonial/anthropological object of knowledge. Relationship between colonial knowledge/formation of academic disciplines (especially anthropology). Colonial/postcolonial transformations of colony, nation, and metropole.

GLOS 5801. International Development: Critical Perspectives on Theory and Practice. (3 cr; A-F or Aud. Prereq-Admission to MSID prog, grad student) Interdisciplinary approaches to development. Assumptions, competing paradigms, analysis of policies, projects, problems. Globalization, societal crisis, indigenous alternatives to dominant paradigm. Partially taught in separate sections to deepen understanding of particular topic (e.g., environment, health, education).


GLOS 5803. MSID Country Analysis. (3 cr; A-F or Aud. Prereq-Admission to MSID prog, grad student) Multidisciplinary study of host country. Emphasizes social sciences and history, especially concepts/information regarding development issues.

GLOS 5805. Community Internships in the Global South. (3 cr; A-F only. Prereq-Admission to MSID prog, grad student) Grassroots internship with a host-country development agency or project through Minnesota Studies in International Development. Community characteristics, development strategies/problems, organizational structure/culture, cross-cultural communication issues.

GLOS 5806. Topics: Case Studies in International Development. (3 cr; A-F or Aud. Prereq-Admission to MSID prog, grad student) Development issues illustrated in students' local-level projects through MSID. Focuses on a particular sector as it relates to development of country. Sample topics: environment and development; health and development; education, literacy, and development; women and development.

GLOS 5807. Applied Field Methods. (3 cr; A-F or Aud. Prereq-Admission to MSID program) Application of selected field research methods in rural/urban settings in Asia, Africa, and Latin America. Analysis of practical, ethical, and theoretical issues raised through small field assignments and individual research projects.

GLOS 5808. MSID Directed Research. (3 cr; A-F or Aud. Prereq-Admission to MSID prog, grad student) Research project based on field work in Ecuador, India, Kenya, or Senegal through Minnesota Studies in International Development (MSID).

GLOS 5809. Advanced International Development Internship. (3 cr; A-F only) Study abroad course for Minnesota Studied in International Development.


GLOS 5910. Topics in East Asian Studies. (1-3 cr [max 3 cr], Stdnt Opt) Description varies with topic title.

GLOS 5920. Topics in European Studies. (3 cr, Stdnt Opt) Description varies with topic title.

GLOS 5930. Topics in Latin American Studies. (3 cr, Stdnt Opt) Description varies with topic title.

GLOS 5940. Topics in Middle Eastern Studies. (3 cr, Stdnt Opt) Description varies with topic title.

GLOS 5950. Topics in Russian Area Studies. (3 cr, Stdnt Opt) Description varies with topic title.

GLOS 5960. Topics in South Asian Studies. (3 cr [max 4 cr], Stdnt Opt) Description varies with topic title.

GLOS 5993. Directed Studies. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq-#; %, @) Guided individual reading or study. Open to qualified students for one or more semesters.

GLOS 5994. Directed Research. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq-#, %, @) Qualified students work on a tutorial basis.
Graduate School (GRAD)

Graduate School

Grad 5102. Preparation for University Teaching for Nonnative English Speakers. (2 cr; S-N only. Prereq—SPEAK score of 45 or successful completion of Foundations in English). [current or anticipated] TA assignment. #

Theory/practice of teaching in higher education in the United States. Emphasizes awareness of cross-cultural communication issues. Students practice in a simulated instructional setting.

Grad 5105. Practicum in University Teaching for Nonnative English Speakers. (2 cr; S-N only. Prereq—[5102 or SPEAK score of 50], #)

Theory, advanced practice in teaching in higher education for nonnative speakers of English. Emphasizes interactive teaching strategies, oral presentation skills, legal/policy issues.

Grad 8101. Teaching in Higher Education. (3 cr; Sdnt Opt.)

Teaching methods/techniques. Focuses on active learning, critical thinking, practice teaching, and preparing a portfolio to document/reflect upon teaching. Reading, discussion, teaching, eval dialog, reflective writing, co-facilitation of course.

Grad 8102. Practicum for Future Faculty. (3 cr; S-N only. Prereq—[8101 or equiv], [native English speaker or SPEAK Test score of 55/60 or ELP rating of 1 from [5102 or 5105]])

Collegial support for teaching, faculty mentorship at regional college or university, investigation of faculty role at variety of institutions, classroom observation/feedback, preparation for academic job search. Non-native English speakers must pass University requirements for international teaching assistants.

Grad 8200. Teaching and Learning Topics in Higher Education. (1 cr [max 4 cr]; A-F only. Prereq—8101 or PFF prog director consent)

Teaching/learning topics in higher education. Applications to specific contexts/topics. Students create course materials for a context/discipline and assess an action plan in terms of student learning. Students write an action plan. Different sections cover topics such as active learning in the sciences, teaching with blogs, multicultural education, teaching in clinical settings, learning-community course design.

Grad 8400. Interdisciplinary Dissertation Writing Seminar. (1-3 cr [max 6 cr]; Sdnt Opt. Prereq—PhD student, #)

Led by graduate faculty. For course description, see sponsoring program(s).

Greek (GRK)

Department of Classical and Near Eastern Studies

College of Liberal Arts

GRK 5001. Intensive Classical Greek. (3 cr; Sdnt Opt. Prereq—Previous experience in another foreign language recommended)

Introduction to classical Greek. Covers two semesters of material in one semester.

GRK 5003. Intermediate Greek Prose. Graduate Student Enrollment. (3 cr; Sdnt Opt. Prereq—Grades of at least [C- or S] in [5002 or 5001] or [*, grad student])

Readings in Classical Greek prose texts by one or more authors (e.g., Plato, Lysias, Xenophon, Herodotus). Review of grammar/morphology. Meets with 3003.

GRK 5004. Intermediate Greek Poetry. Graduate Student Enrollment. (3 cr; Sdnt Opt. Prereq—[3003 or equiv], grad student)


GRK 5100. Advanced Reading. (3 cr [max 18 cr]; Sdnt Opt. Prereq—3004 or #)

Reading in Greek texts/authors. Texts/authors vary each term.

GRK 5200. Biblical Greek. (3 cr [max 6 cr]; Sdnt Opt. Prereq—Grad of at least [C- or S] in [3004 or 5004 or #])


GRK 5701. Prose Composition. (3 cr; Sdnt Opt. Prereq—Grad student or #)

Moving step by step through Ancient Greek grammar, starting with simple sentences and progressing to complex ones. Course ends with students translating short passages of modern Greek prose into Greek.

GRK 5702. Text Criticism. (3 cr; Sdnt Opt. Prereq—Grad student or #)


GRK 5704. Greek Paleography. (3 cr; Sdnt Opt. Prereq—Grad student or #)

Analysis of various hands used in Greek manuscripts with attention to date/provenance. History of transmission of Greek literature.

GRK 5705. Introduction to the Historical-Comparative Grammar of Greek and Latin. (3 cr, Sdnt Opt. LAT 5705, Prereq—Grad student or #)

Historical/comparative grammar of Greek/Latin, from their Proto-Indo-European origins to classical norms.

GRK 5706. History of Greek. (3 cr; Sdnt Opt. Prereq—Grad student or #)

Reading and formal analysis of documents illustrating evolution of Greek language from Mycenaean to modern times.

GRK 5800. Sight Reading for Graduate Students. (1 cr [max 6 cr]; S-N only, Prereq—Enrollment in a grad program in Department of Classical/Near Eastern Studies) Practice in reading Greek texts at sight.

GRK 5993. Directed Studies. (1-3 cr [max 18 cr]; Sdnt Opt. Prereq—Grad student or #)

Guided individual reading or study.

GRK 5994. Directed Research. (1-12 cr [max 18 cr]; Sdnt Opt. Prereq—Grad student or #)

Supervised original research on topic chosen by student.

GRK 5996. Directed Instruction. (1-12 cr [max 20 cr]; Sdnt Opt. Prereq—Grad student or #)

Supervised teaching internship.

GRK 8100. Readings in Greek Prose. (3 cr [max 18 cr]; Sdnt Opt. Prereq—Advanced grad student)

Reading and discussion of ancient Greek prose texts.

GRK 8120. Greek Text Course. (3 cr [max 15 cr]; Sdnt Opt. Prereq—3111 or #; not for students in dept of Classical and Near East Studies) Students attend 3xxx Greek courses. Supplementary work at discretion of instructor.

GRK 8200. Readings in Greek Verse. (3 cr [max 18 cr]; Sdnt Opt. Prereq—Advanced grad student)

Reading/discussion of ancient Greek poetic texts.

GRK 8262. Survey of Greek Literature I. (5 cr; Sdnt Opt.)

Extensive selections from all genres of Greek literature of archaic and early classical periods.

GRK 8263. Survey of Greek Literature II. (3 cr; Sdnt Opt.)

Extensive selections from Greek authors of the classical and Hellenistic eras.

GRK 8300. Readings in Greek Texts. (3 cr [max 18 cr]; Sdnt Opt. Prereq—Advanced grad student)

Reading/discussion of literary or documentary texts from Greek antiquity. Topics may include subjects that draw on various of sources, genres, or methods.

GRK 8400. Readings in Patristic Greek. (3 cr [max 6 cr]; Sdnt Opt. Prereq—Advanced grad student)

Reading/discussion of early Christian texts in Greek.

GRK 8910. Seminar. (3 cr [max 30 cr]; Sdnt Opt)

Various topics in Greek literature examined in depth with emphasis on current scholarship and original student research.

Health Informatics (HINF)

Department of Laboratory Medicine and Pathology

Medical School

HINF 5430. Health Informatics I. (4 cr; A-F or Aud)


HINF 5431. Health Informatics II. (4 cr; A-F or Aud)


HINF 5436. Seminar. (1 cr; S-N or Aud)

Presentation and discussion of research problems, current literature and topics of interest in Health Informatics.

HINF 5494. Topics in Health Informatics. (1-6 cr [max 6 cr]; Sdnt Opt. Prereq—#)

Individual or group studies in health informatics.

HINF 5496. Internship in Health Informatics. (1-8 cr [max 15 cr]; S-N or Aud; Prereq—5340, 5341, #)

Practical industrial experience not directly related to student’s normal academic experience.

HINF 5499. Capstone Project for the Masters of Health Informatics. (3 cr; A-F or Aud. Prereq—[5430, 5431] or #; MHI student) Students apply related knowledge/skills to a practical problem in health informatics. Proper design of projects, past exemplar projects. Students work with adviser to design/complete a project in a practical setting. Students submit a written project report in lieu of a final examination.

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

HINF 8405. Advanced Topics in Health Informatics I. (3 cr; Sdnt Opt. Prereq—#)

Computer systems design for health sciences, small computer concepts/use, computers for clinical services, computer-aided medical decision making, biomedical image processing, pattern recognition. Case studies from health sciences.

HINF 8406. Advanced Topics in Health Informatics II. (3 cr; Sdnt Opt. Prereq—#)

Computer systems design for health sciences, small computer concepts/use, computers for clinical services, computer-aided medical decision making, biomedical image processing, pattern recognition. Case studies from health sciences.

For definitions of course numbers, symbols, and abbreviations, see page 214.

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HINF 8434. Medical Decision Support Techniques. (3 cr; A-F or Aud. Prereq–5432 or #) Examines systems based on statistical and logical approaches to decision making that include statistical prediction, rule-based systems, case-based reasoning, quantitative reasoning, and neural networks, and issues related to their use.

HINF 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

HINF 8446. Professional Studies in Health Informatics. (1-2 cr [max 2 cr]; A-F or Aud. Prereq–5431, PUBH 5452 or #, grad hlth inf major) Health informatics as a profession, including discipline, responsibilities, resources, and job opportunities. Directed experiences in consulting, teaching, writing, conducting research, and managing facilities.

HINF 8492. Advanced Readings in Health Informatics. (1-6 cr [max 6 cr]; A-F or Aud. Prereq–#) Directed readings in topics of current or theoretical interest in medical informatics.

HINF 8494. Research in Health Informatics. (1-6 cr [max 6 cr]; A-F or Aud. Prereq–#) Directed research under faculty guidance.

HINF 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

HINF 8770. Plan B Project. (4 cr; A-F or Aud. Prereq–Plan B MS student, #, no credit toward PhD) Research project. Topic arranged between student and instructor. Written report required.

HINF 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])

HINF 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Hindi (HNDI)

HNDI 5040. Readings in Hindi/Urdu Texts. (3 cr [max 9 cr]; Stdnt Opt. Prereq–4162 or equiv or #) Students read authentic materials of various types to improve reading/speaking ability.


HNDI 5993. Directed Readings. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq–#, @) Guided individual reading or study.

HNDI 8790. Research. (1-5 cr [max 5 cr]; Stdnt Opt. Prereq–#)

History (HIST)

HIST 5011. Proseminar in the History of Medieval Europe. (3 cr; A-F or Aud. Prereq–Advanced undergrads of exceptional ability or grad, #) Examination of basic scholarly bibliography for medieval Western European history. Aim is to help students to prepare for M.A. and Ph.D. examinations.

HIST 5151. Medieval Latin Historians. (3 cr; Stdnt Opt. Prereq–Reading knowledge of Latin) Writing of history in Western Europe during the Middle Ages. Focus on idea of history, philosophy of various historians, techniques of research by medieval historians and chroniclers, history as literature, and value of medieval histories to modern research scholars. Latin texts only.

HIST 5251. Socialist/Post-socialist Transformations. (3 cr; A-F or Aud. =GLOS 5603) Transformations underway in post-socialist societies of Eastern Europe, former Soviet Union. Ramifications of abandonment of state socialism, introduction of market relations. Effect of former system, new market system on cultural institutions/identities.

HIST 5264. Imperial Russia: Formation and Expansion of the Russian Empire in the 18th and 19th Centuries. (3 cr [max 4 cr]; Stdnt Opt) Interaction with Europe and Asia; attempts at modernization and reform; emancipation of the serfs and rise of revolutionary movements.

HIST 5265. 15th-Century Russia: The Collapse of Imperial Russia, the Revolutions, and the Soviet Regime. (3 cr; Stdnt Opt) Analysis of the factors that led to the collapse of the tsarist regime; discussion of the 1917 revolution, the evolution of the Soviet regime and the collapse of Soviet communism. Emphasis on the role of nationalities and the rise of the Commonwealth of independent states.

HIST 5271. The Viking World: Story, History, and Archaeology. (3 cr; A-F or Aud. =HIST 3271) Viking society and expansion of Viking influence abroad. Viking impact on Western Europe, interactions with Slavic lands, settlement of North Atlantic islands, Western Europe’s impact on Scandinavian lands. Analyzes archaeological, historical, linguistic, and numismatic evidence.


HIST 5285. Problems in Historiography and Representation of the Holocaust. (3 cr; Stdnt Opt. =JWST 5111. Prereq–JWST 3521 or RELS 3521 or #) Relationship of paintings, memorials, and other art forms to the question of understanding the Holocaust. Issues of sources, especially use of the Survivors of the Shoah project in U libraries.

HIST 5294. Social History of Russia and Eastern Europe Through the 19th Century. (3 cr; Stdnt Opt) Lives of peasants and workers, nobles and merchants. Topics include family, marriage, sexuality, culture and tradition; transformation from an agricultural to a modern society.

HIST 5295. Social History of Russia and Eastern Europe From the Late 19th Century to the Present. (3 cr; Stdnt Opt) Social movements (revolutionary, nationalist, women’s); communist and post-communist societies.
HIST 5379. Problems in Early American History. (3 cr; Stdnt Opt)
Intensive consideration of topics in early American history. Topics may include readings in race, class, and gender; comparative colonialism; slavery; demography; economic history; religion; and regions in the colonial world.

HIST 5381. Minnesota History Workshop. (3-4 cr [max 6 cr]; Stdnt Opt. Prereq-1501, 1502) A case study and seminar approach to historical research and interpretation. It offers teachers and other scholars a chance to survey a particular topic in Minnesota history and to write their own historical narrative based on primary source research.

HIST 5421. Gender in Latin American History. (3 cr; Stdnt Opt) Women’s history/masculinity. Gender/colonialism, marriage, sexuality, nationalism, labor, political movements, feminism.

HIST 5436. Social History of African Women: 1850 to the Present. (3 cr; Stdnt Opt. Prereq-Grad or #) Explore the historical forces which have shaped African women’s everyday lives and the ways in which these women have been active agents in the making of their own histories.

HIST 5437. History of East Africa. (3 cr; Stdnt Opt. AFRO 3437, AFRO 5437, HIST 5437) Major themes in history of East Africa, from era of early human cultural development to present. Methods that historians use to reconstruct history. Varying interpretations/constructions of history over time.


HIST 5441. Transformations in Pre-Colonial African History. (3 cr; A-F & Aud. Prereq-#) African internal/external processes before 1600. Framework by which early African history is understood, tools for reconstructing it, themes/debates that have shaped it, new directions in which it is moving.

HIST 5446. Problems in West African History. (3 cr; Stdnt Opt. Prereq-Grad or #) This problem-centered course explores several of the major historiographical, methodological, and theoretical debates in West African history. Core topics include state formation, trade, slavery, Islam, gender, and colonialism.

HIST 5464. China in the Song, Yuan, and Ming Dynasties. (3 cr; Stdnt Opt. EAS 3464, HIST 3464) China during the Song (976-1279), Yuan (1279-1368) and Ming (1368-1644) dynasties, political institutions, and social structures. Attention to primary sources and to how historians ask and answer questions about the past.

HIST 5465. China in the Ming and Qing Dynasties. (3 cr; Stdnt Opt. EAS 3465W, HIST 3465W) Political/social history of China from 1600 until end of Qing dynasty in 1911. Ethnicity, daily life, legal structures, city life, peasantry.

HIST 5467. State and Revolution in Modern China. (3 cr; Stdnt Opt. EAS 3467W, HIST 3467W) Modern China’s political evolution including the Taiping Rebellion, Republican Revolution, rise of Nationalist and Communist parties, Maoist era, reform under Deng Xiaoping, and the emergence of democracy in Taiwan.

HIST 5468. Social Change in Modern China. (3 cr; Stdnt Opt. EAS 3468, HIST 3468) Optum War and opening of Treaty Ports in 19th century; missionary activity and cultural influence; changes in education system; women’s movement; early industrialization; socialism and collectivization after 1949; industrialization of Taiwan; PRC’s entry into the world trading system.

HIST 5469. Historiographies of China, 1000-1700. (3 cr; A-F & Aud. Prereq-Grad student or #) Important recent English-language work on Chinese culture during the Song, Yuan, and Ming dynasties. Topics include religion, gender, family structures, ethnic identity, commerce/economics, and political structures/events.


HIST 5501. Medieval Europe and the World. (3 cr; A-F & Aud. Prereq-#) Place of medieval Europe in the world. Relations of Europe with Asia, Africa, and the Americas. European knowledge of the world’s other great cultures. European travelers/explorers. Assessment of other cultures’ knowledge of Europe in the period.

HIST 5505. Survey of the Middle East. (3 cr; Stdnt Opt. Prereq-Grad or #) Peoples, lands, cultures of the Middle East, from earliest civilization to the present.

HIST 5520. Topics in Chinese History. (3 cr [max 12 cr]; Stdnt Opt) Selected topics not covered in regular courses. Taught as staffing permits.

HIST 5541. Islam in the Catholic Age. (3 cr; Stdnt Opt. Prereq-Grad or #) Rise of Islam in its Arabian setting. Roles of prophet, orthodox/Umayyad caliphs, Develops of Islamic state/empire, organizations, institutions, status of Muslims/non-Muslims.

HIST 5547. The Ottoman Empire. (3 cr; Stdnt Opt. Prereq-Grad student or #) Founding of Ottoman state to empire, 1300 to end of empire in 1920. Lands, institutions, peoples, legacy. Impact on Europe.

HIST 5611. Proseminar in Medieval History. (3 cr; A-F & Aud. Prereq-Grad student or #) Basic scholarly bibliography for medieval Western European history during early Middle Ages. Foundation for teaching courses in medieval history, preparing for general doctoral exam.

HIST 5612. Proseminar in Medieval History. (3 cr; A-F & Aud. Prereq-Grad student or #) Basic scholarly bibliography for medieval Western European history during central/later Middle Ages. Foundation for teaching courses in medieval history, preparing for general doctoral exam.

HIST 5614. The Medieval Church. (3 cr; Stdnt Opt. Prereq-Grad student or #) Introduction to history of Western church in Middle Ages. Emphasizes church teachings and institutional structures, beliefs/practices of lay people, medieval Christian encounter with non-Christian world.

HIST 5616. Proseminar in Medieval Spain. (3 cr; A-F & Aud. Prereq-#) Graduate research on the development of the medieval kingdoms of Spain from Roman times to ca. 1500. Emphasis on major social, economic, and cultural developments. Christian, Jewish, and Muslim interaction. Spain and the beginnings of European expansion.

HIST 5617. Spain in the Early Modern Period: 1492-1814. (3 cr; A-F & Aud) Historiography, documents, and archives of early modern Spain analyzed. Includes reading in modern English and Spanish and practical experience with Spanish manuscript documents from the period.

HIST 5621. Proseminar: The French Revolution. (3 cr; A-F & Aud. Prereq-Grad student or [advanced undergrad, #]) Historical literature about French Revolution of 1789. Old Regime political culture, Enlightenment, origins of the revolution, revolutionary transformations in society, politics/culture both in France and abroad, the Terror, Napoleon, revolutionary legacy.

HIST 5631. Proseminar: Comparative Early Modern History. (3 cr; A-F & Aud. Prereq-Hist Grad or #) Critical reading of historical literature dealing with integration of the globe during the early modern period, ca. 1350-1750; book reports, class discussion.


HIST 5640. Topics in Legal History. (3 cr; A-F & Aud) Comparative approaches to, methodologies of, and theoretical debates in legal history. Topics from ancient world to present, such as citizenship/statebuilding, religion and the law, women’s legal history.


HIST 5646. U.S. Women’s Legal History. (3 cr; Stdnt Opt) Women’s legal status in U.S. history, 1648 to present. Changes in women’s legal status in marriage, divorce, and child custody; reproductive/sexual autonomy; and economic/educational equality. Differences among women based on race, class, and ethnicity.

HIST 5648. Development of the Western European Legal Tradition. (3 cr; A-F & Aud) Evolution of and interaction among Roman and civil law, customary/found law, canon law, and English common law. Primary/secondary sources in English.
HIST 5649. Ideas in Context: Making Early Modern Knowledge, 1500-1800. (3 cr; A-F or Aud. Prereq-Grad student or #) Role of institutions/locus in development of early-modern European thought/culture. University, academy, learned society, princely court, museum, printing house, workshop, trading company, armies/navies, state bureaucracies, salons, other independent associations of nascent civil society.

HIST 5650. Proseminar: Early Modern Europe. (3 cr; A-F or Aud. Prereq-Hist grad or #) Critical reading of historical literature for early modern Europe, 1450-1700, dealing with France, Germany, Italy, the Low Countries, and Spain. Each student chooses a country to focus on; book reports, class discussion.

HIST 5671. Proseminar: Modern Britain. (3 cr; A-F or Aud. Prereq-Grad student or #) Critical study of major writings in British history, 1760-1945, and preparation for research in field.

HIST 5715. Readings in European Women's History, 1450-1750. (3 cr; A-F or Aud) Introduction to current historical research on European women's history, 1450-1750. Topics include gender, family, work, revolution, state, women's participation in religious movements, legal status of women.

HIST 5720. Society/Politics: Modern Europe. (3 cr [max 6 cr]; A-F or Aud. Prereq-Grad or #) Introduction to literature in English on problems of modern European social, cultural, political history. Thematic/geographic focus varies year to year. Topics include historical approaches to class/gender relations, state formation as social/political process, family history, evolution of public life, popular culture.

HIST 5721. Contemporary Europe from the Late 19th Century to the Beginning of the Cold War, 1890-1950. (3 cr; Stdnt Opt. + HIST 3721. Prereq:-previous coursework in 19th- and/or 20th-century Europe.) The historical literature and debates surrounding major issues in the social, political, cultural, and economic development of Europe from the turn of the century through the impact of WWII. Topics include the development of imperialism, national rivalries, social and political conflict, the rise of fascism and communism, and the origins of war.

HIST 5735. European Women's History, 1750 to the Present. (3 cr; A-F or Aud, Prereq-#) Selected themes in modern European women's history. Forms of patriarchy, ca. 1450-1700, to state bureaucracies, salons, other independent associations of nascent civil society.

HIST 5740. Topics in Modern German History. (3-4 cr [max 12 cr]; A-F or Aud. Prereq-#) Readings and discussions on some central questions concerning the history of Germany during the modern period with a particular emphasis on the relationship between social change and political development. Offerings vary in thematic and chronological focus.

HIST 5761. Proseminar-Imperial Russia. (3 cr; A-F or Aud. Prereq-Knowledge of Russian or German or French) Western and Russian historiography on crucial issues of imperial Russia. Political institutions; culture and society; modernization and reforms; new interpretations.

HIST 5762. Proseminar in 20th Century Russia. (3 cr; A-F or Aud. Prereq-5761, knowledge of Russian or German or French) Western and Russian historiography on crucial issues of 20th-century Russia. The nature of revolutions, debate over the evolution of the Soviet regime, the collapse of empires, new interpretations.

HIST 5777. Proseminar in Habsburg Central Europe. (3 cr; A-F or Aud. Prereq-#) Central Europe under Habsburg rule from the reforms of Maria Theresa to imperial collapse. Continuity and change in society; economic and political modernization; the rise of national consciousness and anti-Semitism; politics and culture in the Fin de Siecle; the Empire and World War I.

HIST 5794. Proseminar in European Economic History. (3 cr; A-F or Aud. Prereq-#) Europe's rise in the world economy; England's industrial revolution and uneven development in Europe; imperialism and World War I; the Great Depression; the post-1945 economic miracle; continuity and change in Eastern Europe.

HIST 5797. Methods of Population History. (3 cr; A-F or Aud) Standard methods of population analysis. Focuses on methods widely used for historical population research.

HIST 5801. Seminar in Early American History. (3 cr; A-F or Aud) Introduction to the literature of early American history. Readings selected from some of the best scholarship in the field, the questions that now hold the attention of colonial historians, and the theories, methods, and sources they use in pursuit of those questions.

HIST 5802. Readings in American History, 1848-Present. (3 cr; A-F or Aud) Readings-intensive course: U.S. history from Mexican-American War to present.


HIST 5821. American History in the Twentieth Century. (3 cr [max 4 cr]; A-F or Aud. Prereq-Grad student, #) Intensive readings seminar.


HIST 5841. Proseminar in American Economic History. (3 cr; A-F or Aud. Prereq-#) Historical literature on American economic and business history from American Revolution to the modern economy.

HIST 5844. U.S. Labor History. (3 cr; A-F or Aud) Readings in classic and recent approaches to the history of the working class in the United States. Central topics include slavery and free labor, women's paid and unpaid labor, labor protest, and trade union organization.

HIST 5845. History of American Capitalism. (3 cr; A-F or Aud. Prereq-Grad student or #) Historiography/history of American capitalism. Crucial events (e.g., market “revolution,” development of industrial cities) focus weekly discussions of new literature. Students analyze theoretical models of capitalism and new work in social, political, and economic history.

HIST 5857. Proseminar: Readings in the History of American Women. (3 cr; A-F or Aud. Prereq-#) An intensive graduate-level readings course. Survey selected significant topics in historical literature, conceptual frameworks, and methodological problems in the history of American women from 1600 to the present.


HIST 5871. Readings in U.S. Intellectual History, 19th-20th Centuries. (3 cr; A-F or Aud. Prereq-#) Definitions of American national identity from 1789 to the present as expressed in politics, religion, literature, painting, music, architecture, and history.

HIST 5877. Asian American History. (3 cr; A-F or Aud) Introduction to key issues, theoretical frameworks, research, and methodologies of Asian American history. Seminar texts that defined the field. Recent scholarship in history and in related disciplines.

HIST 5881. American Foreign Relations to 1895. (3 cr; A-F or Aud. Prereq-#) Intensive readings in the historiography of American foreign relations with emphasis on American imperialism, domestic courses of foreign policy, and international, political, economic, and cultural relations.

HIST 5890. Problems in American Indian History. (3 cr; A-F or Aud. Prereq-[American Indian History] or Aud) Intensive consideration of topics in American Indian history. Topics may include social history, history of particular regions, political systems, education, and American Indian policy.

HIST 5900. Topics in European/Medieval History. (1-4 cr [max 16 cr]; A-F only, Prereq-Grad or [advanced undergrad with #]) Selected topics in European or medieval history not covered in regular courses; taught as staffing permits.

HIST 5901. Latin America Proseminar: Colonial. (3 cr; A-F or Aud. Prereq-#) Introduces beginning graduate and advanced undergraduate students to major historical writings on various Latin American themes.

HIST 5902. Latin America Proseminar: Modern. (3 cr; A-F or Aud. Prereq-#) Introduces beginning graduate and advanced undergraduate students to major historical writings on various Latin American themes.

HIST 5910. Topics in U.S. History. (1-4 cr [max 16 cr]; Stdnt Opt. Prereq-Grad or advanced undergrad student with #) Selected topics in U.S. history not covered in regular courses. Taught as staffing permits.


HIST 5930. Topics in Ancient History. (1-4 cr [max 16 cr]; A-F or Aud. Prereq-Grad or #) Selected topics in ancient history not covered in regular courses. To be taught as staffing permits and as enrollment warrants.

HIST 5951. Topics in Comparative Third World History. (3-4 cr [max 12 cr]; A-F or Aud. Prereq-Grad student or #) Topics specified in Class Schedule.
HIST 5932. African Historiography and the Production of Knowledge. (3 cr; A-F or Aud. Prereq—Major in African history or [grad student, #])
Recent scholarship on social history of Africa. Focuses on new literature on daily lives of ordinary people in their workplaces, communities, households.

HIST 5933. Seminar in Ancient History. (3 cr; A-F or Aud. Prereq—Previous coursework in Greek or Roman history, #)
Seminar on a selected topic in ancient history.

HIST 5934. Comparative History and Social Theory. (3 cr; A-F or Aud. Prereq—Grad student or [upper-div undergrad, #])
Comparative/structural approaches from broadly comparative/theoretical. Issues of state formation, social movements, social structure, and economic development.

HIST 5935. Methods and Pedagogy in African History. (3 cr; A-F or Aud. Prereq—Grad student or #)
Current historical methods/sources of African history. Pedagogical issues. Students design their own courses.

HIST 5940. Topics in Modern Chinese History. (1-4 cr [max 16 cr]; Stdnt Opt. Prereq—Grad student or [advanced undergrad, #])
Possible topics include cultural, economic, intellectual, political, and social history.

HIST 5941. Readings in Chinese Documents. (3 cr; A-F or Aud. Prereq—Reading knowledge of Chinese)
Readings in Chinese on a topic to be selected by the instructor. Depending on the topic and the time period, readings may involve a mixture of modern and classical Chinese or may be entirely in modern Chinese. Consult instructor for more information.

HIST 5942. Topics: History of Medicine. (3 cr; A-F or Aud. Prereq—Prior history of medicine or history of science course recommended for undergrads.)
An exploration of topics central to the history of medicine. Emphasis on mid-18th century to the present. Topics vary yearly.

HIST 5950. Topics in Latin American History. (1-4 cr [max 15 cr]; A-F or Aud. Prereq—Grad or advanced undergrad with #)
Selected topics in Latin American history not covered in regular courses. Taught as staff permitting.

HIST 5960. Topics in History. (1-4 cr [max 16 cr]; Stdnt Opt. Prereq—Grad or [advanced undergrad with #])
Selected topics in history not covered in regular courses. Taught as staff permitting.

HIST 5962. Expansion of Europe. (3 cr; A-F or Aud. Prereq—Grad student, #)
Research proseminar on actions of Europeans in wider world, 1500-1790. Based on documents in James Ford Bell Library.

HIST 5964. Comparative Economic History. (3 cr; A-F or Aud. Prereq—#)
Theoretical approaches guide cross-cultural examinations of major issues in the economic history of East Asia, Europe, and the New World. Agrarian structures in economic development, markets, the state and economic development, and the industrial revolution.

HIST 5970. Advanced Research in Quantitative History. (4 cr [max 16 cr]; A-F or Aud)
Students will carry out publishable-quality research on a quantitative historical topic.

HIST 5971. Proseminar: Editing and Publishing. (3 cr; A-F or Aud)

HIST 5980. Topics in Comparative Women's History. (3-4 cr [max 20 cr]; A-F or Aud. Prereq—Grad student or [advanced undergrad, #])
Cross-cultural/thematic explorations in history of women. Topics vary. May include gender and colonialism; women and class formation; women and religion; sexuality; medical construction of gender; women's narratives as historical sources; gender and politics.

HIST 5990. Readings in Comparative History. (3 cr [max 9 cr]; A-F or Aud. Prereq—)
Students read and discuss historical works that focus on common themes. The possibility of making similar methods in different geographic areas. Issues of cross-area comparison. Topics vary (e.g., peasant societies, race/ethnicity, states/nationalism).

HIST 5993. Directed Study. (1-16 cr [max 20 cr]; Stdnt Opt. Prereq—Grad student or sr, #, %, @) Guided individual reading or study.

HIST 5994. Directed Research. (1-16 cr [max 16 cr]; Stdnt Opt. Prereq—Grad student or sr, #, %, @) Work on a tutorial basis.

HIST 8015. Scope and Methods of Historical Studies. (3 cr; A-F or Aud. Prereq—#)
Development of historical study over time (especially in 19th and 20th centuries). Methodologies currently shaping historical research. Theoretical developments within the discipline during 19th and 20th centuries.

HIST 8021. Seminar: Advanced Historical Writing. (3 cr; A-F or Aud. Prereq—Grad student, #)
Formal writing group. Writing practices for historians. Readings/discussions about historical analysis. Practical application of writing historical narratives. Students complete a major writing project based on their program needs and progress.

HIST 8025. Politics of Historical Memory. (3 cr [max 6 cr]; A-F or Aud)

HIST 8110. Medieval History: Research Seminar. (3 cr; A-F or Aud. Prereq—#)
Students write and present a research paper centering on these texts. Students are encouraged to discuss and write on the history of late imperial China. Bibliographic exercises; reading and translating primary documents.

HIST 8159. Seminar in Medieval History. (3 cr; A-F or Aud. Prereq—#)
Students produce research paper on history/culture of Cold War era as it developed in United States after World War II. Research project builds upon readings from 8231.

HIST 8239. Readings in Gender, Race, Class, and/or Ethnicity in the United States. (3 cr; A-F or Aud. Prereq—#)
Readings in gender, racial, class, and ethnic relations in U.S. history. Intersections of these forces. Topics vary by instructor.

HIST 8240. Topics in Research in Gender, Race, Class, or Ethnicity in the United States. (3 cr [max 6 cr]; A-F or Aud. Prereq—#)
Dynamics of gender, racial, class, and ethnic relations in U.S. history. Intersections of these forces. Topics vary by instructor.


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

HIST 8390. Research in American Indian History. (3 cr; A-F or Aud. Prereq—5890 or AmIn 5890 or #)
Research and writing skills in American Indian history. With instructor and other participants, students identify their research questions, locate sources with which to answer these questions, conduct original research, and produce a substantial research paper.

HIST 8434. Health and Healing in African History. (3 cr; Stdnt Opt)

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

HIST 8464. Research in Yuan, Ming, and Qing History. (3 cr; A-F or Aud. Prereq—Good working knowledge of classical Chinese, background in history of late imperial China)
Basic skills and resources for doing research in history of late imperial China. Bibliographic exercises; reading and translating primary documents.

HIST 8465. Research in Yuan, Ming, and Qing History. (3 cr; Stdnt Opt. Prereq—Good working knowledge of classical Chinese, background in history of late imperial China)
Basic skills and resources for doing research in history of late imperial China. Students select, translate, and annotate texts appropriate to their research interests and write a research paper based on these texts.

HIST 8630. Seminar in World History. (3 cr; A-F or Aud. Prereq—#)
Critical examination of historical literature dealing with theoretical approaches to world history and teaching of world history.

HIST 8640. Topics in Legal History Research. (3 cr [max 9 cr]; A-F or Aud. Prereq—#)
Comparative, methodological, theoretical, and topical courses in legal historical research, from ancient world to present. Offerings rotate.

HIST 8644. Legal History Workshop. (3 cr; A-F or Aud. Prereq—#)
Introduction to legal history and professional socialization. Work-in-progress of leading scholars working in field of legal history. Students can undertake original research.

HIST 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral, no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

HIST 8709. Seminar: History of Sexuality. (3 cr; A-F or Aud. Prereq—#)
Theories of sexuality (by, e.g., Foucault, Butler, deLauretis), their application in history. Topics may include: feminist critique of Foucault and the classics, psychoanalytic approaches to religious transformations such as the Reformation, varieties of gender
transgression, sexuality in colonial encounters, operation of sexual metaphors in political conflict, and AIDS and the writing of history.


HIST 8720. Research Seminar on Central European History I. (1-4 cr [max 16 cr]; A-F or Aud) Broad research theme/problem: in most cases preparation for dissertation. Students identify primary/secondary sources, conduct research, write paper, and read/comments upon each other’s drafts. Geographic focus varies with instructor, may include Germany or lands of former Habsburg Austrian empire.

HIST 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]).


HIST 8857. Seminar: Research in the History of American Women. (3 cr; A-F or Aud. Prereq–5857, #) Students define a historical problem or area of research on a topic in American women’s history; they would like to pursue in depth, identify appropriate sources and accomplish research in primary and secondary sources, write a 25 to 35-page scholarly article, and read and comment upon each other’s drafts.

HIST 8858. Research in Early American History. (3 cr; A-F or Aud. Prereq–5851 or #) Research and writing skills. With instructor and other participants, students identify their research questions, locate the sources with which to answer these questions, conduct original research, and produce a substantial research paper.

HIST 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

HIST 8900. Topics in European/Medieval History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8910. Topics in U.S. History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8920. Topics in African History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8930. Topics in Ancient History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8940. Topics in Latin American History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8950. Topics in African History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8960. Topics in History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8961. Research Seminar: Intellectual History. (3 cr; A-F or Aud) Approaches/methods. Readings on or exemplifying intellectual history. Intellectual history as something broader than history of philosophical thought: a set of approaches of broad cross-disciplinary applicability. Each student prepares a research paper on a topic of intellectual history and present it to class for critique.

HIST 8990. Topics in Comparative History-Research. (3 cr [max 15 cr]; Stdnt Opt. Prereq–#) Topics vary. Students read discuss historical works from different geographic areas, develop proposals for comparative research, or pursue comparative research projects.

HIST 8993. Directed Study. (1-16 cr [max 16 cr]; A-F or Aud. Prereq–Grad student, #) Students work on tutorial basis. Guided individual reading or study.

HIST 8994. Directed Research. (1-16 cr [max 16 cr]; A-F or Aud. Prereq–#) Work on a tutorial basis.

History of Medicine (HMED)

Medical School

HMED 5002. Public Health Issues in Historical Perspective. (3 cr; Stdnt Opt) Introduction to the evolution of major recurring problems and issues in public health including environment and health, food customs and nutrition, control of alcohol and drugs, venereal diseases and public policy, human resources regulation, and relationship of science to promotion of health.


HMED 5555. Women, Health, and History. (3 cr; Stdnt Opt. Prereq–Grad student or jr or sr with prev coursework in hist or #) Women’s historical roles as healers, patients, research subjects, health activists. Biological determinism, reproduction, mental health, nursing, women physicians, public health reformers, alternative practitioners. Gender disparities in diagnosis, treatment, research, careers. Assignments allow students to explore individual interests.

HMED 5075. Technology and Medicine in Modern America. (3 cr; A-F or Aud. Prereq–#) How technology came to medicine’s center-stage. Impact on medical practice, institutions, consumers, production of medical knowledge, professionalization, health policy, gender/race disparities in health care.

HMED 5200. Early History of Medicine to 1700. (3 cr; A-F or Aud) An introductory survey of the history of medicine in Europe and America.


HMED 5210. Seminar: Theories and Methods in Medical History. (3 cr; A-F or Aud) Historiography of the history of medicine.


HMED 5600. Directed Study. (0-24 cr [max 16 cr]; Stdnt Opt. Prereq–#)

HMED 5940. Topics in the History of Medicine. (3-4 cr [max 16 cr]; Stdnt Opt) Seminar on the historical relations between medicine and the State in the 19th to 20th centuries.

HMED 8001. Foundations in the History of Early Medicine. (3 cr; A-F only) History of Western medicine, from professionalization of healing in Greco-Egyptian antiquity to association of postmortem pathology with disease and clinical movement of early 19th-century Paris.

HMED 8112. Historiography of Science, Technology, and Medicine. (3 cr; A-F only. Prereq–#) Models of practice, different schools. Work of representative historians of science, technology, and medicine.

HMED 8113. Research Methods in the History of Science, Technology, and Medicine. (3 cr; A-F only. #) Introduction to sources, methods, and problems of research in history of science, technology, and medicine. Preparation of major research paper under faculty supervision.

HMED 8220. Seminar: Current Topics in the History of Medicine. (3 cr [max 9 cr]; A-F or Aud. Prereq–#) Topics vary.

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

HMED 8334. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

HMED 8631. Directed Study. (1-6 cr [max 12 cr]; A-F or Aud. Prereq–#)

HMED 8632. Directed Study. (1-6 cr [max 12 cr]; A-F or Aud. Prereq–#)

HMED 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

HMED 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])

HMED 8835. History of Science, Technology, and Medicine. (3 cr; A-F or Aud. Prereq–#) Historical literature of topics common to history of science, technology, and medicine.

HMED 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 16 cr per semester or summer; 24 cr required)
History of Science and Technology (HSCI)

Department of History of Science and Technology

Institute of Technology

HSCI 5211. Biology and Culture in the 19th and 20th Centuries. (3 cr; Stdt Opt. +HSCI 5211)
Changing conceptions of life and aims and methods of biology; changing relationships between biology and the physical and social sciences; broader intellectual and cultural dimensions of developments in biology.

HSCI 5242. The Darwinian Revolution. (3 cr; Stdt Opt. +HSCI 5242)

HSCI 5244. History of Ecology and Environmentalism. (3 cr; Stdt Opt. +HSCI 5244)
Development of ecological thought from 18th century natural theology to contemporary ecology and conservation biology; changing views of “balance” and the “economy” of nature; conceptual and methodological developments in ecosystems ecology; connections between ecology and conservation, population and environmental politics.

HSCI 5331. Technology and American Culture. (3 cr; Stdt Opt. +HSCI 5331)

HSCI 5332. Science and American Culture. (3 cr; Stdt Opt. +HSCI 5332)

HSCI 5401. Ethics in Science and Technology. (3 cr; Stdt Opt. +HSCI 5401)
Historical issues involving ethics in science. Ethical problems posed by modern science/technology, including nuclear energy, chemical industry, and information technologies.

HSCI 5411. Art and Science in Early Modern Europe. (3 cr; Stdt Opt.)
Interaction of art and science, from Renaissance to 19th century. Development of linear perspective, color theory, artistic practice, and scientific illustration/representation.

HSCI 5993. Directed Studies. (1-15 cr [max 15 cr]; Stdt Opt. Prereq-#)
Guided individual reading or study.

HSCI 5994. Directed Research. (1-15 cr [max 15 cr]; Stdt Opt. Prereq-#)

HSCI 8112. Foundations for Research in Ancient Science. (3 cr; A-F or Aud. Prereq-Grad HSCI major or minor or #)

HSCI 8125. Foundations for Research in the Scientific Revolution. (3 cr; A-F or Aud. Prereq-Grad HSCI major or minor or #)
Development of sciences/natural philosophy, 1500-1725.

HSCI 8313. Industrial Revolutions. (3 cr; A-F only)

HSCI 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

HSCI 8421. Social and Cultural Studies of Science. (3 cr; Stdt Opt)
Review of recent work; theoretical and methodological differences among practitioners; selected responses from historians and philosophers of science.

HSCI 8441. Women in Science: Historical Perspectives. (3 cr; Stdt Opt. Prereq-#)
Key literature dealing with patterns of participation in science and medicine since the 18th century. The ways in which modern science is perceived to be gendered, particularly in its practice and in ways that seem to influence theory and applications.

HSCI 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

HSCI 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

HSCI 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))

HSCI 8830. Topics in the History of Science, Technology, and Medicine. (3 cr [max 9 cr]; A-F or Aud. Prereq-#)
Historical literature of topics common to history of science, technology, and medicine.

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

HSCI 8900. Seminar: History of Early Physical Science. (3 cr; Stdt Opt. Prereq-#)
For advanced graduate students; topics in development of natural and mathematical science before 1800.

For advanced graduate students; topics in development of physical sciences since 1800.

HSCI 8920. Seminar: History of Biological Sciences. (3 cr; Stdt Opt. Prereq-#)
For advanced graduate students; topics in development of natural, biological, and medical sciences from Aristotle to the present.

HSCI 8930. Seminar: History of Technology. (3 cr; Stdt Opt. Prereq-#)
For advanced graduate students; topics in development of technology from ancient times to the present.

HSCI 8940. Seminar: History of Science and Technology in the Americas. (3 cr; Stdt Opt. Prereq-#)
For advanced graduate students; topics in development of science and technology, emphasizing the United States and Canada.

HSCI 8950. Seminar: Science and Technology in Cultural Settings. (3 cr; Stdt Opt. Prereq-#)
For advanced graduate students; topics in development of science and technology in or across specific geographic regions or particular cultures.

HSCI 8993. Directed Studies. (1-5 cr [max 15 cr]; Stdt Opt. Prereq-#)

HSCI 8994. Directed Research. (1-5 cr [max 15 cr]; Stdt Opt)

Hmong (HMNG)

College of Liberal Arts

HMNG 5040. Readings in Hmong Texts. (2-4 cr [max 12 cr]; Stdt Opt. Prereq-1016 or 5022 with grade of at least B or #)

Horticultural Science (HORT)

Department of Horticultural Science

College of Food, Agricultural and Natural Resource Sciences

HORT 5007. Advanced Plant Propagation. (3 cr; Stdt Opt. Prereq-1001)

HORT 5009. Pesticides in Horticulture: Their Use and Abuse. (3 cr; A-F or Aud. Prereq-[[ENT 4015 or ENT 4251], PIPA 2001] or #)
History of and practical information about pesticides used by horticulture industry. Pesticide modes of action. Use, application methods, environmental effects. Final three weeks devoted to labs on practical mixing/delivery systems.

HORT 5018. Landscape Operations and Management. (3 cr; Stdt Opt. Prereq-1001 or #)
Business, managerial, and technical aspects of landscape management relative to environmental horticulture and green industry. Tasks associated with maintaining turf and woody/herbaceous plants in landscape. Relationship of those tasks to preparation/justification of labor, equipment, and supply budgets. Labs, demonstrations, hands-on experiences associated with science and technically-based landscape maintenance/operations.

HORT 5025. Public Garden Management. (2 cr; Stdt Opt)

For definitions of course numbers, symbols, and abbreviations, see page 214.
HORT 5011. Human Factors and Work Analysis. (4 cr; A-F or Aud. Prereq-[IE 5511, ME 5211])


HUMF 5211. Human Factors Psychology. (3 cr; A-F or Aud. Prereq—Grad student or #)


HUMF 8541. Decision Support Systems. (4 cr; A-F or Aud. Prereq—Undergrad-level computer programming course or #, programming skills recommended)

Students build a decision support system for a problem of their choice. How to identify appropriate problems. Styles of DSSs, evaluating their effectiveness.

Human Resource Development (HRD)

Department of Work and Human Resource Education

College of Education and Human Development

HRD 5101. Foundations of Human Resource Development. (1 cr; Stdt Opt)

Introduction to human resource development as a field of study and practice.


Introduction to economics as a core discipline supporting the theory and practice of human resource development.

HRD 5103. Psychological Foundation of Human Resource Development. (1 cr; Stdt Opt. Prereq—5101)

Introduction to psychology as a core discipline supporting the theory and practice of human resource development.


Introduction to system theory as a core discipline supporting the theory and practice of human resource development.
HRD 5105. Strategic Planning through Human Resources. (3 cr; A-F or Aud. Prereq-5001 or 5102, 5103, 5104) The theory and practice of strategically developing, utilizing, and aligning human resources as a major contributor to organizational and quality improvement success.

HRD 5106. Evaluation in Human Resource Development. (3 cr; A-F or Aud) Evaluation of human resource development efforts from the perspective of impact on organizations, work processes, and individuals, plus follow-up decisions.

HRD 5111. Facilitation and Meeting Skills. (1 cr; Stdnt Opt) Introduction to the disciplines of planning and running effective meetings. Tools and methods for meeting management and evaluation are presented within the context of organization development.

HRD 5196. Internship: Human Resource Development. (1-10 cr [max 10 cr]; S-N or Aud. Prereq-5001, 5201 or 5301) Students apply and contract for human resource development positions. Contracts describe specific HRD responsibilities to be fulfilled during internship and theory-to-practice learning outcomes.

HRD 5201. Training and Development of Human Resources. (3 cr; A-F or Aud) Training/development of human resources in organizations. Process phases of analysis, design, development, implementation, and evaluation.

HRD 5202. Training on the Internet. (3 cr; Stdnt Opt) Major concepts, skills, and techniques for giving and receiving training on the Internet.

HRD 5301. Organization Development. (3 cr; A-F or Aud) Introduction to major concepts, skills, and techniques for organization development/change.

HRD 5302. Managing Work Teams in Business and Industry. (3 cr; A-F or Aud. Prereq-2 core courses in HRD) Frameworks and strategies for developing effective work teams. Skill development in facilitating resolution of conflicts in organizations. Provides foundational information as well as practical applications for participants (upper-level and graduate students) to become small team leaders.

HRD 5405. Quality Improvement Through Human Resources. (3 cr; A-F or Aud. Prereq- [5001, 5301] or 5303) Quality management, productivity improvement theory/practice from a human resource perspective. Organization development/training as integral components of quality improvement. HR role within quality standards. History of quality improvement, contributions of major leaders.

HRD 5408. International Human Resource Development. (3 cr; Stdnt Opt) Problems, practices, programs, theories, and methodologies in human resource development as practiced internationally.

HRD 5409. Planning and Decision-Making Skills. (1 cr; Stdnt Opt) Introduction to the disciplines of planning and decision making typically used in process improvement interventions. Tools and methods for facilitating group decisions and problem solving.

HRD 5410. Survey of Research Methods and Emerging Research in Human Resource Development. (3 cr; A-F or Aud. Prereq- [Registered, in attendance] at conference of Academy of HRD) Role of research in HRD. Standards/criteria for evaluating research, critique of conference research papers, identification of emerging research themes. Offered in conjunction with the annual conference of Academy of HRD.

HRD 5496. International Field Study in Human Resource Development. (3 cr; Stdnt Opt. Prereq-5001) Field study of the organization development, personnel training and development, career development, and quality improvement theories and practices in a selected nation.

HRD 5624. Sales Training. (3 cr; A-F or Aud) Strategies and techniques for developing effective sales people.

HRD 5625. Technical Skills Training. (3 cr; Stdnt Opt) Analyzing technical skills training practices in business and industry. Systems and process analysis and trouble-shooting of work behavior; design methods and developing training materials.

HRD 5626. Customer Service Training. (3 cr; A-F or Aud) Overview of customer service strategies used by successful organizations and training practices used to develop customer-oriented personnel.


Human Resources and Industrial Relations (HRIR)

Industrial Relations Center
Curtis L. Carlson School of Management

HRIR 5000. Topics in Human Resources and Industrial Relations. (2 cr [max 8 cr]; Stdnt Opt) HRIR 5001. Systems of Conflict and Dispute Resolution. (4 cr; Stdnt Opt. Prereq-Upper div undergrad or grad major; HRIR students contact instructor before registering) Conflict settlement in interpersonal, work-related, community, business, and international settings. Lectures, discussions, observations of actual dispute resolution sessions, exercises. Students participate in simulations.


HRIR 5203. Employment and Labor Law for the HRIR Professional. (2 cr; A-F only. Prereq-[(At least 60 sem cr or 75 qr cr), 2.00 GPA] or grad student or #) Application of statutes and case law to work settings. Civil rights and equal opportunity. Discrimination and harassment. Compensation and benefits. Employee protection and privacy, labor relations. Emphasizes application and ability to recognize legal aspects of HRIR issues.


HRIR 5206. Innovative HR Leadership in the Context of Change and Uncertainty. (2 cr; Stdnt Opt. Prereq-[(At least 60 cr), 2.00 GPA] or grad student or %; grad majors must register A-F) Overview of leadership in managing human resources. Historical evolution. Major theories/models. Principles of effective HR leadership in practice. Effects of uncertainty/change on leadership style/practice. HR leadership as powerful management tool.

HRIR 5208. Leadership and Personal Development. (2 cr; A-F only) Effective/ethical leadership. Leadership theory. Personal leadership strengths/vulnerabilities. Exercises, role playing, giving/receiving feedback. Students create leadership development plan.


HRIR 5991. Independent Study in Human Resources and Industrial Relations. (1-8 cr [max 8 cr]; Stdnt Opt. Prereq-% or #) Individual readings or research topics.
HRIR 8000. Graduate Topics in Human Resources and Industrial Relations. (1-8 cr [max 8 cr]; Stdnt Opt. Prereq–HRIR MA student or Sch Mgmt approval; grad majors must enroll A-F only) Selected graduate topics of current relevance to human resource management and industrial relations.


HRIR 8013. Research Methods in Social and Labor Policy. (3 cr; A-F or Aud. PA 8386. Prereq–8011, grad HRIR major or %; grad majors must enroll A-F only) Application of social science research methods to public policy issues.

HRIR 8014. Human Resource Information Systems. (2 cr; Stdnt Opt. Prereq–Grad HRIR major or %; grad majors must enroll A-F only) Hardware and database fundamentals, software applications, security issues, vendor evaluation, system and software development and design issues, and strategies for gaining user acceptance.

HRIR 8021. Introduction to Human Resources and Industrial Relations. (3 cr; Stdnt Opt. Prereq–HRIR 3021, Econ 1101, Econ 1102, Psy 1001, grad HRIR majors must enroll A-F only) Human resource management in contexts of labor markets and organizations. Valuing, employing, developing, motivating, and maintaining human resources in an industrial society. Staffing, training, and development; organizational behavior and theory; compensation and benefits; labor market analysis; and labor relations and collective bargaining.

HRIR 8022. Field Project. (4 cr; Stdnt Opt. Prereq–[8011, 8031, 8041, 8051, 8061, 8071, grad HRIR major] or %; grad majors must register A-F, must have instructors consent to drop course) Teams formulate and execute study of actual business problem faced by business, non-profit, or governmental organization, generally in Twin Cities.

HRIR 8032. International Human Resource Management. (2 cr; Stdnt Opt. Prereq–Grad HRIR major or %) Strategies for effective management. Analysis of cross-cultural differences in values, norms, and practices and how they affect organizational behavior/performance. Implications for designing HR practices in multinational organizations and international contexts.

HRIR 8031. Staffing, Training, and Development. (4 cr; Stdnt Opt. Prereq–Psy 1001, grad HRIR major or %; grad majors must enroll A-F only) Introduction to staffing processes (recruitment, selection, promotion, demotion, transfer, dismissal, layoff, retirement). Organizational and individual theories and techniques as mechanisms for influencing individual and organizational outcomes, such as performance, satisfaction, and climate.

HRIR 8032. Staffing and Selection: Strategic and Operational Concerns. (2 cr; Stdnt Opt. Prereq–[8031, HRIR grad student] or %; HRIR grad students must register A/F) Theory/practice related to staffing decisions (recruitment, selection, promotion, transfer, dismissal, layoff, retirement) in organizations. Legal environment in which staffing decisions are made. Staffing from strategic/organizational perspectives.

HRIR 8033. Employee Training: Creating a Learning Organization. (2 cr; Stdnt Opt. Prereq–[8031, HRIR grad student] or %; HRIR grad students must register A/F) Theory, research, practices related to design/implement employee training programs. Instructional design, training techniques, transfer of training, program evaluation/costing. Role of employees, firm policies/practices.

HRIR 8034. Employee Development: Creating a Competitive Advantage. (2 cr; Stdnt Opt. Prereq–[8031 or #, grad HRIR major or %; grad majors must enroll A-F only) Career development and planning, employee and management development techniques, and organizational and employee concerns related to mobility, job stress, balancing work and family, obsolescence and plateauing, and cross-cultural assignments.

HRIR 8041. Design and Management of Organizations. (4 cr; Stdnt Opt. Prereq–Econ 1101, Econ 1102, Psy 1001 or #, grad HRIR major or %; grad majors must enroll A-F only) Introduction to micro through macro organizational issues at individual, dyadic, group, organizational, and environmental levels; their implications for organizational design, control, coordination, and development.

HRIR 8042. Organizational Structure and Performance. (2 cr; Stdnt Opt. Prereq–[8041 or #, grad HRIR major or %; grad majors must register A-F) How different organizational practices (e.g., employee empowerment, job enrichment, profit sharing, employee stock ownership, individual incentives, information sharing, integration mechanisms) affect organizations in their competitiveness, profitability, workplace safety, employment stability, and wages. Coherence of system of organizational practices.

HRIR 8043. Comparative Organizations and HRM Systems. (2 cr; Stdnt Opt. Prereq–[8041 or #, grad HRIR major or %; grad majors must register A/F) Variations in organizational practices related to variations in ownership (profit, nonprofit, government, cooperatives), economic systems, culture, technology, market structure, etc. Organizational practices: employee empowerment, job enrichment, profit sharing, employee stock ownership, individual incentives, information sharing, integration mechanisms, and international comparisons.

HRIR 8044. Motivation and Work Behavior in Contemporary Organizations. (2 cr; Stdnt Opt. Prereq–[8041 or #, grad HRIR major or %; grad majors must enroll A-F only) In-depth study of major topics in microlevel organizational behavior. Accountability, organization citizenship behaviors, forms of organizational attachment, motivation, and issues of equity and justice.

HRIR 8045. Organizational Development, HR Metrics, and the Balanced Scorecard. (2 cr; Stdnt Opt. Prereq–[8041 or #, grad HRIR major or %) Nature/conduct of organizational change. Enhancing organizational effectiveness, improving quality of work life, increasing productivity, and facilitating problem solving through diagnostics, interventions, metrics, and scorecards. Intervention/evaluation strategies/processes. HR professional as consultant.


HRIR 8052. Compensation Theory and Applications. (2 cr; Stdnt Opt. Prereq–[8051 or #, grad HRIR major or %; grad majors must enroll A-F only) Relationship between economic and psychological theories and the design and operation of compensation programs. Demographic influences on compensation program outcomes. Statistical analysis applied to pay program design and administration. Global pay variations. Current pay issues and controversies.

HRIR 8053. Employer-Sponsored Employee Benefit Programs. (2 cr; Stdnt Opt. Prereq–[8011, 8051] or #, grad HRIR major or %; grad majors must enroll A-F only) Design and administration of nonmandatory compensation benefit programs: medical expense insurance, pensions, profit sharing plans, disability, and other employee benefits. Effects of providing benefits on workers’ incentives with regard to performance, acquisition and maintenance of human capital, mobility, and risk sharing.

HRIR 8061. Introduction to Labor Market Analysis. (4 cr; Stdnt Opt. Prereq–Econ 1101, Econ 1102 or #, grad HRIR major or %; grad majors must enroll A-F only) Labor supply and demand analysis, its international dimensions; determination of wages, employment and unemployment; accumulation of human capital and investment in education and training; government regulation in areas of discrimination and workplace safety; role of unions in wage determination.

HRIR 8062. Human Resource Strategy and Planning. (2 cr; Stdnt Opt. Prereq–[8061 or #, grad HRIR major or %; grad majors must enroll A-F only) Case studies used to diagnose strategy.

HRIR 8063. Human Resources and Organizational Performance. (2 cr; Stdnt Opt. PA 8055. Prereq–8061 or #, grad HRIR major or %; grad majors must enroll A-F only) Impact of human resource policies and practices on organizational productivity and effectiveness. Role of government, unions, and private sector institutions on organizational effectiveness.

HRIR 8064. Topics in Micro Labor Market Analysis. (2-4 cr [max 3 cr]; Stdnt Opt. Prereq–[8061 or #, HRIR PhD student or %; grad majors must enroll A-F only) May include micro aspects of unemployment, implicit contracts and efficiency wages, investment in human capital, occupational choice, job search, job matching and turnover, migration, labor force participation, and government program evaluation.
HRIR 8065. Topics in Macro Labor Market Analysis. (2-4 cr; max 3 cr; Stdnt Opt. Prereq–8001 or #; HRIR PhD student or %; grad majors must enroll A-F only) May include theories of unemployment based on sectoral shocks, theories of wage rigidity, efficiency wage theories, interindustry wage structure, role of labor market in resource allocation, and effects of government intervention in labor market.


HRIR 8073. Dispute Resolution: Labor Arbitration. (2 cr; Stdnt Opt. Prereq–8071 or #, grad HRIR major or %; grad majors must enroll A-F only) Arbitration to resolve grievances and impasses arising out of the collective bargaining agreement’s administration and negotiation. Arbitration law and legal issues, procedures and practices, case presentation, management rights, discipline and discharge, evidence, contract language interpretation, and remedies. Newly emerging approaches.


HRIR 8102. Capstone Project. (2 cr; Stdnt Opt. Prereq–8001, 801, 8031, 8051, 8071, 8141, 821, HRIR grad major) Application of related knowledge, concepts, and methods to a practical problem in human resources and industrial relations. Benchmarking of related best practices in research and in practice. Full development, analysis, and proposed recommendations for implementation or improvement of the selected problem.


HRIR 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent) HRIR 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

HRIR 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)HRIR 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])

HRIR 8811. Advanced Quantitative Research Methods in Human Resources and Industrial Relations. (2-4 cr [max 3 cr]; Stdnt Opt. Prereq–HRIR core or #, HRIR PhD student or %; grad majors must enroll A-F only) General linear model and its assumptions and violations; simultaneous equations, pooling cross-section and time series; limited qualitative dependent variable models; sample selection models; hazard models. Emphasizes application to human resources and industrial relations.

HRIR 8812. Seminar: Human Resources and Industrial Relations Research Methodology. (2-4 cr [max 8 cr]; Stdnt Opt. Prereq–HRIR PhD student or %; grad majors must enroll A-F only) Application in research projects.

HRIR 8821. Seminar: Human Resources and Industrial Relations Systems. (1-4 cr [max 3 cr]; Stdnt Opt. Prereq–HRIR core or #, HRIR PhD student or %; grad majors must enroll A-F only) Thought and research in the field. Investigating, integrating, and synthesizing more traditional related disciplines, theories, and research into interdisciplinary body of knowledge concerned with human resource and industrial relations problems and employment relationships.

HRIR 8830. Seminar: Staffing, Training, and Development. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–8031 or #, HRIR PhD student or %; grad majors must enroll A-F only) Concepts, problems, and research.

HRIR 8840. Seminar: Organization Theory and Behavior. (1-4 cr [max 6 cr]; Stdnt Opt. Prereq–8041 or #, HRIR PhD student or %; grad majors must enroll A-F only) Application in human resources and industrial relations research/practice.

HRIR 8850. Seminar: Compensation and Reward. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–8051 or #, HRIR PhD student or %; grad majors must enroll A-F only) Relevant theoretical models; formulation of research into compensation and reward issues.


HRIR 8870. Seminar: Labor Relations and Collective Bargaining. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–8071 or #, HRIR PhD student or %; grad majors must enroll A-F only) Analysis of contemporary theoretical and empirical research.

HRIR 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

HRIR 8991. Independent Study in Human Resources and Industrial Relations. (1-8 cr [max 8 cr]; A-F or Aud. Prereq–#) Individual readings and/or research projects.

Industrial Engineering (IE)

Department of Mechanical Engineering
Institute of Technology

IE 5080. Topics in Industrial Engineering. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq–Upper div or grad student) Topics vary each semester.

IE 5111. Systems Engineering I. (2 cr; A-F or Aud. Prereq–IT upper div or grad student) Overview of systems-level thinking/techniques in context of an integrated, design-oriented framework. Elements of systems engineering process, including lifecycle, concurrent, and global engineering. Framework for engineering large-scale, complex systems. How specific techniques fit into framework.

IE 5112. Introduction to Operations Research. (3 cr; A-F or Aud. Prereq–Math 2243 or Math 2373 or equiv.) (One semester of probability or statistics) (IT upper div or grad student) Survey of Operations Research methods/models in deterministic/stochastic settings. Linear programming, integer programming, networks, forecasting, Markov chains, and queuing systems. Examples from various application areas, such as systems engineering, logistics, design, and project management.

IE 5113. Systems Engineering II. (4 cr; A-F or Aud. Prereq–5111, a course on basic probability, IT upper div or grad student) Systems engineering thinking/techniques presented in 5111. Hands-on techniques applied to specific problems. Topics pertinent to effectiveness of design process. Practices and organizational/reward structure to support collaborative, globally distributed design team.


Course Descriptions

IE 5512. Applied Ergonomics. (4 cr; A-F or Aud. Prereq–Upper div IT or grad student. 5513) Small groups of students work on practical ergonomic problems in local industrial firms. Projects cover a variety of ergonomic issues: workstation design, equipment and tool design, back injuries and material handling, cumulative trauma disorders, illumination and noise, and safety.

IE 5513. Engineering Safety. (4 cr; A-F or Aud. Prereq–Upper div IT or grad student) Occupational, health, and product safety. Standards, laws, and regulations. Hazards and their engineering control, including general principles, tools and machines, mechanics and structures, electrical safety, materials handling, fire safety, and chemicals. Human behavior and safety, procedures and training, warnings and instructions.

IE 5522. Quality Engineering and Reliability. (4 cr; Stdt Opt. Prereq–[521 or equiv], [upper div or grad student or CNR]) Quality engineering/management, economics of quality, statistical process control design of experiments, reliability, maintainability, availability.

IE 5531. Engineering Optimization I. (4 cr; Stdt Opt. Prereq–Upper div or grad student or CNR) Linear programming, simplex method, duality theory, sensitivity analysis, interior point methods, integer programming, branch/and/bound/dynamic programming. Emphasizes applications to production/logistics, including resource allocation, transportation, facility location, networks/flows, scheduling, production planning.

IE 5541. Project Management. (4 cr; Stdt Opt. Prereq–Upper div or grad student) Introduction to engineering project management. Analytical methods of selecting, organizing, budgeting, scheduling, and controlling projects, including risk management, team leadership, and program management.


IE 5551. Production Planning and Inventory Control. (4 cr; Stdt Opt. Prereq–CNR or upper div or grad student) Inventory control, supply chain management, demand forecasting, capacity planning, aggregate production and material requirement planning, operations scheduling, and shop floor control. Quantitative models used to support decisions. Implications of emerging information technologies and of electronic commerce for supply chain management and factory operation.


IE 8552. Advanced Topics in Production, Inventory, and Distributions Systems. (4 cr [max 8 cr]; Stdt Opt. Prereq–5551) Cutting edge research issues in production, inventory, and distribution systems. Topics vary: stochastic models of manufacturing systems, stochastic inventory theory, multi-echelon inventory systems and supply chains, supplier-retailer and supplier-manufacturer coordination, supplier and warehouse networks, business logistics, and cooperation.

IE 8646. Doctoral Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr) IE 8773. Graduate Seminar. (1 cr; S-N or Aud) Recent developments.

IE 8774. Graduate Seminar. (1 cr; S-N or Aud. Prereq–8773) Recent developments.

IE 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)) IE 8787. Industrial Engineering Research. (1-6 cr [max 10 cr]; Stdt Opt. Prereq–#) Directed research.

IE 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required) IE 8951. Plan B Course. (1 cr; S-N or Aud) Structured environment in which students can complete M.S. Plan B project.

IE 8953. Plan B. (2 cr; A-F or Aud. Prereq–8951) Structured environment in which students can complete M.S. Plan B project.

Information and Decision Sciences (IDSC)

Department of Information and Decision Sciences

Curtis L. Carlson School of Management


IDSC 8511. Conceptual Topics and Research Methods in Information and Decision Sciences. (4 cr; Stdt Opt. Prereq–Business admin PhD student or #) Relationships to underlying disciplines; major research streams; seminal articles, survey literature, and major researchers. Provides framework for organizing knowledge about information and decision sciences.

IDSC 8521. System Development. (2 cr; Stdt Opt. Prereq–Business admin PhD student or #) Why it is hard to develop efficient/effective information systems, what can be done to improve situation. Defining efficiency/effectiveness in development process and in systems. Producing/evaluating artifacts (constructs, models, methods, tools) that enable more efficient/effective information systems to be developed.

IDSC 8711. Cognitive Science. (4 cr; Stdt Opt. Prereq–Business admin PhD student or #) Empirically based concepts of knowledge and reason, mental representation and conceptual systems that guide problem solving and decision making. Computational metaphor of mind drawn from psychology, computer science, linguistics, anthropology, and philosophy. Implications for understanding of knowledge work.

IDSC 8721. Behavioral Decision Theory. (2 cr [max 6 cr]; Stdt Opt. Prereq–Business admin PhD student or #; offered alt yrs) How decisions are made, how knowledge is stored/used, how knowledge of variability/feedback influence decisions. Decisions at strategic, operational, individual level. Exceptional performance, pathologies of decision making. Basis for “best practice.” How knowledge is managed in decisions, decision failure. Folly, normal accidents, decision problems in which individuals manipulate information to influence/deceive others.
IDSC 8800. Research Seminar in Information and Decision Sciences. (4 cr [max 20 cr]; Stdnt Opt. Prereq—Business admin PhD student or #) Topics, which vary by semester, are selected from new areas of research, research methods, and significant issues.

IDSC 8801. Research Seminar in Information and Decision Sciences. (2 cr [max 20 cr]; Stdnt Opt. Prereq—Admin PhD student or #) New areas of research, research methods, issues.

IDSC 8892. Readings in Information and Decision Sciences. (1–8 cr [max 16 cr]; Stdnt Opt. Prereq—Business admin PhD student or #) Readings useful to a student’s individual program and objectives that are not available through regular courses.

IDSC 8894. Graduate Research in Information and Decision Sciences. (1–8 cr [max 16 cr]; Stdnt Opt. Prereq—Business admin PhD student or #) Individual research on an approved topic appropriate to student’s program and objectives.

Infrastructure Systems Engineering (ISE)
Center for the Development of Technological Leadership

Institute of Technology
ISE 5101. Project Management. (3 cr; A-F or Aud. Prereq—ISE student) Broad areas in project management and leadership. Emphasizes practical understanding of business/ engineering project management. Project planning, scheduling, controlling. Budgeting, staffing, task/cost control. Communicating with, motivating, leading, and managing conflict among team members. Lectures, discussions, experiential exercises.


ISE 8105. Capstone Project. (1–2 cr [max 3 cr]; A-F or Aud. Prereq—ISE student) Integrates knowledge from courses in Master’s program with job experience. Students prepare proposal, conduct project, and report results in written and oral form. Project involves aspects of design, management, or operation of some feature of infrastructure.

ISE 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser approval, DGS approval)

Innovation Studies (IS)
College of Continuing Education
IS 5001. Introduction to Innovation Studies. (1–4 cr [max 4 cr]; A-F or Aud. Prereq—%) Key concepts/models from sociology, futures study, and business. Innovative, team leadership strategies. Definition/application of just-in-time concept. Life-long self-improvement skills.

IS 5002. Final Project for Innovation Studies. (1–4 cr [max 4 cr]; A-F or Aud. Prereq—Completion of IS requirements, %) Either an internship in an organization or a hands-on study project on a contemporary issue or problem. Students apply expertise/ideas to a real-world situation.

IS 5100. Innovation Studies Seminar. (1–4 cr [max 24 cr]; A-F or Aud. Prereq—%) Innovation studies topics.

IS 5950. Special Topics. (1–4 cr [max 12 cr]; A-F or Aud. Prereq—%) Special interdisciplinary topics.

Insurance and Risk Management (INS)
Industrial Relations Center

Curtis L. Carlson School of Management

Interdisciplinary Archaeological Studies (INAR)
College of Liberal Arts
INAR 5100. Topics in Interdisciplinary Archaeological Studies. (5 cr; A-F or Aud. Prereq—InAr grad major or %) Topics specified in the Class Schedule.

INAR 8004. Method and Theory in Archaeology. (3 cr; A-F or Aud. Prereq—InAr grad major or %) Survey and evaluation of archaeological approaches to non-literary, material evidence for past human activities and societies.

INAR 8100. Interdisciplinary Seminar. (3 cr; A-F or Aud. Prereq—InAr grad major or %) Review and evaluation of approaches to interdisciplinary research; themes vary. Leadership and research shared by staff, visitors, and students.

INAR 8200. Directed Readings. (1–7 cr [max 7 cr]; Stdnt Opt. Prereq—InAr grad major or %)

INAR 8300. Directed Research. (1–7 cr [max 7 cr]; Stdnt Opt. Prereq—InAr grad major or %)

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

INAR 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)
Interpersonal Relationships Research (IREL)

College of Education and Human Development

IREL 8001. Proseminar in Interpersonal Relationships Research. (1 cr; max 2 cr; S-N only) = IREL 8001. Seminar: Interpersonal Relationships Research. (1-3 cr; max 6 cr; S-N only)

Overview of major topics, including theoretical assumptions, methods, and samples of current research.

IREL 8021. Seminar: Statistical and Methodological Issues in Research on Dyadic Relationships. (3 cr; S-N only) = IREL 8021. Seminar: Statistical and Methodological Issues in Research on Dyadic Relationships. (1 cr; S-N only)

Focuses on issues of identity, gender, and cultural representation in modern Italy. Focuses on issues of identity, gender, and cultural representation in modern Italy.

IREL 8360. Seminar: Topics in Interpersonal Relationships Research. (1-3 cr; max 6 cr; S-N only) = IREL 8360. Seminar: Topics in Interpersonal Relationships Research. (1-3 cr; max 6 cr; S-N only)

Intensive study of topics.

Introductory Courses (ISG)

ISG 5010. Risk Analysis for Introductory Species and Genotypes. (1 cr; A-F only, Prereq: Grad student or sr, #) = ISG 5010. Risk Analysis for Introductory Species and Genotypes. (1 cr; A-F only, Prereq: Grad student or sr, #)


ISG 5020. Risk Analysis Modeling for Introductory Species and Genotypes. (1 cr; S-N only, Prereq: ISG 5010 or equiv, #) = ISG 5020. Risk Analysis Modeling for Introductory Species and Genotypes. (1 cr; S-N only, Prereq: ISG 5010 or equiv, #)

Four-day workshop. Role/mechanics of mathematical modeling within ecological risk assessment. Integrated exercises, cases.

ISG 8001. Discussions in Introductory Species and Genotypes. (1 cr; max 10 cr; S-N only) = ISG 8001. Discussions in Introductory Species and Genotypes. (1 cr; max 10 cr; S-N only)

Forum for presentation of dissertation proposals, results from ISG practica, discussion of environmental risk assessment techniques, papers on ongoing research or key publications on introduced species/genotypes.

ISG 8021. Problem Solving Practicum in Risk Analysis. (3 cr; max 6 cr; A-F only, Prereq: ISG 5010, ISG 5020) = ISG 8021. Problem Solving Practicum in Risk Analysis. (3 cr; max 6 cr; A-F only, Prereq: ISG 5010, ISG 5020)

Students address real-world problems in environmental risk analysis of introduced species and genotypes, with faculty guidance and in consultation with public/private partner, and apply societal deliberation and scientific/policy analysis.

Course Descriptions

JOURNAL 5101. Health Writing. (3 cr; A-F or Aud. Prereq—[[3004W or 3004Y], [3101 or 3101H], [3121, [jou major or approved ICP major or BIS major or IDM major]] or enrolled in MA in health journalism or grad student or #) Overview/techniques of news reporting/writing. Complex health topics. Techniques of other forms of health writing, including health feature writing and health news media/communication.

JOURNAL 5131. Capstone: In-Depth Reporting. (3 cr; A-F or Aud. Prereq—[[3004W or 3004Y], [3101 or 3101H], [3121, [jou major or approved IDM major or ICP major or BIS major]] or grad student) Techniques/issues of special project stories. Exploratory, investigative, civic, and literary or ethnographic journalism. Topics (e.g., civil rights, governmental malfeasance, health care problems) typically involved in these stories.

JOURNAL 5155. Capstone: Database Reporting. (3 cr; A-F only. Prereq—[[3004W or 3004Y], [3101 or 3101H], [3121, [jou major or approved ICP major or BIS major]] or grad student) Obtaining/analyzing digital data for computer-assisted reporting that can be published on various media platforms. Using spreadsheets/databases to manage information, find news stories, and produce maps/graphics.

JOURNAL 5172. Capstone: Magazine Editing and Production. (4 cr; A-F or Aud. Prereq—[[3004W or 3004Y], [3101 or 3101H], [3115 or 3117W or 3321 or 4202]], [jou major or approved IDM major or ICP major or BIS major]] or grad student) Writing, editing, illustration, design, layout, and photocomposition of print or Web magazine. Emphasizes reporting, telling substantive stories. Students work in groups with varying specializations.

JOURNAL 5195. Online Media Creation and Design. (3 cr; A-F or Aud. Prereq—JOUR 5159H, JOUR 8195. Prereq—[[3004W or 3004Y], 3101, 3121, jou major] or #) Concepts/development of online media products. Health news/informational opportunities in new media.

JOURNAL 5195H. Online Media Creation and Design. (3 cr; A-F or Aud. Prereq—JOUR 5195J, JOUR 8195. Prereq—[[3004W or 3004Y], 3101, 3121, jou major] or #) Concepts/development of online media products. Health news/informational opportunities in new media.

JOURNAL 5251. Psychology of Advertising. (3 cr; A-F or Aud. Prereq—jou major or min or design comm or graphic pre-design or design comm or graph design or IDM/ICP/BIS or #) Psychological principles, research techniques, and applications in advertising/selling. Consumer attitudes/behavior. Psychological mechanisms upon which effectiveness of advertisements/commercials depends.

JOURNAL 5316. Theories of Visual Communication. (3 cr; A-F or Aud. Prereq—Instructor approval for non-jour majors or [[3006, [jou major or jou minor or approved ICP major or approved ICP major or approved BIS major]] or Grad student) Perspectives on study/analysis of visual communication. Message structure, systems of production, use of visual media. Contributions from sociology, anthropology, psychology, and history.

JOURNAL 5501. Communication and Public Opinion. (3 cr; A-F or Aud. Prereq—Non-jour major or jou major with course appr on prog plan or prejor with adviser approval) Theories of communication, persuasion, attitude change. Functions of interpersonal-mediated communication in diffusion of information and in opinion formation.

JOURNAL 5541. Mass Communication and Public Health. (3 cr; Stdnt Opt. Prereq—Jour major or jou minor or grad major or IDM major or ICP major or BIS major) Intersection of mass media, public health, and behavior. Role of theory in understanding intended/ unintended campaign effect. Role of health journalism, decisions that inform media-based interventions.

JOURNAL 5542. Theory-based Health Message Design. (3 cr; A-F or Aud. Prereq—Enrolled in MA in health journalism or grad student or jou major or mass comm minor or approved IDM major or ICP major or BIS major) or #) Best practices for message design across media/contexts. Students apply concepts to design health campaign messages that affect various audiences. Implications of theories of message engagement for current public health practice.

JOUR 5543. Public Health Campaign Evaluation. (3 cr; A-F or Aud. Prereq—[enrolled in MA in health journalism or grad student or jou major or mass comm minor or approved IDM major or ICP major or BIS major] or #) Draws upon the campaign evaluation literature. Recommendations on evaluation research design. Cross-sectional, experimental, and time-based designs. Focuses on summative efforts.

JOURNAL 5552. Law of Internet Communications. (3 cr; A-F or Aud. Prereq—[enrolled in MA in health journalism or grad student or jou major or mass comm minor or approved IDM major or ICP major or BIS major]) or #) Whether/how/which traditional media laws/ regulations apply to the Internet. Developing law of communication on Internet, global/ethical issues.

JOUR 5601W. History of Journalism. (3 cr; A-F or Aud. Prereq—Jour major or jou minor or approved IDM major or ICP major or BIS major; IDL sections are open to non-majors; prereqs do not apply to IDL sections) Development of American media, from beginnings in Europe to present day. Rise of film/radio/television/Internet. Relation of communications development to political, economic, social trends.

JOUR 5606W. Literary Aspects of Journalism. (3 cr; A-F or Aud. Prereq—Jour major or jou minor or approved IDM major or ICP major or BIS major; IDL sections are open to non-majors; prereqs do not apply to IDL sections) Literary aspects of journalism as exemplified in, and influenced by, works of American/British writers, past/present. Lectures, discussions, weekly papers, critiques.

For definitions of course numbers, symbols, and abbreviations, see page 214.
JOUR 5195. Seminar: Health Journalism and Communication. (3 cr; A-F or Aud. Prereq-MA grad student or #) Concepts/development of online media products. Health news and informational opportunities in new media.


JOUR 8202. Advanced Health Journalism: Computer-Assisted Reporting on Health. (3 cr; A-F or Aud. Prereq-Enrolled in MA in health journalism or #) How to use data/databases to tell health news stories or help with health campaigns. Databases, how to access them. How to mine data for effective communication to consumer audience.


JOUR 8192. Health Journalism. (3 cr; A-F or Aud. Prereq-Non-jour major or [jour major, course appr on prog plan]) How to use data/databases to tell health news stories or help with health campaigns. Databases, how to access them. How to mine data for effective communication to consumer audience.

JOUR 8514. Seminar: Mass Communication Theory. (3 cr; A-F or Aud. Prereq-5316, [8001, 8002] or #) Theoretical approaches, analysis of research methods, development of research designs/projets.

JOUR 8517. Seminar: Visual Communication Research. (3 cr; A-F or Aud. Prereq-5316, [8001, 8002] or #) Theoretical approaches, analysis of research methods, development of research designs/projects.

JOUR 8501. Seminar: The Process of Quantitative Mass Communication Research. (3 cr; A-F or Aud. Prereq-9 cr soc sci, EPsys 5260 or equiv or Psys 5260) Logic of social sciences research. Relationship between theory and research, concept explication, measurement, instrumentation, and design issues.

JOUR 8502. Seminar: Multi-method research in Mass Communication. (3 cr; A-F or Aud. Prereq-8501, [EPsys 5260 or equiv or PSys 5260]) Quantitative/qualitative research principles/techniques applied to mass communication and kindred questions. Reliability, generalizability, and validity in their classic/contemporary senses. Survey methods, focus groups, interviews, other methods. Emphasizes "triangulation" of diverse methods.


JOUR 8620. Seminar: Advertising Research. (3 cr [max 12 cr]; A-F or Aud. Prereq--5251 or #) Advertising as persuasive communication. Current research/theory related to advertising decision-making process.

JOUR 8631. Seminar: Mass Media and Social Change. (3 cr; A-F or Aud. Prereq--8001 or 8002 or equiv) Interplay between social theories and media studies. Pragmatism, structural-functionalism, Marxism, political economy, cultural studies, globalization.


JOUR 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq--Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 14% for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

JOUR 8671. Seminar: Communication Ethics--Public/Civic Journalism. (3 cr; A-F or Aud) Historical underpinnings, philosophical debate, theoretical dynamics, legal concerns, ethical implications.


JOUR 8675. Seminar: Issues in Information Access and Communication. (3 cr; A-F or Aud) Societal, industry, technological, and policy aspects/developments that affect information access, particularly through mass media.

JOUR 8678. Seminar: Constitutional Law--Theories of Freedom of Expression. (3 cr; A-F or Aud. + LAW 6039, Prereq--5777 or #) Problems of constitutional/tort law affecting the press. Underlying theories.

JOUR 8679. Seminar: Research Methods in Media Ethics and Law. (3 cr; A-F or Aud) Research at intersection of first amendment and media ethics.

JOUR 8681. Seminar: Media and Globalization. (3 cr; A-F or Aud. Prereq--4801 or 5825 or #) Main problems/currents. Concepts, research, policy relevant to global development. Issues of freedom/constraint, media technology, role of journalism in world affairs.

JOUR 8711. Seminar: Communication Agencies as Social Institutions. (3 cr; A-F or Aud) Influence/efficacy of mass communication, internal dynamics of media organizations, criticism/modes of reform. Theoretical frameworks for analysis.

JOUR 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))

JOUR 8801. Seminar: Comparative Research in Mass Communication, a Cross-National Approach. (3 cr; A-F or Aud. Prereq--4801 or #5285) Comparative research design/strategies. Analysis of production, presentation, transmission, and consumption of mass media products/services (particularly news, entertainment, and information) across national borders. Theoretical concerns, empirical problems, policy. Ethical issues involving research on form/content of mass communication within/between countries.

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

JOUR 8990. Special Problems in Mass Communication. (3-4 cr [max 12 cr]; A-F or Aud) Topics specified in Class Schedule.

JOUR 8993. Directed Study. (1-6 cr [max 6 cr]; A-F or Aud. Prereq--Grad mass comm major or minor, #, #) Directed study.

Kinesiology (KIN)

School of Kinesiology

College of Education and Human Development

KIN 5001. Foundations of Human Factors/Ergonomics. (3 cr; A-F or Aud. +HUMF 5001) Variety in human performance as influenced by interaction with designs of machines and tools, computers and software, complex technological systems, jobs and working conditions, organizations, and sociotechnical institutions. Emphasizes conceptual, empirical, practical aspects of human factors/ergonomic science.

KIN 5013. Developmental/Adapted Physical Education. (3 cr; A-F or Aud) Introduction to physical education for students with disabilities, emphasizing conceptual, organizational, and administrative issues. Topics include historical and legal foundations, service components, individualized education plans, professional roles, and assessment of movement skills.

KIN 5014. Physical Activities for Persons with Disabilities. (3 cr; A-F or Aud) Different approaches to providing physical education service and related movement interventions for persons with disabilities. Topics: movement behavior foundations, movement skill progressions, unique considerations for specific impairments, and sport for persons with disabilities.

KIN 5111. Sports Facilities. (3 cr; A-F or Aud. Prereq--KIN or Rec grad student or MEd student) Steps in planning/building facilities for athletics, physical education, and sport for college, professional, and public use.

KIN 5115. Event Management in Sport. (3 cr; A-F or Aud. Prereq--Grad student, #) Techniques/principles of planning, funding, and managing sport events. Legislative, championships, non-profit events, benefits, professional events.

KIN 5122. Applied Exercise Physiology. (3 cr; A-F or Aud. Prereq--4385 or equiv or #) Mechanisms of cardiorespiratory and muscular responses to exercise; application of exercise physiology to assessment of work capacity, athletic conditioning, and requirements of human powered vehicles; low to moderate exercise as an intervention in lowering risk for common health problems.

KIN 5123. Motivational Interventions in Physical Activity. (3 cr; A-F only. Prereq--3120W or grad student)

Psychological principles related to physical activity (PA). Delivery of motivational interventions for physical activity. Motivational PA interventions. Two papers, one presentation, two exams.

KIN 526. Sport Psychology. (3 cr; Stdnt Opt. Prereq--3126 or equiv or #)

Theory and research in sport psychology. Focus on the psychological study of human behavior in sport and physical activity settings.

KIN 536. Psychology of Coaching. (3 cr; Stdnt Opt)

Psychological dimensions of coaching across age levels, including coaching philosophy, leadership, communication skills, mental and mental skills training for performance enhancement.

KIN 541. Nutrition for Health and Physical Performance. (3 cr; A-F or Aud. Prereq--FSCH 1112 or equiv)

Requirements and physiologic roles of nutrients and physical activity in promotion of health/performance. Assessment of energy requirements. RDAs, food composition/safety, weight management. Prevention of chronic diseases; emphasizes coronary heart disease.

KIN 542. Applied Sport Nutrition for Athletic Performance. (3 cr; A-F or Aud. Prereq--initial licensure/MEd phys ed student)

Trends, issues, and challenges in early childhood/K-12 physical education. Potential effect on curriculum.

KIN 571. Foundations of Kinesiology. (3 cr; A-F or Aud. Prereq--Kin major or #)

Introduction to the emerging field of kinesiology, broadly conceived as the study of human movement. Development and emergence of the term kinesiology and the scholarly, political, and educational ramifications of its development.

KIN 576. Practicum: Developmental/Adapted Physical Education. (1-4 cr [max 4 cr]; S-N or Aud. Prereq--5103 or #5103 or #5104 or #5104 or #; KIN undergraduate pre-teaching with sr status are limited to 2 practicum hrs)

Observation of, participation in physical education instruction for students with disabilities. Current issues in developmental/adapted physical education. Exchange of ideas/problems.


KIN 5731. Sport and Society. (3 cr; A-F or Aud. Prereq--3120W, grad student or #)

Sport, sporting processes, social influences, systems. Structures that have effected and exist within/among societies, nations, and cultures. Contemporary issues such as social differentiation, violence, and honesty.
KIN 5375. Competitive Sport for Children and Youth. (3 cr; Stdnt Opt.) Cognitive, behavioral, biophysical, and psychological factors having important implications for competitive sport participants from early childhood through high school age. Emphasis on translating sport science research into practical implications for youth sport coaches, teachers, and administrators.

KIN 5385. Exercise for Disease Prevention and Management. (3 cr; A-F or Aud. Prereq-Undergrad [physiology or biology]) Exercise testing/prescription with modifications required because of special considerations associated with aging, gender differences, environmental conditions, or presence of medical conditions.

KIN 5421. Sport Finance. (3 cr; A-F or Aud. Prereq-Grad student or #) Introduction to financial analysis in sport. Cash flow statements, budgeting issues, traditional/innovative revenue producing strategies available to sport organizations. Discussion, practical analysis of current market.

KIN 5435. Advanced Theory and Techniques of Exercise Science. (3 cr; A-F or Aud. Prereq-[3535, 4535] or #) Theoretical constructs, in-depth description of procedures used in exercise science research and clinical settings. Laboratory exercises, lectures.

KIN 5461. Foundations of Sport Management. (3 cr; A-F or Aud. Prereq-Kin rec or rec postbac or grad student or #) Theories/techniques in administration/management of sport enterprises. Organizational theory/policy, practical examples of sport management skills/strategies.


KIN 5505. Human-Centered Design - Principles and Applications. (3 cr; Stdnt Opt. Prereq-KIN 3505) Application of design to meet human needs. Design of fabricated products, tools/machines, software/hardware interfaces, art/culture, living environments, and complex sociotechnical systems.

KIN 5511. Women in Sport and Leisure. (3 cr; A-F or Aud. Prereq-REC 5511) Critically examines women’s involvement in/ contributions to sport, physical activity, and leisure.

KIN 5601. Sport Management Ethics and Policy. (3 cr; A-F or Aud. Prereq-MEd or grad student or #) How to critically analyze ethical concepts that underpin or inform sport policies and evaluate sport policies from a normative point of view. Selected sport policy issues are used to illustrate relevance of ethical considerations in policy development and to explore the ethical implications of sport policy.

KIN 5631. Programming and Promotion in Sport. (3 cr; A-F or Aud. Prereq-Kin rec or Rec grad student or #) Introduction to marketing concepts as they apply to sport industry. Consumer behavior, market research, marketing mix, corporate sponsorship, licensing. Discussion, practical application.

KIN 5641. Scientific Theory and Application of Training and Conditioning in Sport. (3 cr; A-F or Aud. Prereq-SPST 4641 or SPST 4641 or SPST 4641 or SPST 4641 or exercise physiology course or #) Current scientific literature on physiological adaptation through training/conditioning for sport. Applying methods/research journals to improve physiological adaptation through training/conditioning with sport specificity.

KIN 5696. Practicum in Kinesiology. (1-6 cr) [max 6 cr] 5-N or Aud. Prereq-Grad student in KIN, #) Practical experience in kinesiology under supervision of a University adviser and an agency supervisor.

KIN 5720. Special Topics in Kinesiology. (1-8 cr [max 8 cr]) Stdnt Opt. Prereq-Kin upper div undergrad or grad student or #) Current issues in the broad field and subfields in kinesiology, or related coursework in areas not normally available through regular offerings.

KIN 5722. Human Factors Psychology. (3 cr; A-F or Aud. Prereq-Grad student or #) Psychological principles that underlie human interactions with technological systems. Techniques/methodologies to assess faulty/incorrect system design. Emphasizes human-centered approaches. Rigorous evaluation of human-machine interaction.


KIN 5725. Organization and Management of Physical Education and Sport. (3 cr; A-F or Aud. Prereq-Grad/initial licensure or #) Comprehensive analysis of organization and management of physical education and sport in educational settings. Focus on management and planning processes, management skills, functions, roles, decision making, leadership, shared systems, and organizational motivation. For physical education teachers, coaches, community sport administrators.

KIN 5740. Topics: Coaching of Individual, Dual, or Team Sports. (1-9 cr [max 9 cr]; A-F or Aud) Instruction at the advanced level, including analyses of skills, game strategies, specific techniques of coaching, and methods of training and conditioning.

KIN 5801. Legal Aspects of Sport and Recreation. (4 cr; A-F or Aud. Prereq-Kin rec or rec major) Legal issues related to recreation, park, and sport programs/facilities in public/private sectors.

KIN 5941. Neural Basis of Movement. (3 cr; A-F or Aud. Prereq-[3131, CNB 1027 or equiv], [Phsl 3051 or equiv]) Overview of various neural subsystems involved in controlling human/primate sensorimotor behavior. Effects of brain lesions on overt behavior, possibilities for rehabilitation. Systems theory approach. Lectures, seminars, class presentations.

KIN 5981. Research Methodology in Kinesiology, Recreation, and Sport. (3 cr; A-F or Aud. Prereq-Rec 5981, Rec 3015 or equiv) Defines/reviews various types of research in exercise/sport science, physical education, and recreation studies. Qualitative research, field studies, and methods of introspection as alternative research strategies to traditional scientific paradigm.

KIN 5987. Professional Skills and Grant Writing for Health Sciences. (2 cr Prereq-Grad student) Introduction to structure/function of different organizations (e.g., NIH, AHA). Writing/reviewing grants/manuscripts. Preparing for a job in academia.

KIN 5992. Readings in Kinesiology. (1-9 cr [max 9 cr]) A-F or Aud. Prereq-CEHD student, grad, #) Independent study to further student research. Requires written consent of supervising faculty.

KIN 5995. Research Problems in Applied Kinesiology. (1-6 cr [max 6 cr]; A-F or Aud. Prereq-[Grad or MEd student in Kin], #) Selected topics in physical activity/human performance.


KIN 8122. Seminar: Exercise Physiology. (2-6 cr [max 6 cr]; A-F or Aud. Prereq-5122 or equiv or #) Classic and contemporary literature in exercise physiology and allied disciplines, emphasizing contributions of major leaders in the field and opportunities for interdisciplinary research.

KIN 8126. Seminar: Sport Psychology. (3 cr; A-F or Aud. Prereq-5126 or instr approval) Literature, theoretical constructs, research methodology, design. Focuses on student-selected topics/problems.

KIN 8128. Doctoral Sport Management Seminar. (3 cr; A-F only, +REC 8128. Prereq-PhD student, #) Analysis of current literature, theoretical constructs, research methodology and design relative to sport management. Focuses on student-selected topics, research problems.

KIN 8132. Seminar: Motor Development. (3 cr; A-F or Aud. Prereq-4132 or equiv or #) Contemporary research literature focusing on motor skill development from before birth to senescence. Emphasizes interaction between physical, environmental, and performer constraints, and coordination/control of movement.

KIN 8135. Seminar: Motor Control and Learning. (3 cr [max 6 cr], A-F or Aud. Prereq-4135 or equiv or #) Advanced reading and discussion of research on motor control, motor learning, and human performance.

KIN 8211. Perception and Action. (3 cr; Stdnt Opt. Prereq-[CEHD or Psy] grad student or #) Survey of theories/research on use of perceptual information for control of action. Focuses on behavioral research on perceptual guidance of daily activities (e.g., standing, walking, driving). Perceptual control in context of expertise (e.g., sports). Perceptual-motor development.

KIN 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

KIN 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

KIN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st 2nd or 3rd 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

KIN 8669. Internship: Applied Sport Psychology. (3-6 cr [max 6 cr]; 5-N or Aud. Prereq-5126, 8126, PhD student, #) Supervised internship; emphasis on educational sport psychology approaches to athletic performance enhancement and psychological adjustment to sport injury.
Laboratory Medicine and Pathology (LAMP)

Department of Laboratory Medicine and Pathology

Medical School

LAMP 5100. General and Systemic Pathology for Dental Students. (4 cr; A-F or Aud. Prereq–Regis dental student)
Causes, courses, mechanisms and outcomes of disease. Required as preparation for clinical dental practice and oral pathology.

LAMP 5125. Chronobiology. (2-6 cr [max 6 cr]; O-N or Aud)
How to interpret biologic time series and how to use them in practice as well as in designing chronobiology experiments. Chronobiologic procedures of data collection and analysis, interpretation of the output in clinical practice.

Landscape Architecture (LA)

Department of Landscape Architecture

College of Design

LA 5201. Making Landscape Spaces and Types. (6 cr; A-F or Aud. Prereq–B.E.D. accelerated status or LA grad or #)
Design exploration using 3-D models and historical precedent studies to create outdoor spaces for human habitation and use. Application of the basic landscape palette of landform, plants, and structures to give physical, emotional, cognitive, and social definition to created places.

LA 5202. Landscape Analysis Workshop. (1 cr; S-N or Aud)
Introduction to field techniques for site analysis, including vegetation, soil, and landform description. One-week session, before fall term, at lake Itasca Forestry and Biological Station.

LA 5203. Ecological Dimensions of Space Making. (6 cr; A-F or Aud. Prereq–LA major or #; recommended for both BED and Grad students)
Design studio experience drawing on ecological, cultural, aesthetic influences to explore development of design ideas responsive to ecological issues and human experience.

LA 5204. Landscape Ecology. (3 cr; Stdnt Opt. Prereq–B.E.D. accelerated status or LA grad student or #)
Relationships among spatial patterns, temporal patterns, ecological processes in landscape. Factors affecting landscape patterns, measurement of landscape pattern, material transport through landscape, effects of landscape pattern on population dynamics, landscape planning.

LA 5301. Introduction to Landscape Architecture Drawing. (3 cr; Stdnt Opt. =LA 1501; or LA grad student or accelerated B.E.D. student)
Perceiving/representing material environment. Sketching/drawing conventions, visual phenomena/forestation.

LA 5351. AutoCAD I. (3 cr; Stdnt Opt. Prereq–B.E.D. major or LA grad or #; may not be taken for graduate credit)
Basic concepts, tools, and techniques of computer-aided drawing. Introduction to current AutoCAD Release software. Strategies and techniques for producing dimensioned and annotated drawings. Introduction to 3-D drawing capabilities. Use of dimension variables, attributes, blocks, symbols, and creation of customized menus.

LA 5352. AutoCAD II. (3 cr; Stdnt Opt. Prereq–Arch 5351 or LA 5351; B.E.D. major or LA grad or #; may not be taken for graduate credit)
Intermediate concepts, tools, and techniques of computer-aided drawing with current AutoCAD Release software. Strategies and techniques for producing dimensioned and annotated drawing. Use of dimension variables, attributes, blocks, symbols, and creation of customized menus.

LA 5371. Computer Methods I. (1 cr; S-N or Aud. =ARCH 5371; Prereq–B.E.D. accelerated status or LA grad or #)
Introduction to current techniques, programs, and new editions of computer programs, and their application to landscape architecture computing.

LA 5372. Computer Methods II. (1 cr; S-N or Aud. =ARCH 5372; Prereq–Arch/LA 5371; LA grad or #)
Current techniques and computer programs, and their application to landscape architecture computing.

LA 5373. Computer Methods III. (3 cr; Stdnt Opt. =ARCH 5373; Prereq–LA grad or #)
Advanced techniques and computer programs, and their application to landscape architecture computing in design, theory, and technology.


LA 5400. Topics in Landscape Architecture. (1-3 cr [max 12 cr]; Stdnt Opt. Prereq–B.E.D. accelerated status or LA grad or #)
Current topics in landscape architecture. Taught by regular or visiting faculty in their areas of specialization.

LA 5401. Directed Studies in Emerging Areas of Landscape Architecture. (1-3 cr [max 12 cr]; Stdnt Opt. Prereq–#)

LA 5402. Directed Studies in Landscape Architecture History and Theory. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq–#)
Independent studies under the direction of landscape architecture faculty.

LA 5403. Directed Studies in Landscape Architecture Technology. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq–#)
Independent studies under the direction of landscape architecture faculty.

LA 5404. Directed Studies in Landscape Architecture Design. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq–#)
Independent studies under the direction of landscape architecture faculty.

LA 5405. Interdisciplinary Studies in Landscape Architecture. (1-6 cr [max 12 cr]; A-F or Aud. Prereq–LA grad or #)
Research, planning, or design projects. Topics vary.

LA 5406. Urban Design Journal. (3-4 cr [max 4 cr]; A-F or Aud. Prereq–Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark)
Methods and theories in urban design and human behavior. Students develop journal as tool for experiencing, analyzing, and recording the urban landscape, its fabric, spatial elements, and individual components, and for analyzing design solutions.

LA 5407. Landscape Architecture Studio. (3-4 cr [max 4 cr]; A-F or Aud. Prereq–Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark)
Individual and small-group projects focusing on urban issues; design process in Danish conditions; solutions based on knowledge of Danish problems in landscape and urban design and an understanding of how these problems are solved within Danish and European contexts.

LA 5408. Landscape Architecture, Architecture, and Planning. (1-3 cr [max 4 cr]; A-F or Aud. Prereq–Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark)
Methods and theories in urban design and human behavior. Students develop urban design journal as tool for experiencing, analyzing, and recording the urban landscape, its fabric, spatial elements, and individual components, and for analyzing design solutions.

LA 5413. Introduction to Landscape Architectural History. (3 cr; A-F or Aud. Prereq–One course in history at 1xxx or higher)
Introductory course examines the multiple roots of landscape architecture by examining the making of types of landscapes over time. Emphasis on ecological and environmental issues, and issues related to political, economic, and social contexts of landscape architectural works.

LA 5431. History of Landscape Architecture: Individual Influences. (3 cr; A-F or Aud)
Assessment of influences of individuals on formation of the profession of landscape architecture from 1800 to present. Lectures, presentations, field trips, readings, papers, projects.

LA 5571. Landscape Construction: Landform Systems and Spatial Performance. (3 cr; A-F or Aud. Prereq–Accelerated BED student or LA grad student)
Theory and professional applications of landform systems for design. Landform typology, representation methods, manipulation techniques, use of land survey data, earthwork construction issues. Spatial accommodation of vehicles in landscape architecture, including road design.

LA 5572. Plants in Design. (3 cr; A-F or Aud. Prereq–[5201, 5203, plant identification course] or #)

Design principles for using plants in landscape. Cultural/ecological principles in design projects of various scales. Lectures, presentations, field trips, readings, projects.

LA 5573. Landscape Technology: Introduction to Geographic Information Systems. (5 cr; A-F or Aud. Prereq–jr or B.E.D. major or LA grad or #)
GIS as an analytical tool to solve geographical problems of regional landscape design and resource management. Topics include application techniques, analytical procedures, data characteristics, data sources, input/output methods, and implementation.
LA 5574. Identification of Minnesota Flora. (3 cr; A-F or Aud. Prereq-BED accelerated status or LA grad student or #) Introduction to identification of approximately 500 plants commonly used by landscape architects and environmental designers in Minnesota. Students develop a working knowledge of over 250 plants. Focuses on plant selection techniques, plant landscape associations, and issues of plants for use in standard landscape architectural settings. Regular field sessions.

LA 5721. Proseminar in Metropolitan Design. (3 cr; A-F or Aud. *ARCH 5721, Prereq-[Arch 5711 or equiv], enrollment in CMD prog or #) Reading seminar. Evolution of the contemporary city. Dynamics that created contemporary urban spatial patterns. Planning/design theories that have guided public interventions in the built environment. Thematic texts, classroom discussions.

LA 5790. Special Topics in Metropolitan Design. (3 cr [max 6 cr]; A-F or Aud. *ARCH 5790) Prereq-Enrollment in CMD prog or #)

LA 8201. Designing Landscapes for Dwelling and Settlement. (6 cr; A-F or Aud. Prereq-5203, 5571, grad LA major, &8202 or #) Professional design studio. Hypothetical projects include development of schematic master plans for site layout, grading, and planting. Design for residential, commercial, and civic uses with attention to zoning and other controls, environmental quality, human behavior, markets, project finance, and techniques. Requires concurrent registration in LA 8202.

LA 8202. Design of Planned Developments. (2-3 cr [max 6 cr]; Stdnt Opt, Prereq-Grad LA major or #) Issues related to planned community developments: historical precedents; design for residential, commercial, and civic uses; role of zoning and other controls; deed restrictions; preparation of design brief; environmental quality; human behavior; market; project finance; and techniques of site development.

LA 8203. Making Regional Landscape Space. (6 cr; A-F or Aud. Prereq-8202, grad LA major, concurrent enrollment 8204 or #) Design exploration of landscape ecology, landscape perception, regional economics, and public policy as informants of design decision-making in regional landscapes at or exceeding township level. Geographic information systems as design tools.

LA 8204. Regional Landscape Space. (3 cr; A-F or Aud. Prereq-Grad LA major or #) Theoretical investigations and current advances in use of landscape ecology, landscape perception, regional economics, and public policy as informants of design decision-making in regional landscapes at or exceeding township level. Geographic information systems as design tools.

LA 8205. Urban Form Options: Landscape Architecture Studio. (6-8 cr [max 8 cr]; Stdnt Opt, Prereq-2 yrs of studio, grad LA major or #) Urban landscape design issues, theories, and problems explored via formal/spatial inquiry in studio, reading, and the exposition of ideas in paired seminar. Urban systems, gathering spaces, ecology, infrastructure, recreation, and public space.

LA 8301. Landscape Architecture: Research Issues and Methods. (3 cr; A-F or Aud. Prereq-8201 or 8202, grad LA major or #) Alternative methodological approaches to landscape architectural research and consideration of their appropriateness for contemporary research topics.

LA 8302. Professional Practice. (3 cr; A-F or Aud. Prereq-8205, grad LA major or #) Office and project management case studies. Organizational behavior, marketing, sales, strategic planning, financial and cost accounting, insurance, legal issues and contracts.

LA 8333. FTE: Masters. (1 cr; No grade, Prereq-Master’s student, adviser and DGS consent)

LA 8400. Topics in Landscape Architecture. (1-5 cr [max 12 cr]; Stdnt Opt. Prereq-Grad LA major or #) Seminar offered by regular or visiting faculty in their area of specialization. Content varies with interest of instructor.

LA 8401. Directed Studies in Emerging Areas of Landscape Architecture. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq-Grad LA major or #) Current topics in landscape architecture. Seminar offered by regular or visiting faculty in their area of specialization. Subject matter varies with instructor.

LA 8402. Directed Studies in Landscape Architecture History and Theory. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq-Grad LA major or #) Advanced independent studies under direction of landscape architecture faculty.

LA 8403. Directed Studies in Landscape Architecture Technology. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq-Grad LA major or #) Advanced independent studies under direction of landscape architecture faculty.

LA 8404. Directed Studies in Landscape Architecture Design. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq-Grad LA major or #) Research, planning, and/or design project. Sample topics: energy efficient design, historic preservation, urban revitalization, agricultural land use, computerized land-use planning, housing.

LA 8406. Concepts of Landscape Evaluation. (3 cr; A-F or Aud. Prereq-Grad land arch major or #) Philosophical basis for wide-ranging approaches to evaluating qualitative aspects of landscape. Aesthetic factors and integration of landscape evaluation into regional design decision-making.

LA 8407. Perception Manipulation in Design of Exterior Space. (3 cr; Stdnt Opt, Prereq-Grad land arch major or #) Historic and modern design devices that alter one’s sense of spatial control and arrangement to create illusionary situations in exterior environment. Organized to inform and test principles of perception distortion in exterior space.

LA 8408. 18th-Century Landscape Theory: Nature and the Sublime, the Beautiful, and the Picturesque. (3 cr; A-F or Aud. Prereq-Grad land arch or arch major or #) Eighteenth-century landscape architectural theory underpinned most modern western traditions in landscape architecture. These theoretical positions framed the nature of Nature in the context of human experience through treaties and works of landscape architecture.

LA 8409. Fitting Buildings to the Land. (3 cr; A-F or Aud. Prereq-Land arch or arch grad student with 1 yr grad design or #) Exercises and projects in site manipulation to adjust structures and attendant uses and circulation to specific land parcels.

LA 8554. Project Programming. (1 cr [max 3 cr]; A-F or Aud. Prereq-8203, grad land arch major or #) Individual research in preparation for final studio.

LA 8555. Advanced Landscape Planning and Design. (6 cr; A-F or Aud. Prereq-8205, grad land arch major or #) Advanced studies in area of student’s choice.

LA 8574. Landscape Storm Water Management. (3 cr; Stdnt Opt. Prereq-8201, grad land arch major or #) Theory and applications of hydrology and storm water management techniques. Applied hydrology, catchment delineation, storm water runoff models, and storm water management techniques (detention ponds, swales, channels, culverts, small storm sewer systems, run-off systems, sedimentation, and erosion control systems).


LA 8741. Metropolitan Design Workshop and Optional Seminar. (3-6 cr [max 6 cr]; A-F or Aud. Prereq-Enrollment in CMD prog or #) Introduction to discipline/methodologies of urban design. Contributing fields/issues, including government/community goals, land use, housing, economic development, natural resources, services, and transportation. Implementation program.

LA 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))
Latin (LAT)
Department of Classical and Near Eastern Studies
College of Liberal Arts

LAT 5001. Intensive Latin. (3 cr; Stdnt Opt. =LAT 1001, LAT 111H. Prereq–Prev. experience in another foreign language is desirable) Covers material usually taught over two semesters.


LAT 5100. Advanced Reading. (3 cr [max 18 cr]; Stdnt Opt. Prereq–[3004, at least two years of college level Latin] or #) Reading in Latin texts/authors. Texts/authors vary each term.

LAT 5200. Advanced Reading in Later Latin: Medieval Lyric. (3 cr [max 18 cr]; Stdnt Opt. =LAT 5004. Prereq–[3004 or equiv or #]) Reading course. Authors of late antiquity, Middle Ages, and Renaissance. Topics specified in Class Schedule.


LAT 5703. Epigraphy. (3 cr; Stdnt Opt. Prereq–Grad student or #) Practical introduction to Latin epigraphy (study/interpretation of inscriptions). Readings/discussion of epigraphic texts. Their value as historical documents, as evidence for development of Latin language, and as literary texts.

LAT 5704. Latin Paleography. (3 cr; Stdnt Opt. Prereq–Grad student or #) Analysis of various hands used in manuscripts of Latin authors, with attention to date/provenance. Transmission of ancient Latin literature.


LAT 5706. History of Latin. (3 cr; Stdnt Opt. Prereq–Grad student or #) Reading/analysis of documents illustrating stylistic registers/evolution of Latin language, from its earliest attestations through Middle Ages.

LAT 5800. Sight Reading for Graduate Students. (1 cr [max 6 cr]; S-N only. Prereq–Enrolled in a grad program in Department of Classical/Near Eastern Studies) Practice in reading Latin texts at sight.

LAT 5993. Directed Studies. (1-4 cr [max 18 cr]; Stdnt Opt. Prereq–Grad student or #) Guided individual reading or study.

LAT 5994. Directed Research. (1-12 cr [max 20 cr]; Stdnt Opt. Prereq–Grad student or #) Guided research on original topic chosen by student.

LAT 5996. Directed Instruction. (1-12 cr [max 20 cr]; Stdnt Opt. Prereq–Grad student or #) Supervised teaching internship.


LAT 8120. Latin Text Course. (3 cr [max 15 cr]; Stdnt Opt. Prereq–3111 or #; not for students in dept of Classical and Near East Studies) Students attend 3xxx Latin courses. Supplementary work at discretion of instructor.


LAT 8262. Survey of Latin Literature I. (3 cr; Stdnt Opt) Extensive readings in variety of works from republican and early Augustan period.

LAT 8263. Survey of Latin Literature II. (3 cr; Stdnt Opt) Variety of works from Augustan and imperial periods.

LAT 8267. Graduate Survey of Latin Literature of Late Antiquity. (3 cr; Stdnt Opt. Prereq–#, %) Latin literature of 4th to 6th centuries A.D., including Augustan and Auggustine.

LAT 8300. Readings in Latin Texts. (3 cr [max 18 cr]; Stdnt Opt. Prereq–Advanced grad student) Reading/discussion of literary or documentary texts from Roman antiquity. Topics may include subjects that draw on various sources, genres, or methods.

LAT 8910. Seminar. (3 cr [max 30 cr]; Stdnt Opt) Various topics in Latin literature examined in depth with emphasis current scholarship and original student research.

Liberal Studies (LS)
College of Continuing Education

LS 5100. Liberal Studies Seminar. (1-4 cr [max 24 cr]; A-F or Aud. Prereq–%) Interdisciplinary topics.

LS 5125. Field Experience. (1-8 cr [max 8 cr]; A-F or Aud. Prereq–MLS student or #) Off-campus observation, experience, and evaluation in interdisciplinary field of study.

LS 5950. Special Topics. (1-4 cr [max 12 cr]; A-F or Aud. Prereq–%) Interdisciplinary topics.

LS 5993. Directed Studies. (1-4 cr [max 15 cr]; Stdnt Opt. Prereq–Grad student, %) Guided individual reading or study.


LS 8001. Introduction to Interdisciplinary Inquiry. (3 cr; A-F or Aud. Prereq–MLS student, %) Techniques for obtaining/analyzing linguistic data from unfamiliar languages through direct interaction with a native speaker.

LS 8100. Advanced Interdisciplinary Inquiry. (3 cr [max 3 cr]; A-F or Aud. Prereq–MLS student, %) Readings/discussion to shape/focus final project. Workshop format. Key ideas of various disciplines, influential thinkers. Emphasizes developing critical themes.

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

Linguistics (LING)
Institute of Linguistics, ESL, and Slavic Languages and Literatures
College of Liberal Arts

LING 5001. Introduction to Linguistics. (4 cr; Stdnt Opt. =LING 3001, LING 3001H. Prereq–grad or #) Phonetics, phonology, morphology, syntax, semantics, and historical-comparative linguistics; language learning andpsychology of language; linguistic universals; language in society.

LING 5005. Applications of Linguistics. (3 cr; Stdnt Opt. Prereq–3001 or 3001H or 3011 or 5001 or 5001H or 5011 or #) Relationships between linguistics and neighboring disciplines. Applications to practical fields such as lexicography, orthography, translation/interpreting, language planning, reading, language teaching, bilingual education, education of the deaf, and correction of language disorders. Computer applications, forensic applications. Topics vary.

LING 5101. Language Types and Linguistic Universals. (3 cr; Stdnt Opt. Prereq–[5001 or 5001H or 5011 or 5021, 5302] or #) Comparison of languages and language types. Cross-linguistic similarities/universals of language, their explanation.

LING 5105. Field Methods in Linguistics I. (4 cr; Stdnt Opt. Prereq–[5201, 5302, grad major] or #) Techniques for obtaining/analyzing linguistic data from unfamiliar languages through direct interaction with a native speaker.

LING 5106. Field Methods in Linguistics II. (4 cr; Stdnt Opt. Prereq–[5105, grad major] or #) Techniques for obtaining/analyzing linguistic data from unfamiliar languages through direct interaction with a native speaker.

LING 5201. Syntax Theory I. (3 cr; Stdnt Opt. Prereq–3001 or 3001H or 5001 or 5001H or #) Concepts/issues in current syntactic theory.


LING 5205. Semantics. (3 cr; Stdnt Opt. Prereq–5201 or #) Analysis of sentence meaning. Semantic properties. Relations such as analyticity, entailment, quantification, and genericity. Philosophical background, formal techniques of semantic analysis, how sentence meaning depends on word meaning, syntax, and context. The role of semantics in grammatical theory.

LING 5206. Linguistic Pragmatics. (3 cr; Stdnt Opt. Prereq–5201 or #) The analysis of linguistic phenomena in relation to beliefs and intentions of language users; speech act theory, conversational implicature, presupposition, information structure, relevance theory, discourse coherence.


LING 5303. Phonology II. (3 cr; Stdnt Opt. Prereq–5302 #) Phonology of human languages. Preparation for reading papers in the literature and for doing research in phonology.


LING 5462. Field Research in Spoken Language. (3 cr; Stdnt Opt. Prereq–3001 or 3001H or 5001 or #) Transcribing/analyzing talk and movement related to talk. Applying concepts to recorded conversations.

LING 5501. Introduction to Language Acquisition. (3 cr; Stdnt Opt. Prereq–3001 or 5001 or #) First/second language acquisition.


LING 5701. Sociolinguistics. (3 cr; Stdnt Opt. Prereq–3001 or 3001H or 5001 or #) Social determinants of linguistic diversity, variation, and change. Topics may include social and regional dialects, language style/register, style-code-switching, quantitative study of speech, linguistic/social inequality.


LING 5801. Introduction to Computational Linguistics. (3 cr; Stdnt Opt. Prereq–5201 or program permission or #) Methods/issues in computer understanding of natural language. Programming languages, their linguistic applications. Lab projects.

LING 5802. Computational Linguistics. (3 cr; Stdnt Opt. Prereq–5801 or #) Computer processing of natural language. Applications to such areas as speech recognition and information retrieval. Applications to such areas as speech recognition and information retrieval. Computer processing of natural language. Applications to such areas as speech recognition and information retrieval.

LING 5900. Topics in Linguistics. (1-4 cr [max 12 cr]; Stdnt Opt) Topics vary. See Class Schedule.

LING 5931. Morphology and Syntax of Contemporary English. (3 cr; Stdnt Opt. Prereq–5001 or 5001H or 5001 or #) Linguistic analysis of word/sentence structure of contemporary English. Focuses on data from recorded/written texts.

LING 5932. Topics in the Structure of Modern English. (5 cr [max 12 cr]; Stdnt Opt. Prereq–[5001 or 5001H or 5001 or #]) Aspects of the morphology, syntax, or semantics/pragmatics of modern English. Emphasizes analysis of written or recorded texts. Topics vary.


LING 6005. Research Paper Workshop. (3 cr [max 12 cr]; S-N or Aud. Prereq–[5105 or 5205, 5305 or 5205, 5302 or #; grad ling major] Workshop on research methodology/writing in Linguistics.

LING 6015. Field Methods in Linguistics I. (4 cr [max 8 cr]; Stdnt Opt. Prereq–[5001, 5201, 5302, grad linguistics major] or #) Structural analysis of unknown language through work with a native speaker.

LING 6016. Field Methods in Linguistics II. (4 cr [max 8 cr]; Stdnt Opt. Prereq–[5001, 5201, 5302, grad linguistics major] or #) Structural analysis of unknown language through work with a native speaker.

LING 8200. Topics in Syntax and Semantics. (3 cr [max 9 cr]; Stdnt Opt. Prereq–5202, 5205 or #) Syntax and semantics of natural language, with particular emphasis on the interface between the two.


LING 8300. Topics in Phonetics and Phonology. (3 cr [max 9 cr]; Stdnt Opt. Prereq–5303 or #) Current issues in phonological theory. Topics vary.

LING 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent) Consent required for development of independent research project.

LING 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent) Consent required for development of independent research project.

LING 8500. Topics in Second Language Acquisition. (3 cr [max 9 cr]; Stdnt Opt. Prereq–5001 or 5001H or 5001 or #) Based on review of published research, students design and carry out their own studies, writing/preserving research reports at end of term. Focuses on first or second language acquisition, or both, depending on instructor.

LING 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

LING 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])

LING 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)


LING 8920. Topics in Language and Cognition. (3 cr [max 6 cr]; Stdnt Opt. Prereq–5001 or #) Language-related issues in cognitive science from a linguistic perspective. Serves as elective for cognitive science minor, but only for linguistics nonmajors.

LING 8991. Independent Study. (1-4 cr [max 15 cr]; Stdnt Opt. Prereq–#) Independent Study

Logistics Management (LM)

Department of Marketing and Logistics Management

Curtis L. Carlson School of Management

LM 8892. Readings in Logistics Management. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq–Adviser consent or #) Readings useful to student’s individual program or objectives that are not available in regular courses.

LM 8894. Graduate Research in Logistics Management. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq–Adviser consent or #) Individual research on an approved topic appropriate to student’s program and objectives.

Management (MGMT)

Department of Strategic Management and Organization

Curtis L. Carlson School of Management


MGMT 5480. Topics in Natural Resources. (3 cr; A-F only) Specific topic for each offering.

MGMT 8101. Theory Building and Research Design. (4 cr; Stdnt Opt. Prereq–Business admin PhD student or #) Problem formulation, conceptual modeling, theory building, and research design in the social and behavioral sciences.

Management of Technology (MOT)

Institute of Technology

MOT 5991. MOT Independent Study. (1-3 cr; S-N or Aud. Prereq–MOT grad student) Independent study in MOT-related topic.


MOT 8113. Operations Management for Competitive Advantage. (2 cr; A-F or Aud. Prereq–Grad MOT major) Overview of operations functions. Impact of operation management on a firm’s competitiveness and network of trading partners. Key relationships between operations and other value chain functions. Integrating operations decisions to achieve objectives. Product-process design, quality management, supply chain management, technology management, work force issues.

MOT 8114. Strategic Technology Analysis. (2 cr; A-F only. Prereq–Grad MOT major) Technology, its creation, history, and dynamics/interaction with economics, industry, and society. Role of technology in business and management. Tools/techniques for analysis of technologies. Emerging technologies, their significance.

MOT 8121. Managing Organizations in a Technological Environment. (2 cr; A-F or Aud. Prereq–Grad MOT major) General management principles for organizations, people, and business systems in technology-intensive industries. Application of managerial approaches to project, business, and corporate levels of organizations and to demands of entrepreneurial/established technology firms.


MOT 8213. Macroenvironment of Technology. (2 cr; A-F or Aud. Prereq–Grad MOT major) Development of scenarios for anticipated social, political, governmental, and economic forces affecting technological change. Use of scenarios to respond to industry threats, opportunities, and uncertainties. Corporate strategies, including building alliances for global competitiveness.


MOT 8231. Managing Information Resources in Technology-based Organizations. (1 cr; A-F or Aud. Prereq–Grad MOT major) Managing information resources/technology in an organization where technology is a critical part of value chain. Database management systems, electronic commerce. Managerial issues: strategic planning for IT/IS, infrastructure, outsourcing, competitive value, implementation.

MOT 8232. Managing Technological Innovation. (2 cr; A-F or Aud) How technological innovation is important to business success, can be managed, and may drive business strategy. Organizational dynamics of innovation, how it may be enhanced. Bringing innovations to marketplace for existing businesses and new ventures.


MOT 8234. Capstone Project. (1-2 cr [max 12 cr]; A-F or Aud. Prereq–Completion of two semesters, grad MOT major) Applied research activity, specifically related to management of technology, in cooperation with participant’s home organization. Working with a faculty advisor and work mentor, students address an industry-based management of technology project, venture, process, or challenge. Formal presentation to capstone committee is required.

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

Writing with power. (1 cr; A-F or Aud. Prereq—Grad MOT major) Principles of stakeholder management. Ethical framework for responsible management of inventors, employees, suppliers, customers, and external community. Moral leadership, trust in organizations, and quality control. New metaphors and techniques for managing the socially responsible organization.


MOT 8930. Topics in Emerging Technologies. (1.5 cr; S-N or Aud. Prereq—MOT grad student) Limited speakers give half- or full-day seminars on special topics in emerging technologies (e.g., energy systems, tissue engineering, thermal spray coating technology).

MOT 8940. Managing Intellectual Property. (1.5-1.5 cr [max 1.5 cr]; S-N only. Prereq—MOT grad student) Characteristics of Intellectual Property (IP), its role in technology enterprises. Law of patents, trade secrets, trademarks, copyrights, know-how and other IP. Effect of IP rights acquisition and asset valuation on company competitiveness. IP protection licensing strategy.

MOT 8950. International Management of Technology Project. (1.5 cr; A-F or Aud. Prereq—MOT grad student) On-site residency in international locations for up to two weeks. Visits to local, technology-intensive companies. Lectures/discussions with company executives, government officials, and university faculty. Comparative analysis of management of technology concepts/issues in an international business context: social, economic, cultural, and governmental perspectives. Written assignment required.

## Manufacturing Systems (MS)

### Institute of Technology

**MS 5101. Manufacturing Strategy and Operations Management.** (3 cr; A-F or Aud. Prereq—Grad MS major) Strategic roles of manufacturing, process technology, operations management, and market strategies; their impact on manufacturing. Overview of operations functions such as demand forecasting, capacity planning, inventory planning, inventory control, materials management, Kanban & JIT, facility selection, strategic alliances, and outsourcing.


**MS 5105. Financial Decision Making in Manufacturing.** (2 cr [max 3 cr]; A-F or Aud. Prereq—Grad MS major) Fundamental topics in engineering economics, such as risk and uncertainty, capital cost accounting, time value of money, investments, and capital. Skills developed in budget management, capital cost justification, cost estimation, value engineering, equipment appraisals and replacement, and creating business plans.

**MS 5106. Intelligent Decision Support Systems in Engineering.** (3 cr; A-F or Aud. Prereq—Grad MS major) Methods for identifying where to apply DSSs, technologies for building them, strategies for evaluating their effectiveness. Examples from many engineering areas.

**MS 5107. Simulation of Manufacturing Systems.** (1 cr; A-F or Aud. Prereq—Grad MS major) Using integrated simulation/animation environment to create, analyze, and evaluate realistic models for various manufacturing, assembly, and material handling systems. Experimental design for simulation. Random number generation, selecting input distributions, evaluating simulation output.

**MS 5199. Topics in Manufacturing Systems.** (max 7 cr; A-F or Aud. Prereq—Grad MS major) See Class Schedule.

**MS 5201. Project Management.** (1 cr; A-F or Aud. Prereq—Grad MS major) Practical understanding of project management. Project planning: scheduling; budgeting; staffing; task and cost control; and communicating with, motivating, and managing team members.

**MS 5202. Technology Forecasting.** (1 cr; A-F or Aud. Prereq—Grad MS major) Introduction to methods. Technology assessment/forecasting. Applications to history of technology/industry. Technological developments and their economic, social, and industrial impacts.


**MS 5204. Automated Machining Processes.** (1 cr; A-F or Aud. Prereq—Grad MS major) Description and demonstration of automated machine tools and machining cells. Machining center configuration and operation, machine tool controller, machining code generation, in-process sensing and control, cell controllers, and system simulation.


**MS 5206. Industrial Safety.** (1 cr; A-F or Aud. Prereq—Grad MS major) Occupational safety and health/product safety for engineers. Fundamental safety concepts, engineering intervention principles. Standards, laws, and regulations governing safety, including products, processes, and manufacturing. Hazards and their engineering control, the human element, management of safety/health.

**MS 5207. Design for Manufacturability.** (1 cr; A-F or Aud. Prereq—Grad MS major) Machine design practice plans for assembly of components into systems. Basic design principles.

**MS 5208. Plasma Processing.** (1 cr; A-F or Aud. Prereq—Grad MS major) Plasma coating processes, manufacturing issues. Details of technologies such as plasma spraying and diamond deposition. Lab demonstrations.

**MS 5209. Micro Electrical Mechanical Systems.** (1 cr; A-F or Aud. Prereq—Grad MS major) Introduction to MEMS by presenting various microfabrication techniques such as integrated circuit microfabrication processes, bulk micromachining, bonding, and high-spectremetry processes. MEMS design processes. MEMS applications. Future of MEMS.

**MS 5210. Robotics.** (1 cr; A-F or Aud. Prereq—Grad MS major)
Master of Business Taxation (MBT)

Department of Strategic Management and Organization

Curtis L. Carlson School of Management

MKTG 8892. Readings in Marketing. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq-MBA 6210 or equiv, business admin PhD student or #) Readings useful to student's individual program and objectives that are not available in regular courses.

MKTG 8894. Graduate Research in Marketing. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq-MBA 6210 or equiv, business admin PhD student or #) Individual research on an approved topic appropriate to student's program and objectives.

Master of Business Taxation (MBT)

Department of Strategic Management and Organization

Curtis L. Carlson School of Management

MBT 5150. Current Financial Accounting Issues. (2 cr; A-F or Aud. Prereq-MBA 6210 or equiv, Master's student, adviser and DGS consent) Current corporate transactions serve as case studies for analyzing tax consequences of various transaction structures. Participants prepare present value models of related tax consequences to corporations/shareholders involved. Use of Section 338(h)(10) for acquisitions of S corporations, international acquisitions.


MBT 5335. Taxation of the Small Business Corporation. (2 cr; A-F or Aud. Prereq-Psych 5230, MBT student) Federal income taxation of S corporations. Election eligibility. Termination of status; treatment of income and deduction items; distributions, basis of stock and debt. Compensation arrangements in closely held corporations; fiscal year issues; personal service corporations; advantages of C corporations vs. S corporations; corporation liquidation and redemption rules; S corporation's built-in gains tax.

MBT 5340. Taxation of Partnerships and Partnerships. (2 cr; A-F or Aud. Prereq-Psych 5315, MBT student) Reviews tax consequences associated with formation, operation, and dissolution of a partnership.


MBT 5351. Wealth Transfer II (Estate Planning). (2 cr; A-F or Aud. Prereq-Psych 5315, MBT student) Topics related to planning transfer of property during lifetime and at death.

MBT 5355. Income Taxation of Fiduciaries. (2 cr; A-F or Aud. Prereq-Psych 5315, MBT student) Simple, complex, and revocable trusts; estates; accumulation distributions, income in respect of decedents; trust accounting income and principal; distributable net income; terminations; and excess distributions.

For definitions of course numbers, symbols, and abbreviations, see page 214.


MBT 5361. State and Local Taxation II. (2 cr; A-F or Aud) Income/sales tax consequences of mergers/ acquisitions, corporate reorganizations. Practical application of tax concepts. Planning ideas in drop shipments, investment holding companies, e-commerce, leasing companies, and like tax alternatives. Real property taxation, individual income taxation, state administrative tax procedures, state payroll considerations.


MBT 5370. Taxation of Property Transactions. (2 cr; A-F or Aud. Prereq–ACCT 5135, MBT student) Determining realized gain or loss and recognized gain or loss, and tax treatment of that gain or loss on property dispositions. Consequences of property transactions including depreciation, depletion, basis, and capital gains problems.

MBT 5373. Taxation of Inventories. (2 cr; A-F or Aud. Prereq–ACCT 5135, MBT student) Valuation, charitable contributions of inventory, acquisition of going-business valuation, uniform capitalization requirements, retail inventory method, accounting method changes. As related to LIFO background, economic considerations, election, conformity, costing, pooling, methods, Inventory Price Index Computations (IPIC).

MBT 5376. Taxation of Financial Instruments. (2 cr; A-F or Aud) How financial products/derivatives are used and the tax consequences that result. Trends/developments.


MBT 5381. Tax Aspects of International Business II. (2 cr; A-F or Aud. Prereq–MBT 5380) Foreign tax credit, Subpart F planning opportunities, international structuring (joint ventures, use of entity classification regulations). Transfer pricing, foreign currency. Legislative, regulatory, and judicial developments.


MBT 8335. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

Master of Healthcare Administration (MHA)

Curtis L. Carlson School of Management

MHA 8763. External Forces Affecting Health Services Delivery. (2 cr; A-F or Aud. Prereq–PhD student) Guidance in development of concepts, models, and principles of financing, social policy making, and organizing and human resource development for health services delivery. Written paper and teaching presentation required.

MHA 8782. Research Practicum. (2 cr; A-F or Aud. Prereq–PhD student) Field experience in healthcare research. Supervised independent and team research on selected topics and problems.

Materials Science (MATS)

Department of Chemical Engineering and Materials Science

Institute of Technology

MATS 5517. Electron Microscopy. (3 cr; A-F or Aud) Transmission electron microscope, scattering and diffraction, electron sources, lenses, apertures and resolution, specimen preparation, diffraction patterns, kikuchi diffraction, planar defects, strain fields, high resolution imaging, X-ray spectrometry.

MATS 5518. Imaging and Diffraction in the Scanning Electron Microscope. (1 cr; A-F or Aud. Prereq–#) Theory/practice of scanning electron microscopy. Classroom sessions cover how instrument works, best-use practices. Practical sessions allow students to hone skills.

MATS 5519. Basic Transmission Electron Microscopy. (1 cr; A-F or Aud. Prereq–#) Theory/practice of transmission electron microscope. Classroom sessions cover how instrument works, best-use practices. Practical sessions allow students to hone skills.

MATS 5520. Basic Analytical Electron Microscopy. (3 cr; A-F or Aud. Prereq–MATS 5518, 519) Theory/practice of analytical electron microscope. Classroom sessions cover techniques, best-use practices. Practical sessions allow students to hone skills.

MATS 5521. Thin Films and Interfaces. (3 cr; Stdt Opt.-IT upper div or grad, Mats 4015 or #) Fundamentals of vacuum science; vapor pressures and thin film deposition processes (physical and chemical vapor deposition, sputtering, laser ablation); thermodynamics and kinetics of thin film growth; epitaxy; film stability and reactions; structure-property relationship; multilayers and diffusion barriers; characterization techniques to include photon, electron, and ion spectroscopies. Computer-based homework problems.

MATS 5531. Electrochemical Engineering. (3 cr; Stdt Opt.-Chem 5531. Prereq-MATS 3010 or #, upper div IT or grad) Fundamentals of electrochemical engineering. Topics include electrochemical mass transfer, electrokinetics, thermodynamics of cells, modern sensors, formation of thin films and microstructured materials. Computer-based problems will be assigned.


MATS 8002. Thermodynamics and Kinetics. (3 cr; A-F or Aud) First three laws of thermodynamics, free energy, equilibrium constants, fugacity and activity relationships, solution models, order-disorder transitions, phase transitions. Elementary statistical mechanics. Applications to materials systems, including surface energies, nonequilibrium equilibria, reaction kinetics, mass transport, diffusion.


MATS 8004. Mechanical Properties. (3 cr; A-F or Aud) Defects in crystalline materials, including point defects, dislocations, and grain boundaries. Structure and movement of defects related to mechanical behavior of materials. Tools used to understand crystals and crystallography.

MATS 8005. Dislocations and Interfaces. (3 cr; A-F or Aud) Structure and properties at an advanced level. Influence of bonding and crystallography on structures of dislocations cores. CSL and DSCl theory of grain boundaries and of structures of phase boundaries in heterojunctions including thin film epilayers. Effect of defects on electrical, optical, magnetic, and superconducting behavior of materials.

MATS 8114. Structure and Symmetry in Soft Materials. (2 cr; A-F or Aud. Prereq–# or equiv or #) Molecular interactions, packing, symmetry operations/ structure. X-ray/neutron scattering in soft materials, including organic/liquid crystals, amorphous, and polymers.

MATS 8115. Electron Microscopy of Soft Matter. (2 cr; A-F or Aud. Prereq–Materials science/ engineering or chemical engineering grad major or #) Operation principles of transmission electron microscope (TEM) and scanning electron microscope (SEM). How these instruments are applied in study of soft materials (e.g., liquid, semi-liquid material systems). Unique specimen preparation techniques, low image contrast, electron-beam radiation-damage, limited signal-to-noise ratio. TEM/SEM digital imaging.
MATS 8204. Computational Methods and Applications to Problems in Materials Science and Engineering. (3 cr; A-F or Aud. Prereq–Grad student, knowledge of programming languages such as Fortran) Implementation of computational methods/applications to numerical problems in materials science and engineering. Emphasizes implementation to applications.

MATS 8211. Physical Chemistry of Polymers. (4 cr; Stdnt Opt–CHEM 8211, CHEM 8211. Prereq–Undergrad physical chem or #) Introduction to polymer physical chemistry. Chain conformations; thermodynamics of polymer solutions, blends, and copolymers; light, neutron, and X-ray scattering; dynamics in dilute solutions and polymer characterization; dynamics of melts and viscoelasticity; rubber elasticity, networks, and gels; glass transitions; crystallization.

MATS 8212. Solid State Reaction Kinetics. (3 cr; Stdnt Opt. Prereq–8002) Reactions between ceramic solids in terms of transport mechanisms. Thermodynamics of point defects in binary and ternary ionic solids, diffusion in the bulk and along line and surface defects, chemical and electrochemical potential gradients, reactions at interfaces, physical examples drawn from oxidation and solid/solid reactions of ceramics.


MATS 8215. Electronic Ceramics. (3 cr; A-F or Aud. Prereq–#) Electronic properties of ceramics; electronic and ionic conduction; dielectric behavior; ferroelectric, piezoelectric, pyroelectric, and electrooptic properties. Relationships between structure (crystal structure, microstructure) and properties. Introduction to applications (e.g., capacitors, sensors, actuators).

MATS 8216. Contact and Fracture Mechanics. (3 cr; A-F or Aud) Theories of indentation contact and fracture resistance emphasizing structure/property relationships. Surfaces, thin film interfaces, coatings, and bulk behavior. Theoretical basis and experimental techniques for measuring mechanical behavior at the nano-scale. Lab exercises.


MATS 8218. Thin Film Growth and Epitaxy. (3 cr; A-F or Aud) Principles of epitaxial growth. Growth models, thermodynamics, kinetics, homoepitaxial growth, continuous models of homoepitaxial growth, models of heteroepitaxial growth, surfaces, interfaces, defects, coincident lattices, experimental methods of growth, characterization.


MATS 8221. Synthetic Polymer Chemistry. (4 cr; A-F or Aud. +CHEM 4221, CHEM 8221, CHEN 5221, CHEM 8221, MATS 5221. Prereq–[Undergrad polymer chemistry course, undergraduate physical chemistry course] or #) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

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

MATS 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

MATS 8666. Doctoral Pre-Theesis Credits. (1-6 cr; max 12 cr) No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

MATS 8877. Thesis Credits: Master’s. (1-18 cr) No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required (Plan A only)

MATS 8888. Thesis Credit: Doctoral. (1-24 cr; max 100 cr) No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

MATS 8993. Directed Study. (1-12 cr; max 12 cr; Stdnt Opt)

MATS 8994. Directed Research. (1-12 cr; max 12 cr; Stdnt Opt)

MATS 8995. Special Topics. (1-4 cr; max 4 cr; Stdnt Opt) New or experimental courses offered by department or visiting faculty.

Mathematics (MATH)

School of Mathematics

Institute of Technology


MATH 5075. Mathematics of Options, Futures, and Derivative Securities I. (4 cr; Stdnt Opt. Prereq–Two yrs calculus, basic computer skills) Mathematical background (e.g., partial differential equations, Fourier series, computational methods, Black-Scholes theory, numerical methods—including Monte Carlo simulation). Interest-rate derivative securities, exotic options, risk theory. First course of two-course sequence.

MATH 5076. Mathematics of Options, Futures, and Derivative Securities II. (4 cr; A-F or Aud. Prereq–5075) Mathematical background such as partial differential equations, Fourier series, computational methods, Black-Scholes theory, numerical methods (including Monte Carlo simulation), interest-rate derivative securities, exotic options, risk theory.


MATH 5285H. Honors: Fundamental Structures of Algebra I. (4 cr; Stdnt Opt. Prereq–[2243 or 2573 or 2573]. [2285 or 2574 or 3285]) Review of matrix theory, linear algebra. Vector spaces, linear transformations over abstract fields. Group theory, including normal subgroups, quotient groups, homomorphisms, class equation, Sylow’s theorems. Specific examples: permutation groups, symmetry groups of geometric figures, matrix groups.

MATH 5286H. Honors: Fundamental Structures of Algebra II. (4 cr; Stdnt Opt. Prereq–5285) Ring/module theory, including ideals, quotient, homomorphisms, domains (unique factorization, euclidean, principal ideal), fundamental theorem for finitely generated modules over euclidean domains, Jordan canonical form. Introduction to field theory, including finite fields, algebraic transcendental extensions, Galois theory.

MATH 5335. Geometry I. (4 cr; Stdnt Opt. Prereq–[2243 or 2573 or 2573], [2285 or 2574 or 3285]) Advanced two-dimensional Euclidean geometry from a vector viewpoint. Theorems/problems about triangles/circles, isometries, connections with Euclid’s axioms. Hyperbolic geometry, how it compares with Euclidean geometry.

Course Descriptions

MATH 5345. Introduction to Topology. (4 cr; Stdnt Opt. Prereq-[2263 or 2374 or 2573]. [2283 or 25174 or 3283])
Set theory, Euclidean/metric spaces. Basics of general topology, including compactness/connectedness.

MATH 5378. Differential Geometry. (4 cr; Stdnt Opt. Prereq-[2263 or 2374 or 2573]. [2243 or 2375 or 2574]). [2283 or 3283] recommended)
Basic geometry of curves in plane and in space, including Frenet formula, theory of surfaces, differential forms, Riemannian geometry.

MATH 5385. Introduction to Computational Algebraic Geometry. (4 cr; Stdnt Opt. Prereq-[2263 or 2374 or 2573]. [2243 or 2375 or 2574])
Geometry of curves/surfaces defined by polynomial equations. Emphasizes concrete computations with polynomials using computer packages, interplay between algebra and geometry. Abstract algebra presented as needed.

MATH 5445. Mathematical Analysis of Biological Networks. (4 cr; Stdnt Opt. Prereq-Linear algebra, differential equations)

MATH 5467. Theoretical Neuroscience. (4 cr; Stdnt Opt. Prereq-[2243 or 2375 or 2574].)

MATH 5467. Introduction to the Mathematics of Image and Data Analysis. (4 cr; Stdnt Opt. Prereq-[2243 or 2375 or 2573]. [2283 or 2574 or 3283 or #]). [2263 or 2374], 4567] recommended)

MATH 5481. Mathematics of Industrial Problems I. (4 cr; Stdnt Opt. Prereq-[2243 or 2375 or 2573]. [2263 or 2574 or 2574], familiarity with some programming language)
Topics in industrial math, including crystal precipitation, air quality modeling, electron beam lithography. Problems treated both theoretically and numerically.

MATH 5482. Mathematics of Industrial Problems II. (4 cr; Stdnt Opt. Prereq-[2243 or 2375 or 2573]. [2263 or 2574 or 2574], familiarity with some programming language)
Topics in industrial math, including color photography, catalytic converters, photocopying.

MATH 5485. Introduction to Numerical Methods I. (4 cr; Stdnt Opt. Prereq-[2243 or 2375 or 2573], familiarity with some programming language)
Solution of nonlinear equations in one variable. Interpolation, polynomial approximation, numerical integration/differentiation, numerical solution of initial-value problems.

MATH 5486. Introduction to Numerical Methods II. (4 cr; Stdnt Opt. Prereq-[5485])


MATH 5525. Introduction to Ordinary Differential Equations. (4 cr; Stdnt Opt. Prereq-[2243 or 2375 or 2573]. [2283 or 3283])

MATH 5535. Dynamical Systems and Chaos. (4 cr; Stdnt Opt. Prereq-[2243 or 2375 or 2573]. [2263 or 2574 or 2574])
Dynamical systems theory. Emphasizes iteration of one-dimensional mappings. Fixed points, periodic points, stability, bifurcations, symbolic dynamics, chaos, fractals, Julia/Mandelbrot sets.

MATH 5583. Complex Analysis. (4 cr; Stdnt Opt. Prereq-2 sem soph math [including 2263 or 2574 or 2573]. [2283 or 3283]) recommended)

MATH 5587. Elementary Partial Differential Equations I. (4 cr; Stdnt Opt. Prereq-[2243 or 2575 or 2573]. [2263 or 2574 or 2574])
Emphasizes partial differential equations w/physical applications, including heat, wave, Laplace’s equations. Interpretations of boundary conditions. Characteristics, Fourier series, transforms, Green’s functions, images, computational methods. Applications include wave propagation, diffusions, electростatics, shocks.

MATH 5588. Elementary Partial Differential Equations II. (4 cr; max [400 cr]. A-F or Aud. Prereq-[2243 or 2573 or 2573]. [2263 or 2574 or 2574]. 5587 or #)

MATH 5594H. Honors Mathematics - Topics. (4 cr; max [12 cr]. A-F or Aud. Prereq-[5593H with grade of at least B, experience in writing proofs] or #; intended for mathematically-talented students with proven achievement in theoretical mathematics coursework)
Topics vary depending on interests of instructor. Theoretical treatment of chosen topic.

MATH 5616H. Honors: Introduction to Analysis I. (4 cr; Stdnt Opt. Prereq-[2243 or 2573]. [2263 or 2574]. [2283 or 3283]) or [2574])

MATH 5616H. Honors: Introduction to Analysis II. (4 cr; Stdnt Opt. Prereq-5615)

MATH 5651. Basic Theory of Probability and Statistics. (4 cr; Stdnt Opt. Prereq-[2263 or 2374 or 2573]. [2243 or 2373]. [2283 or 2574 or 3283]) recommended; Credit will not be granted if credit has been received for Stat 4101, Stat 5101)
Logical development of probability, basic issues in statistics. Probability spaces, random variables, their distributions/expected values. Law of large numbers, central limit theorem, generating functions, sampling, sufficiency, estimation.

MATH 5652. Introduction to Stochastic Processes. (4 cr; Stdnt Opt. Prereq-5651 or Stat 5101)
Random walks, Markov chains, branching processes, martingales, queuing theory, Brownian motion.

MATH 5654. Prediction and Filtering. (4 cr; Stdnt Opt. Prereq-5651 or Stat 5101)

MATH 5705. Enumerative Combinatorics. (4 cr; Stdnt Opt. Prereq-[2243 or 2375 or 2573]. [2263 or 2574 or 2574 or 3283])
Basic enumeration, bijections, inclusion-exclusion, recurrence relations, ordinary/exponential generating functions, partitions, Polya theory. Optional topics include trees, asymptotics, listing algorithms, rook theory, involutions, tableaux, permutation statistics.

MATH 5707. Graph Theory and Non-Enumerative Combinatorics. (4 cr; Stdnt Opt. Prereq-[2243 or 2375 or 2573]. [2263 or 2574 or 2574 or 3283])
Basic enumeration, bijections, inclusion-exclusion, recurrence relations, ordinary/exponential generating functions, partitions, Polya theory. Optional topics include graph algorithms, Latin squares, block designs, Ramsey theory.

MATH 5711. Linear Programming and Combinatorial Optimization. (4 cr; Stdnt Opt. Prereq-2 sem sof math [including 2243 or 2575 or 2573])

MATH 5900. Tutorial in Advanced Mathematics. (0-6 cr; max [120 cr]. A-F or Aud)
Individually directed study.

MATH 8001. Preparation for College Teaching. (1 cr; max [3 cr]. S-N or Aud. Prereq-l math grad student in good standing or #)
New approaches to teaching/learning, issues in mathematics education, components/expectations of a college mathematics professor.
MATH 8141. Applied Logic. (3 cr; A-F or Aud)
Applied techniques of mathematical logic to other areas of mathematics and computer science. Sample topics: complexity of computation, computable analysis, unsolvability of diophantine problems, program verification, database theory.

MATH 8142. Applied Logic. (3 cr; A-F or Aud)
Applying techniques of mathematical logic to other areas of mathematics, computer science. Complexity of computation, computable analysis, unsolvability of diophantine problems, program verification, database theory.

MATH 8151. Axiomatic Set Theory. (3 cr; A-F or Aud. Prereq—5166 or #)
Axiomatic development of basic properties of ordinal/cardinal numbers, infinitary combinatorics, well founded sets, consistency of axiom of foundation, constructible sets, consistency of axiom of choice and of generalized continuum hypothesis.

MATH 8152. Axiomatic Set Theory. (3 cr; A-F or Aud. Prereq—8151 or #)
Notion of forcing, generic extensions, forcing with finite partial functions, independence of continuum hypothesis, forcing with partial functions of infinite cardinalities, relationship between partial orderings and Boolean algebras, Boolean-valued models, independence of axiom of choice.

MATH 8166. Recursion Theory. (3 cr; A-F or Aud. Prereq—Math grad student or #)

MATH 8167. Recursion Theory. (3 cr; A-F or Aud. Prereq—8166)
Sample topics: complexity theory, recursive analysis, generalized recursion theory, analytical hierarchy, constructive ordinals.

MATH 8172. Model Theory. (3 cr; A-F or Aud. Prereq—Math grad student or #)
Interplay of formal theories, their models. Elementary equivalence, elementary extensions, partial isomorphisms. Lowenheim-Skolem theorems, compactness theorems, preservation theorems, Ultraproducts.

MATH 8173. Model Theory. (3 cr; A-F or Aud. Prereq—8172 or #)
Types of elements. Prime models, homogeneity, saturation, categoricity in power. Forking.

MATH 8190. Topics in Logic. (1-3 cr; max 12 cr; A-F or Aud)
Offered for one year or one semester as circumstances warrant.

MATH 8201. General Algebra. (3 cr; A-F or Aud. Prereq—4xxx algebra or equiv or #)
Groups through Sylow, Jordan-H[ö]lder theorems, structure of finitely generated Abelian groups. Rings and algebras, including Gauss theory of factorization.

MATH 8202. General Algebra. (3 cr; A-F or Aud. Prereq—8201 or #)
Classical field theory through Galois theory, including solvable equations. Symmetric, Hermitian, orthogonal, and unitary form. Tensor and exterior algebras. Basic Wedderburn theory of rings; basic representation theory of groups.

MATH 8207. Theory of Modular Forms and L-Functions. (3 cr; A-F or Aud. Prereq—8202 or #)
Zeta and L-functions, prime number theorem, Dirichlet's theorem on primes in arithmetic progressions, number formulas; Riemann hypothesis; modular forms and associated L-function; Eisenstein series; Hecke operators, Poincaré [c] series, Euler product; Ramanujan conjectures; Theta series and quadratic forms; waveforms and L-functions.

MATH 8208. Theory of Modular Forms and L-Functions. (3 cr; A-F or Aud. Prereq—8207 or #)
Applications of Eisenstein series: special values and analytic continuation and functional equations of L-functions. Trace formulas. Applications of representation theory. Computations.

MATH 8211. Commutative and Homological Algebra. (5 cr; A-F or Aud. Prereq—8202 or #)
Selected topics.

MATH 8212. Commutative and Homological Algebra. (5 cr; A-F or Aud. Prereq—8211 or #)
Selected topics.

MATH 8245. Group Theory. (3 cr; A-F or Aud. Prereq—8202 or #)
Permutations, Sylow's theorems, representations of groups on groups, semi-direct products, solvable and nilpotent groups, generalized fitting subgroups, p-groups, co-operation action on p-groups.

MATH 8246. Group Theory. (3 cr; A-F or Aud. Prereq—8245 or #)
Representation and character theory, simple groups, free groups and products, presentations, extensions, Schur multipliers.

MATH 8251. Algebraic Number Theory. (3 cr; A-F or Aud. Prereq—8202 or #)
Algebraic number fields and algebraic curves. Basic commutative algebra. Completions: p-adic fields, formal power series, Puiseux series. Ramification, discriminant, different. Finiteness of class number and units theorem.

MATH 8252. Algebraic Number Theory. (3 cr; A-F or Aud. Prereq—8251 or #)

MATH 8253. Algebraic Geometry. (3 cr; A-F or Aud. Prereq—8252 or #)

MATH 8254. Algebraic Geometry. (3 cr; A-F or Aud. Prereq—8253 or #)

MATH 8257. Topics in Algebraic Geometry. (1-3 cr; max 12 cr; A-F or Aud. Prereq—8250 or #)

MATH 8271. Lie Groups and Lie Algebras. (3 credits; A-F or Aud. Prereq—8270 or #)
Definitions and basic properties of Lie groups and Lie algebras; classical matrix Lie groups; Lie subgroups and their corresponding Lie subalgebras; covering groups; Maurer-Cartan forms; exponential map; correspondence between Lie groups and simply connected Lie groups; Baker-Campbell-Hausdorff formula; homogeneous spaces.

MATH 8272. Lie Groups and Lie Algebras. (3 credits; A-F or Aud. Prereq—8271 or #)
Solvable and nilpotent Lie algebras and Lie groups; Lie's and Engel's theorems; semisimple Lie algebras; cohomology of Lie algebras; Whitehead's lemmas and Levi's theorem; classification of complex semisimple Lie algebras and compact Lie groups; representation theory.

MATH 8280. Topics in Number Theory. (1-3 credits; max 12 cr; A-F or Aud. Prereq—#; offered for one year or one semester as circumstances warrant)

MATH 8300. Topics in Algebra. (1-3 credits; max 12 cr; A-F or Aud. Prereq—Grad math major or #; offered as one yr or one sem cr as circumstances warrant)

MATH 8301. Manifolds and Topology. (3 cr; A-F or Aud. Prereq—Some point-set topology, algebra or #)
Classification of compact surfaces, fundamental group covering spaces. Homology group, basic cohomology. Application to degree of a map, invariance of domain/dimension.

MATH 8302. Manifolds and Topology. (3 cr; A-F or Aud. Prereq—8301 or #)

MATH 8306. Algebraic Topology. (3 cr; A-F or Aud. Prereq—8301 or #)
Singularity homology, cohomology theory with coefficients. Eilenberg-Snystrod axioms, Mayer-Vietoris theorem.

MATH 8307. Algebraic Topology. (3 cr; A-F or Aud. Prereq—8306 or #)
Basic homotopy theory, cohomology rings with applications. Time permitting: fibre spaces, cohomology operations, extra-ordinary cohomology theories.

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

MATH 8360. Topics in Topology. (1-3 credits; max 12 cr; A-F or Aud. Prereq—8501 or #; offered as one yr or one sem cr as circumstances warrant)

MATH 8365. Riemannian Geometry. (3 cr; A-F or Aud. Prereq—8301 or basic point-set topology or #)

MATH 8366. Riemannian Geometry. (3 cr; A-F or Aud. Prereq—8365 or #)
Gauss, Codazzi equations. Tensor calculus, Hodge theory, spinors, global differential geometry, applications.

MATH 8370. Topics in Differential Geometry. (1-3 credits; max 12 cr; A-F or Aud. Prereq—8301 or 8365; offered for one yr or one sem cr as circumstances warrant)
Current research in Differential Geometry.

MATH 8380. Topics in Advanced Geometry. (1-3 credits; max 12 cr; A-F or Aud. Prereq—8301, 8365)
Current research.

MATH 8385. Calculus of Variations and Minimal Surfaces. (3 cr; A-F or Aud. Prereq—4xxx partial differential equations or #)

MATH 8386. Calculus of Variations and Minimal Surfaces. (3 cr; A-F or Aud. Prereq—8595 or #)
Theory of multiple integrals. Geometrical differential equations, i.e., theory of minimal surfaces and related structures (surfaces of constant or prescribed mean curvature, solutions to variational integrals involving surface curvatures), all extremals for variational problems of current interest as models for interfaces in real materials.
MATH 8387. Mathematical Modeling of Industrial Problems. (3 cr; A-F or Aud. Prereq–5xxx numerical analysis, some computer experience or #) Mathematical models from physical, biological, social systems. Emphasizes industrial applications. Modeling of deterministic/probabilistic, discrete/continuous processes; methods for analysis/computation.


MATH 8390. Topics in Mathematical Physics. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8601; offered for one yr or one sem as circumstances warrant) Current research.

MATH 8401. Mathematical Modeling and Methods of Applied Mathematics. (3 cr; A-F or Aud. Prereq–4xxx numerical analysis and applied linear algebra or #) Dimension analysis, similarity solutions, linearization, stability theory, and classification of type. Fourier series and integrals, wavelets, Green’s functions, weak solutions and distributions.


MATH 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent) Finite element and finite difference methods for elliptic boundary value problems (e.g., Laplace’s equation) and solution of resulting linear systems by direct and iterative methods.

MATH 8446. Numerical Analysis of Differential Equations. (3 cr; A-F or Aud. Prereq–8445 or #) Numerical methods for parabolic equations (e.g., heat equations). Methods for elasticity, fluid mechanics, electromagnetics. Applications to specific computations.

MATH 8450. Topics in Numerical Analysis. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–Grad math major or #; offered as one yr or one sem as circumstances warrant) Selected topics.

MATH 8470. Topics in Mathematical Theory of Continuum Mechanics. (1-3 cr [max 12 cr]; A-F or Aud) Offered for one year or one semester as circumstances warrant.

MATH 8501. Theory of Ordinary Differential Equations. (3 cr; A-F or Aud. Prereq–4xxx ODE or #) Existence, uniqueness, continuity, and differentiability of solutions. Linear theory and hyperbolicity. Basics of dynamical systems. Local behavior near a fixed point, a periodic orbit, and a homoclinic or heteroclinic orbit. Perturbation theory.


MATH 8505. Applied Dynamical Systems and Bifurcation Theory I. (3 cr; A-F or Aud. Prereq–5525 or 8502 or #) Static Hopf bifurcations, invariant manifold theory, normal forms, averaging, Hopf bifurcation in maps, forced oscillations, coupled oscillators, chaotic dynamics, co-dimension 2 bifurcations. Emphasizes computational aspects of applications from biology, chemistry, engineering, physics.

MATH 8506. Applied Dynamical Systems and Bifurcation Theory II. (3 cr; A-F or Aud. Prereq–5527 or #) Background on analysis in Banach spaces, linear operator theory. Lyapunov-Schmidt reduction, static bifurcation, stability at a simple eigenvalue, Hopf bifurcation in infinite dimensions invariant manifold theory. Applications to hydrodynamic stability problems, reaction-diffusion equations, pattern formation, and elasticity.

MATH 8520. Topics in Dynamical Systems. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8502) Current research.

MATH 8530. Topics in Ordinary Differential Equations. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–8502) Offered for one year or one semester as circumstances warrant.

MATH 8540. Topics in Mathematical Biology. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8502) Offered for one year or one semester as circumstances warrant.


MATH 8580. Topics in Evolutionary Equations. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8572 or #; offered for one yr or one sem as circumstances warrant)


MATH 8590. Topics in Partial Differential Equations. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–8590; offered for one yr or one sem as circumstances warrant) Research topics.

MATH 8600. Topics in Advanced Applied Mathematics. (1-3 cr [max 12 cr]; Stdnt Opt) Offered for one yr or one semester as circumstances warrant. Topics vary. For details, contact instructor.

MATH 8601. Real Analysis. (3 cr; A-F or Aud. Prereq–5616 or #) Set theory/foundamentals. Axiom of choice, measures, measure spaces, Borel/Lebesgue measure, integration, fundamental convergence theorems, Riesz representation.


MATH 8604. Topics in Real Analysis. (3 cr [max 12 cr]; A-F or Aud. Prereq–8602 or #; offered for one yr or one sem as circumstances warrant) Current research.

MATH 8640. Spatial Ecology. (3 cr; A-F or Aud. Prereq–Two semesters calculus, theoretical population ecology or four semesters more robust calculus, course in statistics or probability or #) Introduction: role of space in population dynamics and interspecific interaction; includes single species and multispecies models, deterministic and stochastic theory, different modeling approaches, effects of implicit/explicit space on competition, pattern formation, stability diversity and invasion. Recent literature. Computer lab.

MATH 8652. Theory of Probability Including Measure Theory. (3 cr; Stdnt Opt. Prereq-8561 or #) Conditional distributions and expectations, convergence of sequences of distributions on real line and on Polish spaces, central limit theorem and related limit theorems, Brownian motion, martingales and introduction to stochastic processes.


MATH 8655. Stochastic Calculus with Applications. (3 cr; Stdnt Opt. Prereq-8654 or 8659 or #) Stochastic integration with respect to martingales, Ito’s formula, applications to business models, filtering, and stochastic control theory.

MATH 8659. Stochastic Processes. (5 cr; Stdnt Opt. Prereq-8652 or #) In-depth coverage of various stochastic processes and related concepts, such as Markov processes and sequences, renewal sequences, exchangeable sequences, stationary sequences, Poisson point processes, Levy processes, interacting particle systems, distributions, and stochastic integrals.

MATH 8660. Topics in Probability. (1-3 cr [max 12 cr]; Stdnt Opt) Offered for one year or one semester as circumstances warrant.

MATH 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 31st/2nd registrations, up to 12 combined cr; 1 cr for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

MATH 8668. Combinatorial Theory. (3 cr; A-F or Aud) Basic enumeration, including sets and multisets, permutation statistics, inclusion-exclusion, integer/ set partitions, involutions and Polya theory. Partially ordered sets, including lattices, incidence algebras, and Mobius inversion. Generating functions.

MATH 8669. Combinatorial Theory. (3 cr; A-F or Aud. Prereq-8666 or #) Further topics in enumeration, including symmetric functions, Schensted correspondence, and standard tableaux; non-enumerative combinatorics, including graph theory and coloring, matching theory, connectivity, flows in networks, codes, and extremal set theory.

MATH 8680. Topics in Combinatorics. (1-3 cr [max 12 cr]; A-F or Aud. Prereq-Grad math major or #; offered as one yr or one sem as circumstances warrant) Selected topics.


MATH 8775. 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 8790. Topics in Complex Analysis. (1-3 cr [max 12 cr]; A-F or Aud. Prereq-8702 or #; offered for one yr or one sem as circumstances warrant) Current research.

MATH 8801. Functional Analysis. (3 cr; A-F or Aud. Prereq-8652 or #) Motivation in terms of specific problems (e.g., Fourier series, eigenfunctions). Theory of compact operators. Basic theory of Banach spaces (Hahn-Banach, open mapping, closed graph theorems). Frechet spaces.

MATH 8802. Functional Analysis. (3 cr; A-F or Aud. Prereq-8801 or #) Spectral theory of operators, theory of distributions (generalized functions), Fourier transformations and applications. Sobolev spaces and pseudo-differential operators. C-star algebras (Gelfand-Naimark theory) and introduction to von Neumann algebras.

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

MATH 8990. Topics in Mathematics. (1-6 cr [max 24 cr]; S-N or Aud. Prereq-#) Readings, research.

MATH 8991. Independent Study. (1-6 cr [max 24 cr]; S-N or Aud. Prereq-#) Individually directed study.

MATH 8992. Directed Reading. (1-6 cr [max 24 cr]; No grade. Prereq-#) Individually directed reading.

MATH 8994. Topics at theIMA. (1-3 cr [max 6 cr]; Stdnt Opt) Current research at IMA.

Mathematics Education (MTHE)

Department of Curriculum and Instruction
College of Education and Human Development

MTHE 5011. Arithmetic Structures in School Mathematics. (3 cr; Stdnt Opt. Prereq-Tchg exper or insrr consent) Pedagogy, content, and instructional strategies for teaching arithmetic. Content and issues relevant to the elementary/middle or middle/secondary grade levels.

MTHE 5031. Geometric Structures in School Mathematics. (3 cr; Stdnt Opt. Prereq- Enrollment in math initial licensure program) Pedagogy, content, and instructional strategies for teaching school geometry. Content and issues relevant to the geometry curriculum. Instructional materials and technology appropriate for geometry. Each offering will focus on either elementary/middle or middle/secondary grade levels.

MTHE 5100. Topics in Mathematics Education. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq-Ed or grad student) Issues, materials, and instructional techniques focusing on specific current topics appropriate for secondary school and college mathematics teachers.

MTHE 5101. Teaching Elementary School Mathematics. (3 cr; Stdnt Opt. Prereq-Tchg license or student elem ed MEd or special ed or #) Modern trends, methods, and materials used to convey mathematical ideas.

MTHE 5155. Rational Number Concepts and Proportionality. (3 cr; Stdnt Opt. Prereq-Educ student or #) The relationship between the development of rational number concepts and proportional reasoning skills. Examination of how newer school curricula treat these concepts. Application of materials in the classroom and analysis of results. Reading and responding to current research.


MTHE 5170. Historical Topics in the Mathematics Classroom. (1-3 cr [max 3 cr]; Stdnt Opt) Historical underpinnings of school mathematics content and methodology. Cross-cultural contributions in the development of mathematical ideas. Development of lessons, activities, and materials for school use.

MTHE 5171. Teaching Problem Solving. (3 cr; Stdnt Opt) Investigation of fundamental concepts and principles of problem solving, reasoning, and proof. Emphasis on activities and applications appropriate for junior and senior high classes. Pedagogical experiences to prepare teachers to teach problem solving, reasoning, and proof in classrooms.

MTHE 5172. Teaching Probability and Statistics. (3 cr; Stdnt Opt) Investigation of fundamental concepts and principles of probability and statistics. Emphasis on activities and applications appropriate for junior and senior high school classes. Pedagogical experiences to prepare teachers to integrate quantitative literacy accurately and effectively in classrooms.
Course Descriptions


MTHE 5313. Teaching and Learning Mathematics in the Middle School. (3 cr; Stdtnt Opt. Prereq–Tchg exper or #) Mathematics learning, instruction methods, mathematics topics, and assessment procedures appropriate for the middle grades. Examination of newer curricular materials. Illustration of successful instructional techniques. Discussion of the relationship between the nature of the learner and effective instruction.


MTHE 5355. Mathematics for Diverse Learners. (5 cr; Stdtnt Opt. Prereq–Teaching license or student in elem ed or special ed or #) Mathematical concepts and methods for exceptional students, both low achieving and gifted. Experimental materials and methods designed for underachieving students.

MTHE 5366. Technology-Assisted Mathematics Instruction. (5 cr; Stdtnt Opt) Technology—including computers, programmable and graphing calculators, and video—as instructional tools in mathematics. Design and evaluation of technology-based mathematics lessons; the effect of technology on the mathematics curriculum; managing the technology-enriched classroom.

MTHE 5696. Student Teaching in Mathematics. (1-8 cr [max 8 cr]; S-N only. Prereq–MEd/initial licensure student or #) Student teaching in secondary school mathematics classes.

MTHE 5993. Directed Studies in Mathematics Education. (2 cr [max 3 cr]; S-N or Aud. Prereq–Math Ed MEd student, #) Secondary school classroom teaching project to improve specific teaching skills, planned by student, approved/directed by student’s adviser.

MTHE 8501. Theory and Classical Research in Mathematics Education. (3 cr; Stdtnt Opt. Prereq–Grad math educ major) Critical review of research and relevant theoretical formulations; criteria for appraising research methods; educational implications.


MTHE 8591. Seminar: Mathematics Education. (1-3 cr [max 3 cr]; Stdtnt Opt. Prereq–Math educ PhD student) Problems of mathematics instruction from kindergarten through junior college; opportunity to develop proposals and design models for empirical research.

MTHE 8995. Problems: Mathematics Education. (1-6 cr [max 12 cr]; Stdtnt Opt. Prereq–MA or PhD educ major with math educ concentration) Students survey most recent literature and design and prepare research reports on special topics.

Mechanical Engineering (ME)

Department of Mechanical Engineering

Institute of Technology

ME 5080. Topics in Mechanical Engineering. (1-4 cr [max 4 cr]; Stdtnt Opt. Prereq–IT upper div or grad student, submission of permission form, #) Topics vary each semester.

ME 5090. Advanced Engineering Problems. (1-4 cr [max 4 cr]; Stdtnt Opt. Prereq–ME upper div or grad student) Independent research project with faculty adviser in mechanical engineering, typically related to adviser’s research interests. Student contacts adviser to develop project description well before project’s start date.

ME 5101. Vapour Cycle Systems. (4 cr; A-F or Aud. Prereq–IT upper div or grad student) Vapor compression and absorption refrigeration systems; heat pumps; vapor power cycle analysis, regeneration, reheat, compound cycle modifications, combines gas turbines–vapor cycle systems.

ME 5102. Thermal Environmental Engineering. (4 cr; A-F or Aud. Prereq–IT upper div or grad 3323 or 3323) Thermodynamic properties of moist air; psychrometric charts; HVAC systems; solar energy, human thermal comfort; indoor air quality; heating and cooling loads in buildings.

ME 5105. HVAC System Design. (4 cr; A-F or Aud. Prereq–5103, [IT upper div or grad student]) Design procedures used for heat exchangers, cooling towers, hydronic systems, and air handling systems. HVAC system design for a commercial building.

ME 5113. Aerosol/Particle Engineering. (4 cr; A-F or Aud. Prereq–IT upper div or grad student) Kinetic theory, definition, theory and measurement of particle properties, elementary particle mechanics, particle statistics; Brownian motion and diffusion, coagulation, evaporation and condensation, sampling and transport.

ME 5115. Air Quality and Air Pollution Control. (4 cr; A-F or Aud. Prereq–IT upper div or grad student) Air pollution sources, atmospheric transport, transformations, fate, and emissions control. Air pollution meteorology, dispersion, chemistry of secondary pollutant formation, standards and regulation. Control devices and techniques for gaseous and particulate emissions. Cyclones, electrostatic precipitators, wet and dry scrubbers, combustion modification.

ME 5116. Cleanroom Technology and Particle Monitoring. (4 cr; A-F or Aud. Prereq–IT upper div or grad student) Fundamentals of cleanroom technology for microelectronics manufacturing; airborne and liquid-borne particulate contaminants; particle monitors: optical and condensation particle counters, wafer surface scanner, microscopy; filter performance and testing; cleanroom design and operation; high purity systems; particle detection in processing equipment.


ME 5228. Introduction to Finite Element Modeling, Analysis, and Design. (4 cr; A-F or Aud. Prereq–IT upper div or grad 3321, AEM 3031, CSCI 1113, MatS 2001) Finite elements as principal analysis tool in computer-aided design (CAD); theoretical issues and implementation aspects for modeling and analyzing engineering problems encompassing stress analysis, heat transfer, and flow problems for linear situations. One-, two-, and three-dimensional practical engineering applications.

ME 5241. Computer-Aided Engineering. (4 cr; A-F or Aud. Prereq–IT upper div or grad 3322, CSCI 1113 or equiv) Apply computer-aided engineering to mechanical design. Engineering design projects and case studies using computer-aided design and finite element analysis software; design optimization and computer graphical presentation of results.

ME 5243. Advanced Mechanism Design. (4 cr; A-F or Aud. Prereq–IT upper div or grad 3322 or equiv, basic kinematics and dynamics of machines; knowledge of CAD packages such as Pro-E recommended) Analytical methods of kinematic, dynamic, and kinetoelectodynamic analysis and synthesis of mechanisms. Computerized design for function, path, and motion generation based on Burmeister theory.


ME 5248. Vibration Engineering. (4 cr; Stdtnt Opt. Prereq–IT upper div or grad 3321) Apply vibration theory to design; optimize isolators, detuning mechanisms, viscoelastic suspensions and structures. Use modal analysis methods to describe free vibration of complex systems, relating to both theoretical and test procedures.

ME 5286. Robotics. (4 cr; A-F or Aud; Prereq- [3281 or equiv], [upper div ME or AEM or CSci or grad student]). Manipulator forward/inverse kinematics, homogeneous transformations, coordinate frames, Jacobian/velocity control, task primitives/programming, computational issues of robot path trajectories. Reaction forces, manipulator dynamics/control. Vehicle kinematics, dynamics, and guidance. Lab project demonstrates concepts.


ME 5341. Case Studies in Thermal Engineering and Design. (4 cr; A-F or Aud. Prereq-IT upper div or grad student, 3321, 3322) Characteristics of applied heat transfer problems: nature of problem specification, incompleteness of needed knowledge base, accuracy issues. Categories of applied heat transfer problems (e.g., materials processing, turbomachinery, cooling of electronic equipment), heat exchangers, HVAC systems.


ME 5351. Computational Heat Transfer. (4 cr; A-F or Aud. Prereq-IT upper div or grad student, 3322) Numerical solution of heat conduction and analogous physical processes. Develop and use a computer program to solve complex problems involving steady and unsteady heat conduction, flow and heat transfer in ducts, flow in porous media, and other special applications.

ME 5361. Plasma-Aided Manufacturing. (4 cr; A-F or Aud. EE 5611. Prereq—Grad or IT upper div, ME 3321, ME 3322 or equiv) Properties of plasma—plasma as a processing medium, process control and system design considerations using specific examples of plasma spray coating, welding, and microelectronics processing.

ME 5381. Biological Transport Processes. (4 cr; A-F or Aud. AEM 317, CSci 5753, IT upper div, grad student, transport class, [3322 or ChEn 5103] or #). Fluid, mass, and heat transport in biological systems. Mass transfer across membranes, fluid flow in capillaries, intestines, veins and arteries. Biotransport issues in single cells and tissues, artificial organs, membrane oxygenators, and drug delivery applications.

ME 5446. Introduction to Combustion. (4 cr; A-F or Aud. Prereq-IT upper div or grad student, 3321, 3332, AEM 3401) Thermodynamics, kinetics, energy and mass transport, and pollutants in reacting systems. Reactors, laminar and turbulent flames. Ignition, quenching, and blowoff. Flame shapes. Combustion in reciprocating engines, furnaces, and turbines, with emphasis on internal combustion engine performance and emissions.

ME 5461. Internal Combustion Engines. (4 cr; A-F or Aud. Prereq-IT upper div or grad student, 3321, 3322) Basic spark ignition and diesel engine principles, air, fuel-air and actual engine cycles, cycle modeling, combustion and emissions, knock phenomena, air flow and volumetric efficiency, mixture requirements, ignition requirements and performance. Lectures and complementary labs.


ME 5666. Modern Thermodynamics. (4 cr; A-F only. Prereq- 3531 or equiv) Applications of thermodynamics to natural phenomena. Multiscale approach. Student group projects, with undergrads and grad students in same group. Three hours/week classroom instruction, one hour/week project discussion. Project presentations at weeks 8 and 14.

ME 8113. Advanced Aerosol/Particle Engineering. (3 cr; max 4 cr; A-F or Aud. Prereq-IT upper div student) Introduction to kinetic theory, definition, theory, and measurement of particle properties; elementary particle mechanics, particle statistics; Brownian motion and diffusion, coagulation, evaporation and condensation, sampling, and transport.

ME 8221. New Product Design and Business Development I. (4 cr; A-F or Aud. BMEN 8401, ENTR 8401, ENTR 8501, OMS 8061. Prereq-IT upper div student, senior level) Students and faculty work with company representatives to develop a product concept, a working physical prototype, and an extensive business plan. Concept design, manufacturing, marketing, introduction strategy, and profit forecasting. Sponsoring company intends to bring product to market. ME 8222 must be taken in sequence with 8221 the same year.

ME 8222. New Product Design and Business Development II. (4 cr; A-F or Aud. BMEN 8402, Prereq- 8221) Students and faculty work with company representatives to develop a product concept, a working physical prototype, and an extensive business plan. Concept design, detail design, manufacturing, marketing, introduction strategy, and profit forecasting. Sponsoring company intends to bring product to market. Must be taken in sequence with 8221 the same year.


ME 8253. Computational Nanomechanics. (5 cr; Stdnt Opt. Prereq-IT grad student) Fundamentals of mechanical properties in nanometer scale. Role of discrete structure and underlying atomistic, molecular and interfacial forces are illustrated with modern examples. Overview of computational atomistic methods. Lectures, hands-on computing using publicly available or personally developed scientific software packages.


ME 8287. Topics in Dynamics and Control. (2-4 cr; max 12 cr; A-F or Aud. Prereq-5281) Topics vary with each offering.

ME 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent) Planning experiments. Uncertainty, qualification, visualization, analogies. Temperature, pressure, heat flux, and flow measurements. Signal processing and analysis. Introduction to optical diagnostics.
ME 8341. Conduction. (3 cr; A-F or Aud, Prereq-Undergrad class in heat transfer or #) Advanced understanding/application of conduction/diffusion to heat/mass transfer problems. Solving ordinary/partial differential equations related to physics of diffusion. Special topics in numerical microscale heat transfer.

ME 8342. Convection. (3 cr; A-F or Aud, Prereq-Grad level course on fundamentals of fluid mechanics that has a substantial component on viscous flows or #) Heat transfer in fluids flowing around bodies and in tubes/ducts. Forced/natural convection. Laminar/turbulent flow regimes. Turbulent transport and modeling. High-speed flows, viscous dissipation, variable property effects. Application to heat exchange devices. Convective mass transfer.


ME 8381. Bioheat and Mass Transfer. (3 cr; Stdtnt Opt, Prereq-IT grad student, upper-division transport/fluids course; [physics, biology] recommended) Analytical/numerical tools to analyze heat/mass transfer phenomenon in cryobiological, hyperthermic, other biomedically relevant applications.

ME 8390. Advanced Topics in the Thermal Sciences. (1 cr [max 6 cr]; A-F or Aud) Topics vary according to instructor.

ME 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

ME 8462. Turbomachinery. (3 cr; A-F or Aud, Prereq-IT grad student, 5321, 5322 or equiv or #) Thermodynamic analysis of energy transfer between fluid and rotor; dimensional analysis; principles of axial, mixed, and radial flow pumps, fans, compressors, and turbines; cascade performance; computer flow simulations; applications to propulsion systems and power plants.

ME 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

ME 8772. Advanced Transportation Technologies Seminar. (1 cr; S-N or Aud, -CE 8213) Advanced technologies specifically related to transportation. Topics draw from core science/technology areas of human factors, intelligent vehicles, traffic modeling/management, sensing, communications, and controls.

ME 8773. Graduate Seminar. (1 cr; S-N or Aud, Prereq-IT grad student) Recent developments.

ME 8774. Graduate Seminar. (1 cr; S-N or Aud, Prereq-8773) Recent developments.

ME 8775. Technical Communication. (1 cr; S-N or Aud) One-day workshop on presenting a seminar. Students deliver one-hour seminar on technical topic and attend nine other technical seminars.

ME 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])

ME 8794. Mechanical Engineering Research. (1-6 cr [max 10 cr]; Stdtnt Opt. Prereq-#) Directed research.

ME 8800. Modern Developments in Mechanical Engineering. (1 cr [max 2 cr]; S-N or Aud, Prereq-IT grad student) Seminars on topics in engineering science of importance to mechanical engineers. Invited scholars deliver five-lecture series on each topic; two to five topics each semester.

ME 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade, Prereq-Max 18 cr per semester or summer; 24 cr required)

ME 8951. Plan B. (1 cr; S-N or Aud) Structured environment in which students can complete a M.S. Plan B project.

ME 8952. Plan B. (2 cr; A-F or Aud, Prereq-8951S) Structured environment in which students can complete a M.S. Plan B project.

MEDC 5185. Principles of Biomolecular Simulation. (3 cr; Stdtnt Opt, Prereq-Chem 3502 or #) Molecular simulation for students in medicinal chemistry, pharmaceutics, biochemistry, and chemical physics.

MEDC 5202. Research and Development Process of Pharmaceutical Products. (2 cr; S-N or Aud) New drug development process in the U.S. pharmaceutical industry.

MEDC 5245. Introduction to Drug Design. (3 cr; A-F or Aud, +CHEM 5245, PHAR 6245, Prereq-Chem) Concepts that govern design/discovery of drugs. Physical, bioorganic, medicinal chemical principles applied to explain rational design, mechanism of action drugs.

MEDC 5594. Advanced Methods in Quantitative Drug Analysis. (3 cr; A-F or Aud, Prereq-#) Quantitative methods (HPLC, GC, TLC, and immunoassays) for analysis of drugs and metabolites in biological fluids. Advanced techniques such as capillary electrophoresis, supercritical fluid chromatography, GC-MS, LC-MS, and tandem mass spectrometry. Chromatographic theory and statistical approaches to method validation.

MEDC 5495. Vistas in Medicinal Chemistry Research. (1 cr; S-N or Aud) Selected topics of contemporary interest in medicinal chemistry.

MEDC 5700. General Principles of Medicinal Chemistry. (2 cr; A-F or Aud, Prereq-MedC grad student or #) Fundamental principles of molecular recognition, physicochemical properties of drugs, drug metabolism and disposition, interaction of molecules with DNA/RNA.

MEDC 5710. General Principles of Medicinal Chemistry. (2 cr; A-F or Aud, Prereq-MedC grad student or #) Fundamental principles of enzyme inhibitors, combinatorial chemistry and library design, drug receptor interactions and signal transduction mechanisms, and molecular modeling.

MEDC 8100. Medicinal Chemistry Seminar. (1 cr [max 6 cr]; Stdtnt Opt. Prereq-Grad-major or #) Current topics.

MEDC 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

MEDC 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

MEDC 8500. Design of Chemotherapeutic Agents. (2 cr; A-F or Aud, Prereq-5600 or #) Modern aspects of designing chemotherapeutic agents. Strategies for enzyme inhibition and metabolic blocks in development of antinecancer, antimicrobial, and antiviral agents.

MEDC 8600. Chemical Aspects of Drug Metabolism and Bioactivation. (2 cr; A-F or Aud, Prereq-5600 or #) Chemical and enzymatic mechanisms of biotransformation and bioactivation of drugs and other xenobiotics. Reactivity and fate of bioactivated metabolites.

MEDC 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

ME 8700. Advanced Concepts in Drug Design. (2 cr; A-F or Aud, +CHEM 8700, PHAR 6247Hi, Prereq-5600 or #) Current approaches to rational design of drugs.

MEDC 8760. Design of Peptidomimetics. (2 cr; A-F or Aud, Prereq-5600 or #) Current approaches to design and synthesis of mimetics of biologically active peptides. Structural and conformational rationale used in peptidomimetic design.

ME 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])

MEDC 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)
MEDC 8900. Research in Medicinal Chemistry. (1-4 cr [max 8 cr]; A-F or Aud. Prereq—Grad med chem major or #) Study and experimental investigation.

Medieval Studies (MEST) Center for Medieval Studies College of Liberal Arts MEST 5610. Advanced Topics in Medieval Studies. (3-4 cr [max 15 cr]; Stdnt Opt. Prereq—One yr work in some area of Middle Ages, reading knowledge of appropriate language, #) From late antiquity through end of Middle Ages (circa 300-1500 A.D.). Current topics specified in Class Schedule.

MEST 5993. Directed Studies in Medieval Studies. (1-3 cr [max 6 cr]; Stdnt Opt. Prereq—Graduate standing, e-mail, access to Middle Wide Web, reading knowledge of appropriate language, #) Directed study with one of the core faculty of medieval studies program.

MEST 8010. Medieval Studies Colloquium. (3 cr [max 9 cr]; Stdnt Opt) Lectures by and discussions with faculty and visiting speakers.

MEST 8110. Seminar in Medieval Studies. (3-4 cr [max 48 cr]; A-F or Aud. Prereq—Appropriate languages, #) Offered when feasible.

Microbial Engineering (MICE) BioTechnology Institute College of Biological Sciences MICE 5309. Biocatalysis and Biodegradation. (3 cr; Stdnt Opt. +BIOC 5309. Prereq—chemistry through organic chemistry; knowledge of word processing, e-mail, access to Middle Wide Web, access to college-level science library recommended) Assessing validity of information on biocatalysis and biodegradation; fundamentals of microbial catalytic metabolism as it pertains to biodegradation of environmental pollutants; biocatalysis for specialty chemical synthesis; display of this information on the World Wide Web.

MICE 5355. Advanced Fermentation and Biotechnology Laboratory. (1 cr; S-N Only, Prereq—[3301 or BIOL 3301]. [grad student in microbial engineering or upper-div major in [microbiology or chem engineering or biochemistry]], #) Methods in industrial microbiology, lab, and pilot scale fermentation/biotechnology engineering. Lab experiments carried out in fermentation pilot plant. Operation of bench/pilot scale bioreactors. Designing bioreactors. Process optimization, monitoring, and control. Scale-up experiments, data analysis.

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

MICE 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])

MICE 8920. Teaching Practicum. (1 cr [max 4 cr]; Stdnt Opt. Prereq—Grad MIE major) Supervised experience in classroom, laboratory, and/or recitation instruction; develops skills in effective use of instructional techniques, materials, tests, and measurements.

MICE 8990. Biotechnology Seminar. (1 cr [max 2 cr]; Stdnt Opt. Prereq—First-yr students enroll 5-11, as they do not make a presentation; second-yr students enroll A-F, as they present a seminar) Student presentations of thesis research and presentations by invited speakers.

Microbiology (MICB) Department of Microbiology Medical School MICB 5205. Microbiology and Immunology for Medical Students. (7 cr; A-F only, Prereq—Mcb 3301, MicB 4131) Basic clinical human immunology, medical microbiology. Molecular/cellular basis of immune responses, tolerance. Immunologic disease, serology, antimiicrobial agents, chemotheraphy. Basic medical bacteriology, parasitology, mycology, virology. Unifying principles governing pathogenesis. Diseases are grouped with organisms important in differential diagnosis.

Microbiology, Immunology, and Cancer Biology (MICA) Department of Microbiology Medical School MICA 5000. Practicum: Teaching. (1 cr [max 4 cr]; A-F or Aud. Prereq—[MIMP or MICA] grad major or #) Supervised experience in lab instruction. Use of instructional materials, tests/measurement.

MICA 8002. Structure, Function, and Genetics of Bacteria and Viruses. (4 cr; A-F or Aud. Prereq—[One undergrad or grad course each in [microbiology, genetics, biochemistry]] or #) Structure, function, and metabolism of microorganisms. Microbial genetics. Molecular virology.

MICA 8003. Immunity and Immunopathology. (4 cr; Stdnt Opt. Prereq—Undergrad level immunology course or #) Lymphocyte activation, signal transduction in lymphocytes, antigen receptor genetics, antigen presentation, lymphoid anatomy, adaptive immune responses to microbes, immunodeficiency, immunopathology, cytokines, transplantation, autoimmunity.


MICA 8005. Topics in Microbiology, Immunology, and Cancer Biology. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq—8001, two of B002 or 8003 or 8004) Colloquium format. Readings/discussion on specialized topic.

MICA 8006. Protein Sequence Analysis. (5 cr; Stdnt Opt. Prereq—Biochem course, knowledge of UNIX operating system recommended) DNA and protein sequence and protein structure databases; protein sequence analysis; methods for display of sequence comparison and prediction results; Genetics Computer Group (GCG) sequence analysis programs; and current literature and research problems.

MICA 8007. Cell Biology and Biochemistry of the Extracellular Matrix. (3 cr; A-F or Aud. +BIOC 8007, Prereq—8002 or 8004 or #) Concepts in cell adhesion and tissue composition and importance of cell adhesion in tissue function and disease. Topics range from structure/function/assembly of tissue components to cellular adhesion mechanisms.


MICA 8010. Microbial Pathogenesis. (5 cr; A-F or Aud. Prereq—MICA grad student or inst) Molecular mechanisms of bacterial/viral pathogenesis. Strategies of disease causation/interaction with host, regulation of virulence factors, mechanism of virulence factor transmission to other microbes.

MICA 8011. Current Topics in Immunology. (3 cr; A-F or Aud. Prereq—MICA 8003 or #) Colloquium format. In-depth reading, discussion, and presentation of current topics in immunology.


MICA 8094. Research in Microbiology, Immunology, and Cancer Biology. (1 cr [max 5 cr]; S-N or Aud. Prereq—1st yr MICA grad student) One-on-one research training from faculty adviser during laboratory rotation.

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

MICA 8371. Mucosal Immunobiology. (3 cr; A-F or Aud. +CMB 8371, OBIO 8371. Prereq—8001 or #) Host immune processes at body surfaces. Inmate adaptive immunity at mucosal surfaces, interactions/responses of various mucosal tissues to pathogens, current approaches being used to target protective vaccination to mucosal tissues. Lectures, journal club format.

MICA 8644. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

MICA 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/fifth registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

MICA 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])

MICA 8888. Thesis Credits: Doctoral. (1-12 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

Molecular Cellular Developmental Biology and Genetics (MCDG)  
College of Biological Sciences  
MCDG 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)  
MCDG 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)  
MCDG 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)  
MCDG 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))  
MCDG 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)  
MCDG 8900. Student Research Seminar. (1 cr [max 10 cr]; S-N or Aud. Prereq–Grad MCDG or BMB major %)  
MCDG 8910. Journal Presentations. (1 cr [max 2 cr]; S-N or Aud. Prereq–Grad MCDG or BMB major %)  
MCDG 8920. Special Topics. (1-4 cr [max 6 cr]; Stdnt Opt. Prereq–Grad MCDG or BMB major %)  
MCDG 8950. Teaching Practicum. (1 cr [max 2 cr]; S-N or Aud. Prereq–Grad MCDG major or %)  
MCDG 8993. Directed Studies. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq–MCDG grad student or %)  
MCDG 8994. Research. (1-5 cr [max 10 cr]; S-N or Aud. Prereq–MCDG grad student or %)  

Museum Studies (MST)  
Bell Museum of Natural History  
MST 5011. Museum History and Philosophy. (3 cr; A-F or Aud. Prereq–#)  
MST 5012. Museum Practices. (3 cr; A-F or Aud. Prereq–#)  

Music (MUS)  
School of Music  
College of Liberal Arts  
MUS 5101. Piano Pedagogy I. (2 cr; Stdnt Opt. Prereq–8 cr in MusA 1301 or MusA 1401 or #)  
MUS 5120. Piano Pedagogy II. (2 cr; Stdnt Opt. Prereq–8 cr in MusA 1301 or MusA 1401 or #)  
MUS 5150. Body Awareness in Activity: The Alexander Technique for Musicians. (2 cr [max 4 cr]; Stdnt Opt.)  
MUS 5170. Organ Literature I. (3 cr; Stdnt Opt. Prereq–3502, 3603, sr or grad or #)  
MUS 5180. Organ Literature II. (3 cr; A-F or Aud. Prereq–3502, 3603, sr or grad or #)  
MUS 5190. Voice Pedagogy. (2 cr [max 6 cr]; A-F or Aud. Prereq–#)  
MUS 5191. Voice Pedagogy II. (2 cr [max 4 cr]; Stdnt Opt. Prereq–#)  
MUS 5192. Voice Pedagogy III. (2 cr; Stdnt Opt. Prereq–#)  
MUS 5200. Internship. (1-4 cr [max 32 cr]; S-N or Aud. Prereq–#)  
MUS 5201. Advanced Piano Literature I. (2 cr; A-F or Aud. Prereq–#)  
MUS 5202. Advanced Piano Literature II. (2 cr; A-F or Aud. Prereq–#)
MUS 5250. Chorus. (1 cr [max 6 cr]; Stdnt Opt. Prereq—Choral and/or instrumental music background and/or audition.) # University Women’s Chorus, Men’s Chorus, Concert Choir and Choral Union. Choirs participate in a variety of programs exploring both Western and non-Western repertoire from the Middle Ages through the 20th century. Concerts include touring, and collaborative campus and community performances.

MUS 5240. University Singers. (1 cr [max 8 cr]; A-F or Aud. Prereq—Audition.) # Mixed choir with members of former chamber singers and concert choir. Programs exploring Western/non-Western repertoire from Middle Ages through 20th century. Concerts include touring and collaborative campus/community performances.

MUS 5241. Vocal Literature I. (3 cr; A-F or Aud. Prereq—12 cr in MUSA 1304, grad music student) or # Vocal literature of major/minor composers from 17th century to present. Structure, style, performance practice.

MUS 5242. Vocal Literature II. (3 cr; A-F or Aud. Prereq—12 cr in MUSA 1104 or MUSA 1304, grad music major or #) Vocal literature of major and minor composers from 17th century to present; structure, style, and performance practice.


MUS 5270. Voice Practicum. (1 cr [max 2 cr]; Stdnt Opt. Prereq—Undergrad sr vocal major or #) Teaching voice class or individual students with peer and faculty feedback. Assist in class voice instruction or teach two students weekly in conjunction with two one-hour observation labs. May be taken for two semesters.

MUS 5271. Diction for Singers I. (2 cr; A-F or Aud. Prereq—MUSA 1304 or grad music major or #) Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used.

MUS 5272. Diction for Singers II. (2 cr; A-F or Aud. Prereq—MUSA 1304 or grad music major or #) Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used.

MUS 5275. Vocal Pedagogy I. (3 cr; Stdnt Opt. Prereq—Sr vocal major or #) Advanced study of mind/body preparations for singing, anatomy, and physiology of the vocal mechanism. Voice use and care, historical and comparative pedagogy, learning theories, models and guidelines for teaching, instructional techniques, and diagnosing and solving vocal problems.

MUS 5276. Vocal Pedagogy II. (3 cr; A-F or Aud. Prereq—Sr vocal major or #) History of solo vocal performance; selection and preparation of beginning level solo vocal repertoire; development of vocal performance skills (interpretation, expression, artistry), recital programming, and vocal career counseling.

MUS 5279. Group Voice: Performance/Pedagogy. (2-5 cr; A-F or Aud. Prereq—performance experience, #) 2 cr per sem; performance/pedagogy track; 3 cr per sem; [upper div student or grad student], #) Foundations/fundamentals of speech/singing. Vocal production, breath and body, voice, physics, physiology, terminology. Application of vocal techniques in learning/performing repertoire. Teaching methods, including voice/motion exercises.


MUS 5336. Jazz Arranging. (3 cr; A-F or Aud. Prereq—3502 or #) Beginning techniques of arranging for jazz combo and small ensemble; vocal and instrumental.

MUS 5340. Jazz Ensemble. (1 cr [max 6 cr]; A-F or Aud. Prereq—audition, #) A 20-member performing organization covering significant jazz compositions and arrangements written specifically for this medium.

MUS 5341. Jazz Pedagogy. (2 cr; A-F or Aud. Prereq—#) Teaching methods of vocal and instrumental jazz improvisation, basic arranging techniques, and jazz history; bibliographies and materials.


MUS 5400. University and Campus Bands. (1 cr [max 10 cr]; Stdnt Opt) Lab course.

MUS 5410. University Wind Bands. (1 cr [max 14 cr]; A-F or Aud. Prereq—audition, #) Wind ensemble and symphony bands perform standard and contemporary literature; concerts and tour appearances. Players from all colleges may participate.

MUS 5420. Orchestra. (1 cr [max 8 cr]; A-F or Aud. Prereq—audition, #) Symphony orchestra performs standard repertoire and major works with chorus; concerts and tour appearances. Players from all colleges may participate.


MUS 5423. Suzuki Pedagogy Practicum. (1 cr; A-F or Aud. Prereq—[&5424R or &5425R], grad music student) or #, grad consent) Supervised teaching of both individual and group lessons. Instructor provides periodic critiques from observation of live or videotaped lessons.


MUS 5425. Advanced Suzuki Violin Pedagogy II. (2 cr; A-F or Aud. Prereq—&5424R or #) Intensive examination of Suzuki techniques for intermediate and advanced violin students in Western society. Discussion, playing experience, observation of children’s lessons in the MacPhail Center Suzuki Program, and practical teaching experience.

MUS 5427. Violin Pedagogy I. (2 cr; A-F or Aud. Prereq—Violin or viola major or #) Private teaching of violin students at beginning, intermediate, and advanced levels. Discussion and demonstrations of pedagogical techniques.

MUS 5428. Violin Pedagogy II. (2 cr; A-F or Aud. Prereq—Violin or viola major or #) Private teaching of violin students at beginning, intermediate, and advanced levels. Discussion and demonstrations of pedagogical techniques.

MUS 5430. New Music Ensemble. (1 cr [max 8 cr]; A-F or Aud. Prereq—#) Study/performance of contemporary ensemble (including small chamber orchestra) literature. Historical/theoretical analysis of works performed.

MUS 5440. Chamber Ensemble. (1 cr [max 8 cr]; A-F or Aud. Prereq—audition, #) Performance of chamber music; duos, trios, quartets, quintets, and other ensemble combinations for instruments and/or voices.

MUS 5450. Orchestral Repertoire. (1-3 cr [max 9 cr]; A-F or Aud. Prereq—#) Investigation of practical and performance problems in standard orchestral repertoire with regard to style and interpretation.

MUS 5460. Ensemble for the Performance of Early Music, c900-1750. (1 cr [max 6 cr]; A-F only) Performance of medieval, renaissance, and baroque music (sacred and secular) according to traditions established from c900 to 1750. Ensemble consists of a chamber chorus and consort of instruments. Repertoire includes Gregorian chant, masses, motets, chansons, madrigals, and choral/instrumental movements from cantatas, oratorios, passions, all in original languages.

MUS 5461. Guitar Literature I: History and Repertoire before 1900. (2 cr; Stdnt Opt) Early history of classical guitar through its repertoire/composers. Related instruments such as renaissance lute, vihuela, baroque guitar, and baroque lute. Development of modern classical instrument.

MUS 5462. Guitar Literature II: History and Repertoire since 1900. (2 cr; Stdnt Opt) Repertoire/composers, concert/recording artists, and instrumental innovation of Segovia/post-Segovia eras.

MUS 5464. Cello Pedagogy. (2 cr; A-F or Aud) Concentrated study of cello teaching methods. Provides students with the strategies for teaching cello privately, develops analytical skills, and increases knowledge of cello repertoire. For practical application in conjunction with string technique course.


MUS 5466. Guitar Pedagogy. (2 cr; A-F or Aud. Prereq—Guitar principal or major or #) Historical survey of methods and studies from late 18th century to present, reflecting variety of content and approach. Works by Aguado, Sor, Giuliani, Tarrega, Segovia, Carlevaro, Duncan, Iznaola, Dodgson, and Brindle.

MUS 5471. Woodwind Literature and Pedagogy I. (1 cr; A-F or Aud. Prereq—Music major or #) A study of the major teaching materials for the five woodwind instruments including methods, duets, and solos used primarily for pedagogical reasons.

MUS 5472. Woodwind Literature and Pedagogy II. (1 cr; A-F or Aud. Prereq—Music pedagogy major or #) A study of chamber music involving one or more woodwind instruments. May include additional instruments such as piano, strings, and/or voice.
Course Descriptions

MUS 5473. History and Acoustics of Single Reed Instruments. (2 cr; A-F Or Aud. Prereq—Music major or #) Study of clarinet and saxophone history and literature, mechanical design and development, acoustics, modern schools of performance, selected teaching and performance techniques.

MUS 5480. University Brass Choir. (1 cr [max 8 cr]; Stdt Opt. Prereq—audition, #) The University Brass Choir is an ensemble of 16 brass and percussion players exploring unique literature that spans 400 years. From the rich antiphonal music of Giovanni Gabrieli (1557-1612) to the works of the 20th century. The Brass Choir performs in Twin Cities churches and concert halls.

MUS 5481. Trumpet Pedagogy. (2 cr; Stdt Opt. Prereq—Sr or grad in music or #) Principles of trumpet pedagogy. Discussion of literature, history, and current teaching aids.

MUS 5485. Transcription for Winds. (2 cr; Stdt Opt. Prereq—5502 or #) Principles of music manuscript and examination of transcription examples. Transcription projects with score and parts. Smaller projects that involve arrangements and original compositions.

MUS 5490. Percussion Ensemble. (1 cr [max 10 cr]; A-F Or Aud. Prereq—#) Practice and performance of standard and contemporary compositions for percussion instruments in various combinations.

MUS 5491. Percussion Literature I. (2 cr; A-F Or Aud. Prereq—Jr or sr or grad or #) Repertoire derived from orchestral and band literature for snare drum, timpani, mallet instruments, and various percussion accessories. Major works of the 20th century written for solo percussion, percussion ensemble, and chamber groups of percussion and non-percussion instruments.

MUS 5492. Percussion Literature II. (2 cr; A-F Or Aud. Prereq—Jr or sr or grad or #) Repertoire derived from orchestral and band literature for snare drum, timpani, mallet instruments, and various percussion accessories. Major works of the 20th century written for solo percussion, percussion ensemble, and chamber groups of percussion and non-percussion instruments.

MUS 5541. 16th-Century Counterpoint. (3 cr; A-F or Aud. Prereq—[3501, 3508] or pass basic skills exam) Polyphonic counterpart in modal style of Renaissance. Writing exercises in species counterpoint and in two, three, and four parts. Cantus firmus techniques, mixed values, invertible counterpoint, canon. Representative works by Josquin, Lassus, Palestrina, Victoria, and others. Renaissance treatises by Artusi, Banchieri, Diruta, Morley, Zarlino, and others.

MUS 5550. Class Composition. (2 cr [max 8 cr]; A-F Or Aud. Prereq—5502 or #) Original works in various forms. Development of individual compositional style in a post-tonal idiom. Various forms, performing forces, techniques.

MUS 5561. Orchestration I. (3 cr; A-F Or Aud. Prereq—5502) Scoring techniques for ensembles in combination and full orchestra; year-long sequence. Score study of representative works from 18th through 20th centuries.

MUS 5562. Orchestration II. (3 cr; A-F Or Aud. Prereq—5561) Scoring techniques for ensembles in combination and full orchestra; year-long sequence. Score study of representative works from 18th through 20th centuries.

MUS 5571. Schenkerian Analysis for Performers. (3 cr; A-F Or Aud. Prereq—5502) Theory/analysis of tonal music using principles developed by Heinrich Schenker. Basic concepts; notation, their application to excerpts/short pieces from 18th/19th centuries.

MUS 5573. Analysis of Late-Romantic Orchestral Literature. (3 cr; A-F or Aud. Prereq—5502 or Theory IV Exam or # 3504 or equiv recommended) Introduction to advanced tonal analysis. Corpus of dramatic orchestral music by Wagner, Strauss, Tchaikovsky, Rimsky-Korsakov, Moussorgsky, and Rachmaninoff as focus for projects and classroom discussions related to chromatic harmony, form, and orchestration.


MUS 5592. Computer Music II: Interactive Techniques and Theory. (3 cr; A-F or Aud. Prereq—5591 or #) Topics such as filtering, formant synthesis, reverberation techniques, and additive synthesis. Work with interactive MIDI applications.

MUS 5597. Music and Text. (3 cr; A-F or Aud. Prereq—5502) Designed for music majors only, this course gives an introduction to the analysis of music with texts such as art song and opera.

MUS 5610. Topics in Opera History. (3 cr [max 6 cr]; A-F Or Aud. Prereq—grad music major or #) Study of specific operas. Development of opera in context of other artistic, social, cultural, and political events, movements, and changes. Periods/countries vary each semester.


MUS 5614. History of the Symphony in the 20th Century. (3 cr; A-F or Aud. Prereq—grad music major or #) Contributions to artistic life, particularly the ballet.

MUS 5658. History of the Symphony in the 20th Century. (3 cr; A-F Or Aud. Prereq—3603, 5501 or #) Study of the symphony from its beginnings through Beethoven to present. Changing aesthetic concerns, structural, harmonic, and timbral innovations. Sociocultural contexts; analysis and criticism.

MUS 5666. Stravinsky. (3 cr; A-F or Aud. Prereq—5502, 12 cr music history) Analysis and criticism of representative works; aesthetic concerns as expressed in writings of Stravinsky and others; influence upon European and American composers; biographical issues and contributions to artistic life, particularly the ballet.

MUS 5668. Beethoven’s Symphonies. (3 cr; A-F or Aud. Prereq—3603, #) Analytical overview of selected movements from Beethoven’s 9 symphonies. Principles of sonata analysis (norm and deformation); introduction to wider contexts of interpretation and understanding (generic, expressive, social).

MUS 5804. Folk and Traditional Musics: Selected Cultures of the World. (3 cr; A-F Or Aud. Prereq—1801 or 1804 or music grad or #) A study of selected music traditions from 5 to 7 world cultures. Genres, social institutions, concepts, styles, instruments, and usages.


MUS 5993. Directed Studies. (1-4 cr [max 12 cr]; Stdt Opt) Prereq—#. ( @) Guided individual reading or study.

MUS 8110. Sonata Seminar. (2 cr [max 8 cr]; A-F or Aud. Prereq—Grad—Assigning emphasis, strings and winds by audition, #) Performance in standard Baroque, Classical, and Romantic sonatas for piano and violin, cello, viola, flute, clarinet, or oboe.


MUS 8131. Advanced Keyboard Skills. (2 cr; A-F or Aud. Prereq—Grad student in music or #) Diatonic/chromatic tonal harmony applied to keyboard. Emphasizes harmonization, transposition, and improvisation. Open score and clef reading using alto, tenor, and soprano clefs.

MUS 8133. Seminar in Basso Continuo. (3 cr; A-F or Aud. Prereq—Grad student in music or #) Realization of figured basses (bass lines annotated with Arabic numerals indicating harmony) and performance of continuo parts in European concerted music from 17th/18th centuries at keyboard. Emphasizes developing stylistic accomplishment skills at harpsichord/organ.

MUS 8151. Seminar in Organ Repertoire. (3 cr; A-F or Aud. Prereq—Grad student in music or #) Repertoire for pipe organ. Readings/presentations on selected areas of repertoire of 15th through 20th centuries. Organ design/construction of various European and American schools, as well as relevant performance practices.

MUS 8170. Advanced Vocal Accompanying Skills and Repertoire. (2 cr [max 8 cr]; A-F or Aud. Prereq—[French, German, Italian diction], accompanying or DMA voice emphasis or MM voice emphasis by audition) Advanced performance (Lieder, melodie, opera) emphasizing coaching techniques and performance skills of pianists and singers.

MUS 8171. Song Repertoire and Performance for Pianists and Singers: German Lieder. (2 cr; A-F or Aud. Prereq—[Grad student with major in vocal performance or in accompanying or in piano], #) Survey standard German-language song repertoire: Mozart, Schubert, Schumann, Brahms, Strauss, Wolf.
MUS 8172. Song Repertoire and Performance for Pianists and Singers: French Melodies. (2 cr; A-F or Aud. Prereq-[Grad student with major in vocal performance or in accompanying or in piano], #) Surveys standard French melodies: Faure, Chausson, Duparc, Debussy, Ravel, Poulenc, Caplet, Roussel, Satie.

MUS 8173. Song Repertoire and Performance for Pianist and Singers (20th and 21st Centuries). (2 cr; A-F or Aud. Prereq-Grad student, [major in vocal performance or accompanying or in piano], #) Surveys standard English songs from Elizabethan Age to present, Italian songs, “bel canto” tradition.

MUS 8175. Song Repertoire and Performance for Pianists and Singers: Russian, Spanish, and other languages. (2 cr; A-F or Aud. Prereq-[Grad student with major in vocal performance or in accompanying or in piano], #) Surveys standard songs in Russian, Spanish, and other languages: Turina, Obregas, Granados, Nin, Rodrigo, Montsalvatge, Guindi, Tchaikovsky, Rachmaninoff, Prokofiev, Stravinsky, Shostakovich. International Phonetic Alphabet.

MUS 8181. Operatic Accompaniment Skills and Repertoire. (2 cr; A-F or Aud. Prereq-Grad student with major in accompanying or in conducting) Development of skills required in operatic accompanying coaching, performance. Standard opera arias, cultivation of orchestral sound at the piano, stylistic traditions, working with conductors.

MUS 8182. Opera History in Context: Monteverdi and Mozart. (3 cr; A-F only. Prereq-Grad student in music or #) Development of opera in context of other artistic, social, cultural, and political events, movements, and changes. Focuses on two representative composers and some of their significant operas.

MUS 8183. Opera History in Context: Verdi and Britten. (3 cr; A-F only. Prereq-Grad student in music or #) Development of opera in context of other artistic, social, cultural, and political events, movements, and changes. Focuses on two representative composers and some of their significant operas.

MUS 8237. Sousa: Study. Choral. (3 cr; A-F or Aud. Prereq-#) Analysis of various choral scores ranging from Renaissance through 20th century. Reading of choral and choral/orchestral scores at piano, including scores with 4 clefs and transposing instrument.

MUS 8255. Choral Literature: Baroque Era to the Present. (3 cr; A-F or Aud. Prereq-#) Survey of sacred and secular choral works.

MUS 8259. Performance in Choral Conducting. (3 cr; A-F or Aud. Prereq-#) Preparation and performance of choral conducting recital, with supporting paper.

MUS 8333. MUS 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent) MUS 844. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

MUS 8450. Graduate Seminar in Conducting. (3 cr max 32 cr; A-F or Aud. Prereq-Grad student in conducting or #) Development of musicianship, conducting, rehearsal, and analytical skills. Repertoire, gesture, score study, interpretation, pedagogy, and performance presentation in wind band, orchestral, and choral conducting. Students meet twice weekly in group seminar, and prepare and participate in weekly conducting labs scheduled with all major University ensembles.


MUS 8471. Wind Ensemble/Band Conducting I. (4 cr; A-F or Aud. Prereq-Wind conducting emphasis or #) Seminar in wind band repertory of 18th, 19th, and 20th centuries emphasizing stylistic and period practices; techniques of score study, analysis, and interpretation. Practical conducting experience.

MUS 8472d. Wind Ensemble/Band Conducting II. (4 cr; A-F or Aud. Prereq-Wind conducting emphasis or #) Seminar in study of music for small wind ensembles and Harmoniemusik tradition; rehearsal techniques and strategies. Music since 1990; contemporary notation systems; rehearsal techniques and strategies. Practical conducting experience.

MUS 8479. Preparation and Document: Wind Ensemble/Band Conducting. (2 cr; A-F or Aud. Prereq-#) Preparing and performing full wind ensemble or band conducting program with supporting document.

MUS 8580. Topics in Tonal Analysis. (3 cr max 12 cr; A-F or Aud. Prereq-#) Seminar. Sample topics: string quartets of Beethoven, chamber music of Brahms, significant works by tonal composers.

MUS 8581. Schenkerian Theory and Analysis I. (3 cr; A-F or Aud. Prereq-#) Analysis and critical readings pertaining to theory of tonal music developed by Heinrich Schenker. Application of his method to representative repertoire from 18th and 19th centuries. Contrapuntal writing modeled after presentation in Schenker’s [Counterpoint].

MUS 8582. Schenkerian Theory and Analysis II. (3 cr; A-F or Aud. Prereq-#) Application of Schenkerian theory to 18th-19th-century music, coordinated with critical study of major music treatises from that era.

MUS 8584. Current Issues in the Analysis of 19th-Century Music. (3 cr; A-F only. Prereq-[[3502, 3512] or equiv placement exam], #; grad-level Schenkerian analysis recommended) Recent analytic approaches to 19th-century music. Students demonstrate fluency with methods and current issues. In-class discussions, short written analytical projects, two longer papers.

MUS 8590. Topics in 20th-Century Analysis. (3 cr max 12 cr; A-F or Aud. Prereq-Grad music major, #) Seminar explores literatures of 20th-century art music.

MUS 8631. Seminar: Music in Medieval Europe. (3 cr; A-F or Aud. Prereq-Undergrad music degree) Selected genres of polyphonic and monophonic music, 9th-14th centuries, for analysis and cultural criticism. Social roles of music and performance traditions, current musicological issues.

MUS 8632. Seminar: Music in Early Modern Europe. (3 cr; A-F or Aud. Prereq-Undergrad music degree) Transition of chanson, madrigal, mass, and motet from 1400 to 1580. Analysis and cultural criticism; social roles of music and performance traditions; current musicological issues.

MUS 8640. Seminar in Musicology. (3 cr max 12 cr; A-F or Aud. Prereq-Musicology or theory emphasis or #) Topics vary; readings, research, strategies, and methods.


MUS 8645. Current Musicology: Readings. (3 cr; A-F or Aud. Prereq-Musicology or theory emphasis or #) Readings and topics in recent scholarly and analytical work.

MUS 8651. Sonata Theory. (3 cr; A-F or Aud. Prereq—#) Principles of the classic sonata: forms, types, and deformations. Structural analysis, analytical methodologies, and fundamentals of sonata hermeneutics.

MUS 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]); No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

MUS 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])


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

MUS 8994. Directed Research. (1-3 cr [max 12 cr]; A-F or Aud. Prereq—#) Directed research.

MUS 8999. Recital Credits: Doctoral. (4 cr [max 20 cr]; A-F or Aud. Prereq—DMA student, %) Registration for recital credits coincides with performance of D.M.A. recital (five recitals for 20 credits).

MUS 5119. Tuba: Elective.

MUS 5121. Percussion: Elective.


MUS 5123. Guitar: Elective.

NOTE: MUS 5401 through MUS 5423 are private instruction. The prerequisites are (2-4 cr [max 24 cr]; A-F or Aud. Prereq—Audition, %)

MUS 5401. Piano—Secondary.

MUS 5402. Harpsichord—Secondary.

MUS 5403. Organ—Secondary.


MUS 5405. Violin—Secondary.

MUS 5406. Viola—Secondary.

MUS 5407. Cello—Secondary.


MUS 5409. Flute—Secondary.

MUS 5411. Oboe—Secondary.


MUS 5413. Saxophone—Secondary.


MUS 5415. French Horn—Secondary.

MUS 5416. Trumpet—Secondary.

MUS 5417. Trombone—Secondary.

MUS 5418. Baritone—Secondary.

MUS 5419. Tuba—Secondary.

MUS 5421. Percussion—Secondary.

MUS 5422. Harp—Secondary.

MUS 5423. Guitar—Secondary.

NOTE: MUS 8301 through MUS 8324 are private instruction. The prerequisites are (2-4 cr [max 48 cr]; A-F or Aud. Prereq—Audition, %)

MUS 8301. Piano—Major.

MUS 8302. Harpsichord—Major.

MUS 8303. Organ—Major.

MUS 8304. Voice—Major.

MUS 8305. Violin—Major.

MUS 8306. Viola—Major.

MUS 8307. Cello—Major.


MUS 8309. Flute—Major.

MUS 8311. Oboe—Major.

MUS 8312. Clarinet—Major.

MUS 8313. Saxophone—Major.

MUS 8314. Bassoon—Major.

MUS 8315. French Horn—Major.

MUS 8316. Trumpet—Major.

MUS 8317. Trombone—Major.

MUS 8318. Euphonium—Major.

MUS 8319. Tuba—Major.

MUS 8321. Percussion—Major.

MUS 8322. Harp—Major.

MUS 8323. Guitar—Major.

MUS 8324. Accompanying/Coaching.

NOTE: MUS 8501 through MUS 8524 are private instruction. The prerequisites are (2-4 cr [max 8 cr]; A-F or Aud. Prereq—#)

MUS 8501. Piano: Beyond Requirement.

MUS 8502. Harpsichord: Beyond Requirement.

MUS 8503. Organ: Beyond Requirement.

MUS 8504. Voice: Beyond Requirement.


MUS 8506. Viola: Beyond Requirement.

MUS 8507. Cello: Beyond Requirement.


MUS 8509. Flute: Beyond Requirement.

MUS 8511. Oboe: Beyond Requirement.

MUS 8512. Clarinet: Beyond Requirement.

MUS 8513. Saxophone: Beyond Requirement.

MUS 8514. Bassoon: Beyond Requirement.

MUS 8515. French horn: Beyond Requirement.

MUS 8516. Trumpet: Beyond Requirement.

MUS 8517. Trombone: Beyond Requirement.

MUS 8518. Euphonium: Beyond Requirement.

MUS 8519. Tuba: Beyond Requirement.

MUS 8521. Percussion: Beyond Requirement.

MUS 8522. Harp: Beyond Requirement.

MUS 8523. Guitar: Beyond Requirement.

MUS 8524. Accompanying/Coaching: Beyond Requirement.

Music Education (MUED)

School of Music


MUE 5211. Foundations of Music Education. (3 cr; A-F or Aud) An overview of the historical, philosophical, and psychological foundations of music education.

MUE 5313. Youth Music: Preferences, Influences, and Uses. (3 cr; A-F or Aud. Prereq—Grad student in music or music education or #) Youth music preferences and their determinants. How music influences youth behavior. Students/teachers’ uses of commercial styles.

MUE 5350. Student Teaching in Classroom Music. (4-8 cr [max 8 cr]; A-F or Aud. Prereq—Music ed major, #) Supervised teaching and observing of classroom and general music in elementary, junior high, and senior high schools. Weekly seminar emphasizing classroom management, curriculum development, and administration of music programs.

MUE 5433. Techniques and Materials: Choral Ensembles. (2 cr; A-F or Aud. Prereq—Music or music ed major or #) Research and literature on vocal and choral music education; choral curriculum issues; repertoire selection; rehearsal techniques.
MUED 5450. Student Teaching in Vocal Music. (2 cr; [max 8 cr]; A-F or Aud. Prereq-Music ed major, #) Supervised teaching and observing of vocal music in elementary, junior high, and senior high schools. Weekly seminar emphasizing classroom management, curriculum development, and administration of music programs.


MUED 5550. Student Teaching in Instrumental Music. (4-8 cr [max 8 cr]; A-F or Aud. Prereq-Music ed major, #) Supervised teaching and observing of instrumental music in elementary, junior high, and senior high schools. Weekly seminar emphasizing classroom management, curriculum development, and administration of music programs.

MUED 5611. Teaching with Related Arts. (2 cr; A-F for Aud) Methods and materials for teaching music in cultural context including other art forms.

MUED 5621. African Performing Arts in Education. (3 cr; A-F only. Prereq-Grad student in [music or other arts or education] or #) Representation of African performing arts in educational settings outside Africa. Performance practices, principles, techniques. Analyzing, listening, playing instruments, dancing. Performing with master artists, developing educational materials, reviewing resources, designing integrated arts projects.

MUED 5647. Teaching the Percussion Instruments. (2 cr; A-F or Aud) Contemporary approaches for teaching percussion in the schools; development of curricular materials and practice in performance techniques.

MUED 5650. Student Teaching Seminar. (2 cr; A-F or Aud. Prereq-At least C- in all required [music, music education, professional education] courses) Reflective practice during student teaching. Developing materials for professional employment (e.g., resume, portfolio).

MUED 5664. Teaching Music with Technology. (3 cr; A-F or Aud) Home page development techniques, software/materials, audio/video utilities, research applications.

MUED 5669. Psychology of Music. (3 cr; A-F or Aud. Prereq-Psy 1001 or Psy 3604 or #) Basic study of the psychology and psychoacoustics of music including hearing, music perception and cognition, values and preferences, musical abilities, musical systems, media music effects, the influence of music on human behavior, and psycho-socio-physiological processes involved in musical behavior.

MUED 5750. Topics in Music Education. (1-4 cr [max 16 cr]; A-F or Aud. Prereq-Grad student in [music education/therapy or education] or #) Focuses on single topic, specified in Class Schedule.

MUED 5800. Group Music Leadership Skills. (3 cr; A-F or Aud. Prereq-[Completion of [MUS 1151, MUS 1152] or MUS 1155], music therapy major) or #) Role of group music experiences in human development. Relations specific to music therapy. Students develop repertoire of music applications/techniques for various age groups/populations. Standards for group leadership. Precision teaching skills.

MUED 5803. Therapeutic Management in Music Settings. (4 cr; A-F only. Prereq-5804, 5805 or #) Cognitive behavioral methodology related to music therapy and music education settings. Prepares students to complete case studies mandated for internship completion set forth by American Music Therapy Association.


MUED 5805. Music Therapy Methods and Procedures II. (4 cr; A-F only. Prereq-5804 or #) Second course in professional sequence for music therapy. Topics include psychotherapy techniques and other music therapy approaches. Practicum in the community, in-class lab.

MUED 5806. Career Preparation. (3 cr; A-F or Aud. Prereq-5805 or #) Ethics, grant writing, resume/CV preparation, supervision, board certification, professional responsibilities. Students design evidence/research-based music therapy program, present their proposals to class/community.

MUED 5807. Psychiatric Music Therapy. (4 cr; A-F only. Prereq-Grad music therapy student or #) Psychiatric populations. How music therapy can be implemented as evidence-based practice. Students design original research and role-play music therapy interventions for psychiatric populations. Practicum component on designing music therapy interventions.

MUED 5808. Medical Music Therapy. (3 cr; A-F only. Prereq-Grad music therapy major or #) Role/scope of music therapy in medical treatment. Medical diagnosis. How to program appropriate music therapy interventions to address patient needs.

MUED 5855. Music Therapy Internship. (0-13 cr [max 13 cr]; S-N or Aud. Prereq-Music therapy major, #) Six-month resident internship in music therapy at an affiliated, approved hospital or clinic.

MUED 5991. Independent Study. (1-4 cr [max 8 cr]; A-F or Aud. Prereq-Music ed or music therapy major or grad, #, %) Independent study project organized by the student in consultation with the appropriate instructor.

MUED 8112. Introduction to Research Methods and Design in Arts Education. (3 cr; A-F or Aud. Prereq-Grad student in [music or music education], %) Methods and research designs employed in investigating education issues in the arts. Reporting results. Proposal development. Bibliographic skills for conducting a review of related research literature. Common analytical techniques.

MUED 8115. Assessment in Arts Education. (3 cr; A-F or Aud. Prereq-Grad student in [music or music education], %) Methods for assessing unique challenges in artistic achievement: performances, products, and other artistic achievements. Assessment design. Interpretation for large-/small-scale assessments in performance, classroom, and clinical settings.

MUED 8118. Qualitative Research in Arts Education. (3 cr; A-F or Aud. Prereq-Grad student in [arts or education], %) A theoretical, practical and systematic approach to qualitative research in arts education. Students participate in a joint field exploration or work in a setting relevant to their long-term research interests.

MUED 8119. Advanced Applications of Research Methods. (3 cr; A-F only. Prereq-Grad music education student or #) Application of research methods/design. Emphasizes both qualitative and quantitative methods. Contemporary procedures/theories of data collection, management, analysis, and interpretation.

MUED 8211. Foundations of Music Education. (3 cr; A-F or Aud. Prereq-Grad student in [music or music education] or #) Major historical, philosophical, sociological, and psychological foundations of music education. Primary literature in the field. Role and current state of music education.

MUED 8280. Seminar: Current Trends in Music Education. (5 cr [max 50 cr]; A-F only. Prereq-%) Current issues/trends in music education: philosophical, historical, psychological, and pedagogical. Course’s focus varies, reflecting the dynamic nature of the field.


MUED 8282. Seminar: Historical Issues. (3 cr; A-F or Aud. Prereq-Doctoral student in music or music education or #) Issues in historical foundations of music education.

MUED 8283. Seminar: Psychological Issues. (3 cr; A-F or Aud. Prereq-Doctoral student in music or music education or #) Issues in psychological foundations of music education.

MUED 8284. Seminar: Research and Scholarly Issues. (3 cr; A-F or Aud. Prereq-Doctoral student in music or music education or #) Scholarly/professional expectations of music educators and music therapists in academia and other positions of leadership. Writing for a variety of professional purposes/publications.

MUED 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)


MUED 8900. Seminar: Music Education Doctoral Seminar. (1 cr [max 8 cr]; A-F only. Prereq-%) Research-oriented collaboration between students and faculty. Models the manner in which research is conceived, primary literature evaluated, methods designed, and research projects carried through to completion.

MUED 8994. Directed Research. (1-8 cr [max 8 cr]; A-F or Aud. Prereq-#)
Course Descriptions

Nanoparticle Science and Engineering (NPSE)

Institute of Technology
NPSE 8001. Introduction to Nanoparticle Science and Engineering. (3 cr; A-F or Aud)
A broad, interdisciplinary overview of the emerging field of nanoparticle science and engineering. This introductory course, designed for students with diverse backgrounds in science and engineering, covers a wide spectrum of topics—from the synthesis of nanoparticles, to nanoparticle growth and transport, to characterization methods for nanoparticles, to novel nanoparticle-based materials and devices.

NPSE 8002. Nanoparticle Science and Engineering Laboratory. (3 cr; A-F or Aud. Prereq-8001, [IT grad student or #)
Practical exposure to computational and experimental techniques in nanoparticle research. Required for Ph.D. students minoring in nanoparticle science and engineering.

NPSE 8101. Nanoparticle Science and Engineering Seminar. (1 cr; S-N or Aud. Prereq-IT grad student or #)
A broad overview of current research in nanoparticle science and engineering. Topics include areas of nanoparticle synthesis, nanoparticles characterization, nanoparticle-based materials and devices, environmental impact of nanoparticles, and instrumentation for nanoparticle research. Speakers from the University of Minnesota as well as external experts.

Natural Resources Science and Management (NR)

Department of Forest Resources
College of Food, Agricultural and Natural Resource Sciences
NR 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)
NR 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)
NR 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]. No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to 4 times, up to 60 combined cr)
NR 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])
NR 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

Neuroscience (NSC)

Medical School
NSC 5031W. Perception. (3 cr; Sdnst Opt. =PSY 5031W. Prereq-Psy 5031 or Psy 5031 or #)
Cognitive, computational, and neuroscience perspectives on visual perception. Color vision, pattern vision, image formation in eye, object recognition, reading, impaired vision. Course is biennial: offered fall of odd years.

NSC 5037. Psychology of Hearing. (3 cr; Sdnst Opt. =PSY 5037. Prereq-Psy 5031 or #)
Biological and physical aspects of hearing, auditory psychophysics, theories and models of hearing, perception of complex sounds including music and speech, clinical and other applications.

NSC 5201. Computational Neuroscience I: Membranes and Channels. (3 cr; Sdnst Opt. =PHSL 5201. Prereq-calcus through differential equations)
Comprehensive examination of membrane and ion channels using UNIX workstations to simulate their properties. Hodgkin-Huxley model, nonlinear dynamic systems, voltage- and ligand-gated ion channels, impulse propagation.


NSC 5461. Cellular and Molecular Neurosciences. (4 cr; A-F or Aud. Prereq-NSc grad student or #)
Lectures by team of faculty, problem sets in important physiological concepts, discussion of original research papers.

Current research on drugs of abuse, their mechanisms of action, characteristics shared by various agents, and neural systems affected by them. Offered biennially, spring semester of even-numbered years.

NSC 5481. Invertebrate Neurobiology. (3 cr; A-F or Aud. =ENT 5481)
Fundamental principles/concepts underlying cellular bases of behavior and “systems” neuroscience. Particular invertebrate preparations. Offered annually the last 10 weeks of spring semester.

NSC 5540. Advanced Survey of Biomedical Neurosciences. (2 cr; Sdnst Opt. Prereq-#)
Advanced preparation for members of biomedical community or students with advanced scientific background. Current topics in biomedical neuroscience, accompanied by supporting, fundamental concepts. Intensive, one week course.

NSC 5551. Itasca Cell and Molecular Neurobiology Laboratory. (4 cr; S-N or Aud. Prereq-NScience grad student or #)
Intensive lab introduction to cellular and molecular aspects of research techniques in contemporary neurobiology; held at Itasca Biological Station. Electrophysiological investigations of neuronal properties, neurochemical assays of transmitter action, and immunohistochemical studies in experimental preparations.

NSC 5561. Systems Neuroscience. (4 cr; A-F or Aud. Prereq-NSc grad student or #)

NSC 5561. Behavioral Neurosciences. (3 cr; A-F or Aud. Prereq-Grad NSc major or grad NSc minor or #)
Neural coding/representation of movement parameters. Neural mechanisms underlying higher order processes such as memorization, memory scanning, and mental rotation. Emphasizes experimental psychological studies in human subjects, single cell recording experiments in subhuman primates, and artificial neural network modeling.

NSC 5667. Neurobiology in Disease. (2-3 cr [max 3 cr]. Sdnst Opt. =NSU 5667. Prereq-#)
Basic clinical/pathological features, pathogenic mechanisms. Weekly seminar course.

NSC 5668. Neurodegeneration and Repair. (2 cr; Sdnst Opt. Prereq-#)
Pathogenic mechanisms of neuronal death, neurodegenerative disease, neuronal repair. Weekly seminar course.

NSC 8026. Neuro-Immunne Interactions. (3 cr; Sdnst Opt. =CMB 8361, PHCL 8026, PSY 8026. Prereq-5561, MicB 4131)
Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation. Course is offered fall of even-numbered years.

NSC 8021. Cognitive Neuroscience. (4 cr; A-F only. =CGSS 8041. Prereq-#)

Faculty and postdoctoral fellows interested in psychotropic drugs and chemicals participate. Some seminars devoted to biomedical ethics. Neurochemistry, pharmacology, and behavior as antecedent or consequential variables.

NSC 8211. Developmental Neurobiology. (3 cr; A-F or Aud. Prereq-NScience grad student or #)
How neuronal types develop. Emphasizes general mechanisms. Experimental data demonstrating mechanisms.

NSC 8216. Selected Topics in Autonomic and Neuroendocrine Regulation. (1 cr; S-N or Aud. =PHSL 8216. Prereq-#)
Advanced seminar. Course is offered fall and spring semesters.

NSC 8217. Systems and Computational Neuroscience. (2 cr; S-N or Aud. Prereq-5561 or #)
Advanced seminar.

NSC 8221. Neurobiology of Pain and Analgesia. (3 cr; Sdnst Opt. Prereq-#)
Pain and analgesia. Course is triennial.

NSC 8222. Central Regulation of Autonomic Function. (3 cr; A-F or Aud. =PHSL 8222. Prereq-5561)
Neural/hormonal sensory pathways affecting central autonomic nuclei involved in maintenance of homeostasis. Current research on physiological control systems at cellular, organ, and integrative levels. Course is offered fall of odd-numbered years.

NSC 8247. Anatomy and Physiology of Hearing and Balance. (3 cr; Sdnst Opt. =OTOL 8247)
Structure/function of auditory-vestibular systems. Network analysis of middle/inner ear mechanisms, hair cell biophysics, auditory nerve/CNS electrophysiology, information processing, neural mechanisms subserving balance/gaze, cellular morphology, and computer models.
NSC 8248. Directed Readings in Auditory Physiology. (1-2 cr [max 2 cr]; Sdtnt Opt. +OTOL 8248) Current research on biophysics and physiology of auditory system; topics selected for each student. Written reviews prepared and discussed.

NSC 8320. Readings in Neurobiology. (1-4 cr [max 4 cr]; Sdtnt Opt.) Topics in neurobiology and neurophysiology.

NSC 8321. Career Skills and Understanding Responsibilities as a Neuroscientist. (3 cr [max 2 cr]; S-N or Aud. Prereq–Neuroscience grad major or #) Information that falls outside of core neuroscience academic curriculum. Areas of practical value for graduate school and career development. Career skills, writing skills, responsible conduct in research.

NSC 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser approval)

NSC 8334. Laboratory Neuroscience. (1-3 cr [max 10 cr]; S-N or Aud. Prereq–Grad NSC major) Guided research.

NSC 8411. Teaching in Neuroscience. (1 cr [max 4 cr]; S-N or Aud. Prereq–instr approval) Graduate student serves as laboratory instructors in 4151 and work with fellow students and faculty mentors to design curriculum, classroom sessions, exams, and course evaluations.

NSC 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

NSC 8481. Advanced Neuropharmacology. (4 cr; A-F or Aud. +CMB 8481, PHM 8481, Prereq–#) Delivery of compounds to central nervous system (CNS) to activate proteins in specific brain regions for therapeutic benefit. Pharmaceutical/pharmacological issues are presented along with delivery to CNS.

NSC 8866. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

NSC 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade)

NSC 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Neuroscience Department (NSCI)

NSCI 5101. Introduction to Neuroscience for Graduate Students. (5 cr; A-F or Aud. Prereq–Bio 3021 or Bio 4331; %; intended for grad students outside neuroscience program who require comprehensive intro) Basic principles of cellular/molecular neurobiology and nervous system. A term paper supplements lectures. Multiple-choice exams.

NSCI 5110. Dental Neuroscience for Graduate Students. (2 cr; A-F or Aud. Prereq–Bio 5110; Bio 3021, Bio 4004; %; intended for grad students who require a comprehensive grad-level neuroscience course) Structure/function of human nervous system. Lectures and reading assignments emphasize topics pertinent to dentistry.

NSCI 5111. Medical Neuroscience for Graduate Students. (5 cr; A-F or Aud. Prereq–Bio 5110; Bio 3021, Biol 2004; %; intended for grad students who require a comprehensive medically-oriented neuroscience course) Survey of molecular, cellular, and systems neuroscience as related to medicine. Lecture/lab.

NSCI 5340. Advanced Survey of Biomedical Neuroscience. (2 cr; Sdtnt Opt. Prereq–#; intended for members of biomedical community or students with advanced scientific backgrounds) Current topics in biomedical neuroscience. Supporting, fundamental concepts. Intensive, one week course.

NSCI 5913. Brain U 101: Neuroscience in the Classroom. (3 cr; A-F or Aud. Prereq–[Elementary or middle school or high school or preschool] teacher, #, application) Two-week summer workshop. Week one focuses on training teachers in neuroscience through lectures, activities, and discussion sessions. Week two focuses on designing inquiry-based classroom investigations based on neuroscience education given during week one. Follow-up activities held during the academic year include Brain U staff/faculty classroom presentations and use of training materials.

NSCI 5914. Brain U 202: Neuroscience in the Classroom. (3 cr; A-F or Aud. Prereq–[NSCI 5913 or Bio 5100], #, application) One-week summer workshop. Focuses on critiquing previously implemented neuroscience class activities, developing assessment tools, learning peer mentoring, and expanding neuroscience content knowledge. Follow-up activities held during academic year include Brain U staff/faculty classroom presentations, use of training materials, and peer mentoring sessions.

NSCI 5915. Brain U 303: Neuroscience in the Classroom. (2 cr; A-F or Aud. Prereq–[NSCI 5913 or Bio 5100], 5914, #, application) One-week summer workshop. Focuses on critiquing previously implemented neuroscience class activities and assessment tools, and expanding neuroscience content knowledge. Follow-up activities held during academic year include Brain U 310 participants’ use of training materials and implementation of neuroscience investigations.


Neuroscience (NSU)

Department of Neuroscience

Medical School


NSU 8318. Neuroradiological Conference. (1 cr; S-N or Aud) Neuroradiological conference.

NSU 8320. Neurosurgical Conference. (1 cr; S-N or Aud) Neurosurgical conference.


Nursing (NURS)

School of Nursing

NURS 5016. Critical Reading of Scientific Literature in Adolescent Health. (1 cr; Sdtnt Opt. Prereq–[Grad-level research methods course, inferential statistics course] or #) Application of skills, from research methods and statistics courses to critical reading of empirical literature on adolescent health. Relevance of research findings to adolescent health practice.


NURS 5034. Clinical Seminar: Nursing Care of Clients With Complex Health Conditions. (2 cr; A-F or Aud. Prereq–5033, B100, Nursing postbaccalaureate certificate program) Exemplar cases from students. clinical settings used as basis for development of clinical decision-making. Critical analysis of current/emergent nursing care issues associated with caring for complex/diverse populations.

NURS 5035. Practical Nursing Care for Complex Health Conditions. (4 cr; A-F or Aud. Prereq–Nursing postbaccalaureate certificate program or master of nursing program) Clinical decision-making, comprehensive nursing care of clients with complex health problems. In collaboration with a clinical preceptor and a faculty adviser, students develop an individualized learning contract.

NURS 5040H. Seeking Solutions to Global Health Issues. (3 cr; Sdtnt Opt. Prereq–Grad student or sr Nursing Honors student or upper div Honors or #) Global health issues from interdisciplinary perspective. Emphasizes ethnocultural sensitivity/complexities. Students propose realistic actions that could be taken to resolve these issues.

NURS 5113. Web-based Teaching and Learning Strategies. (2 cr; S-N or Aud) Skills necessary to design, produce, implement, and evaluate effective technology enhanced learning environments. Pedagogical/technological issues surrounding teaching with technology.
**Course Descriptions**

NURS 5115. Interprofessional Health Care Informatics. (3 cr; A-F or Aud)

Implications of informatics on practice, including nursing, public health, and health care in general. Electronic health record issues. Ethical, legislative, political, and global/future informatics issues.

NURS 5116. Consumer Self-Care Informatics. (1-2 cr [max 2 cr]; Stdt Opt. Prereq: Nursing student or #)

Consumer’s issues in acquiring, understanding, using, or providing health information. Online strategies for improving health. Consumer-provider relationships. Ethical/legal issues in informatics.

NURS 5210. Palliative Care for Children. (1 cr; Stdt Opt. Prereq—#)


NURS 5411. Ethical Issues in Health Care of Elders. (3 cr; Stdt Opt. Prereq–Grad student or nursing sr or #)

Health care related ethical issues that confront elders, their families, health care providers, and society.

NURS 5170. Research Topics. (1-16 cr [max 16 cr]; Stdt Opt. + PUBH 6707)

Exploration of research topic to meet individual student needs.

NURS 5172. Decision Making in Health Care. (2 cr; Stdt Opt. Prereq—Grad student or #)

Selected classical conceptual models of decision making, their particular perspectives/limitations/usefulness for decision making about health care issues. Models/components used to assess, evaluate, teach, or help healthy people, patients, families, health care professionals, or policy making groups in making health care decisions.

NURS 5183. Scholarly Leadership. (1 cr; S-N or Aud; Prereq—Advanced doctoral nursing student, #)

Implications of dissertation research on advancing science, clinical practice, and leadership in nursing and health care. Principles of scholarly collaboration.

NURS 5200. Holistic Health Assessment and Therapeutics for Advanced Practice Nurses. (3 cr; Stdt Opt. Prereq: Nursing grad student or professional master of nursing [MN] student)

Health assessment knowledge skills for advanced practice nursing practice with patients across age span, including pregnancy. Selected nursing interventions, complementary therapies for application to specific populations/illnesses.

NURS 5202. Introduction to Complementary Healing Practices. (3 cr; Stdt Opt)

Historical and cultural context of the allopathic and complementary healing traditions. Philosophies and paradigms of selected complementary therapies and culturally based healing traditions; descriptions of selected interventions.

NURS 5204. Population Focused Assessment and Intervention. (2 cr; Stdt Opt. Prereq-Grad nursing major, #)


NURS 5221. Refugee Health Trauma, Stress, and Coping. (5 cr; Stdt Opt. Prereq—Grad student or #)

War, displacement, and associated stressors affecting psychosocial health of refugees. Migration experiences, family/community dynamics, approaches for recovery. Creating community-based interventions to support refugee health.

NURS 5222. Advanced Physiology. (3 cr; Stdt Opt)

Systems approach to human physiology/pathophysiology. Physiologic changes across life span. Emphasizes clinical application using population-specific content related to various specialty areas in advanced practice nursing.

NURS 5223. Assessment of Psychopathology for Advanced Practice Psychiatric/Mental Health Nursing. (4 cr; Stdt Opt. Prereq—Nurs grad or #)

Advanced concepts from nursing theory and research, social sciences, neuropsychology, and neuropsychology used in the assessment of psychiatric symptoms and disorders across the age continuum. During clinical, develop proficiency in the assessment of psychopathology in clients with psychiatric symptoms.

NURS 5224. Clinical Pharmacotherapeutics. (3 cr; Stdt Opt. Prereq—Nursing grad student in advanced practice in primary care, physiology course. #)

Foundation in pharmacotherapeutics across life span. Pharmacodynamics/kinetics/epidemiology, client patterns of medication use, selection of appropriate drugs for selected client conditions, and prescriptive writing privileges for advanced practice nurses.

NURS 5225. Psychopharmacology for Advanced Practice Psychiatric/Mental Health Nursing. (3 cr; Stdt Opt. Prereq—Grad student or RN [with master’s degree] or #)

Advanced concepts in neuroscience, psychopharmacology, and clinical management related to psychopharmacological treatment of psychiatric disorders/symptoms. Application to problems in various clinical settings.

NURS 5228. Pharmacology for Advanced Practice Nursing. (2 cr; A-F or Aud. Prereq—Grad student or #)

Overview of pharmacological principles for commonly used medication classes. Each drug class, related physiology. Pharmacodynamics and pharmacokinetics of drug classes and specific medications.

NURS 5241. Nursing Leadership for Effective Practice. (3 cr; A-F or Aud. Prereq—Final sem of MN Program)

Leadership theory/application. System issues affecting nursing practice and patient outcomes.

NURS 5300. Health Behavior Intervention: Theory and Application. (3 cr; Stdt Opt. Prereq—Grad or #)

Interdisciplinary course examines theoretical foundations and research base of intervention strategies to promote health behavior acquisition, behavioral change, and maintenance for adults (individuals and groups). Critical examination of health behavior and patterns and health risk assessment; approaches to program creation.

NURS 5310. Interprofessional Teamwork for Health Professionals. (1 cr; S-N or Aud. Prereq: Student in [nursing or dentistry or medicine or pharmacy or public health or master s in health care administration] or #)

Introductory experience to interprofessional teamwork skills. Focuses on patient-centered care.

NURS 5340. Group as a Health-Care Intervention. (2 cr; Stdt Opt. Prereq—Grad or #)

Theoretical concepts and research findings from the areas of group therapy and dynamics are applied in the development of a model for using group as an intervention for various client populations.

NURS 5501. Professional Issues in Nursing-Midwifery. (1-2 cr [max 2 cr]; S-N or Aud. Prereq—Nursing grad major, #)

Analysis of professional issues that confront and impact the practice of certified nurse-midwives. History and development of the professional organization including certification, legislation, ethical dimensions, public policy, and clinical practice issues.

NURS 5522. Sociopolitical Context of Women’s Health. (1-2 cr [max 3 cr]; S-H or Aud. Prereq—Grad student)

Women’s health issues from multidisciplinary perspective. Sexual/reproductive health issues across life span. Sociocultural issues affecting health, such as poverty/silence.

NURS 5604. Advanced Health Assessment and Interventions with Adolescents. (2 cr; Stdt Opt. Prereq—CPsy 5303 or equiv or #)

Integrates knowledge from nursing, public health, health behavior, and adolescent development as framework for developing health assessment/intervention strategies for clinical practice with adolescents.

NURS 5800. Nursing Topics. (1-4 cr [max 8 cr]; Stdt Opt. Prereq—#)

Course allows students to study a topic not included in regular courses, or for faculty to offer a course to determine interest in a topic.

NURS 5801. Policymaking, Health Policy, Political Action and Nursing. (3 cr; Stdt Opt)

Analysis of sociocultural values, public policymaking, health care policy, and the relationship to the health care delivery system. The impact of health care policy on the profession and practice of nurses, and on consumers. Enhanced participation of nurses in policymaking and political action.

NURS 5802. Spirituality and Nursing Practice. (2 cr; Stdt Opt. Prereq—For undergrad cr: nurs sr or RN; for grad cr: nurs grad student or #)

Exploration of the concept of spirituality as integral to the whole person. Discussion of spiritual nursing care interventions.

NURS 5803. Transcultural Nursing: Theories and Issues. (2 cr; Stdt Opt. Prereq—Cultural anth course or #)

Study of cultural factors that influence theories, issues, and nursing care practices in diverse cultures and subcultures. Emphasis on nursing within international systems of health care and nursing practices related to various health-illness systems in this country and worldwide.

NURS 5805. The ‘M’ Technique. (1 cr; S-N or Aud. Prereq—Undergrad nursing student or grad student in health sciences or health professional)


NURS 5806. Theoretical Foundations and Experiential Learning in Complementary/Alternative Therapies. (2-3 cr; Stdt Opt. Prereq—#)

Overview of complementary therapies. Demonstration of selected therapies. Theoretical/scientific knowledge supporting use of therapies.

NURS 5808. American Indian Health and Health Care. (2 cr; Stdt Opt. Prereq—Upper div or grad student or #)

Examines health of native nations in Minnesota within historical/cultural contexts. Epidemiology of major health conditions, health services, traditional Indian medicine, health beliefs. Opportunities for contact with Native American community.

NURS 5820. Foundations of Infection Control. (3 cr; Stdt Opt. Prereq—Baccalaureate degree in health related field or #)

Integrates microbiology, epidemiology, and patient care practices applied to a population-focused practice. Focuses on risk identification, prevention strategies.

NURS 5830. Advanced Clinical Nursing. (1-6 cr [max 6 cr]; Stdt Opt. Prereq—Grad nursing major, #)

Independent study or faculty seminar on special clinical topic.
NURS 5900. Introduction to Principles and Practice of Anesthesia. (6 cr; A-F or Aud. Prereq—Grad student in nurse anesthesia) Administration of anesthesia. Application in operating room setting under one-to-one guidance of Certified Registered Nurse Anesthetist (CRNA).

NURS 5901. Basic Principles and Practice of Nurse Anesthesia. (2 cr; A-F or Aud. Prereq—5900 or equiv) Students apply principles of anesthesia to formulate nurse anesthesia care plans for care of adults undergoing anesthesia.

NURS 5910. Nurse Anesthesia Care: Patients With Cardiothoracic Problems. (2 cr; A-F only. Prereq—5922, 5222, 5228, 5001, PhD 5115) First in series of three courses. Delivering anesthesia to complex patients. Focuses on anesthesia for patients undergoing cardiothoracic procedures.

NURS 5920. Nurse Anesthesia Care: Advanced Principles for Special Populations. (6 cr; A-F or Aud. Prereq—5910) Examination/application of principles used to deliver anesthesia by nurse anesthetists to special populations.

NURS 5925. Grant Writing and Critique. (1 cr; Stdnt Opt. Prereq—Grad student or #) Self-paced course. Online modular format. How to write compelling grants. Students select a research or program grant to critique, applying knowledge obtained through learning modules.

NURS 5940. Contemporary Issues in Nurse Anesthesia. (2 cr; S-N only. Prereq—5930) Analysis of economic, legal, political, ethical, and social factors that influence the practice and profession of CRNAs.

NURS 5941. Nurse Anesthesia Practicum A. (5 cr; S-N or Aud. Prereq—5930) First of a series of three clinical courses that focus on developing proficiency in nurse anesthesia practice. Emphasizes incorporating current research and demonstrating increasing autonomy in decision making and case management.


NURS 5995. Research Dissemination. (2 cr; Stdnt Opt. Prereq—Doctoral student or #) Knowledge dissemination skills for advancement of health/nursing science/practice. Emphasizes interpretation/diffusion of research findings to health professionals and selected audiences in various venues and communication modalities.

NURS 8100. The Discipline of Nursing. (3 cr; Stdnt Opt. Prereq—Grad nurs major or #) Knowledge structures used in nursing; theories, models, and conceptual frameworks. Articulation and evaluation of personal conceptual framework for advanced nursing practice.

NURS 8112. Theoretical Foundations of the Discipline. (3 cr; Stdnt Opt. Prereq—8100 or equiv, knowledge of phl of sci) Paradigms in nursing and related methods of inquiry, knowledge structures, and projection of needs of further knowledge development and testing.

NURS 8113. Theory Development in Nursing. (3 cr; S-N or Aud. Prereq—8100 or equiv, 8112 or #) Strategies for theory development; synthesis of theoretical formulations in nursing using selected inductive and deductive theory development strategies.

NURS 8115. Integrated Seminar in Nursing Informatics. (3 cr; A-F or Aud. Prereq—Doctoral student, #) Problem-focused topics related to nursing and health informatics theory, measurement, and ethical/policy issues. Interdisciplinary, cross-institutional relationships. Interpersonal dynamics that support trust-building exchanges.

NURS 8116. Clinical Decision Support: Theory and Application. (3 cr; A-F only. Prereq—5115 or [HINF 5430, HINF 5431] or #) Principles/concepts of knowledge management and decision making. Students design a clinical decision support intervention. Legal, ethical, and practical issues related to its implementation and maintenance of CDS interventions.

NURS 8120. Phenomenon of Health. (3 cr; Stdnt Opt. Prereq—Grad nurs major, #) Prevailing and emerging views of health from differing belief systems and their relevance to practice. Philosophical, theoretical, and methodological implications for development of a nursing paradigm based on evolving perspectives of humanness.

NURS 8121. Health Behaviors and Illness Responses. (3 cr, A-F or Aud. Prereq—Doctoral student or #) Theories of health behaviors and responses to illness are analyzed/critiqued. Multivariate research designs. Specification of testable, descriptive, dynamic models for health/illness that incorporate culture, biology, environment, and health systems for diverse individuals, families, communities, and populations.

NURS 8122. Stress, Coping, and Health. (2 cr; Stdnt Opt. Prereq—Research course, grad nurs major, #) Stress and coping theories and related research; adequacy and efficacy of stress-management interventions/programs; directions for future research.

NURS 8123. Complementary Therapies: Theory and Research. (2 cr; Stdnt Opt. Prereq—Research course) Scientific basis of selected complementary therapies such as therapeutic touch, imagery, music, and massage; hypotheses related to selected interventions; appropriate methodologies.


NURS 8134. Interventions and Outcomes Research. (3 cr; A-F or Aud. Prereq—8121, PhD student, #) Design/evaluation of intervention/outcomes research. Use of advanced experimental design and multivariate statistical approaches to evaluate theory-based interventions with longitudinal outcomes in context.

NURS 8140. Moral and Ethical Positions in Nursing. (3 cr; Stdnt Opt. Prereq—Grad nurs major or #) Synthesis of ethical positions, from nursing perspective, on health-related issues—individual, group, population, and policy levels. Normative ethics, theoretical basis for positions taken, and contextual implications for subsequent action.


NURS 8170. Research in Nursing. (3 cr; Stdnt Opt. Prereq—8170 or inferential stat course taken within two yrs) Research process/methods appropriate for problems relevant to nursing. Critique of research studies, proposal development.

NURS 8171. Qualitative Research Design and Methods. (3-4 cr [max 4 cr]; Stdnt Opt. Prereq—8170 or equiv) Overview and comparative analysis of selected qualitative research methods and analytic strategies. Focuses on developing rigorous qualitative designs that contribute to development of nursing and health care knowledge for diverse populations.


NURS 8173. Principles and Methods of Implementing Research. (3 cr; Stdnt Opt. +SAPH 8173, Prereq—8114 or other [8xxx grad research methods course, 2 grad stat courses]) Integrates scientific, statistical, and practical aspects of research. Inter-relationships among design, sample selection, subject access, human subjects requirements, instrument selection and evaluation, data management, analyses plans, grant writing, and research career issues. Field experiences required.

NURS 8175. Quantitative Research Design and Methods. (3 cr; A-F or Aud. Prereq—[8170 or equiv], [8xxx statistics or 88xxx statistics]) Designs for quantitative descriptive and quasi-experimental/ experimental evaluation of scientific problems across domain of nursing. Emphasizes evaluation of logic of design/attribute of causality from health and social science perspectives.

NURS 8176. Research on Decision Making in Health Care. (3 cr; Stdnt Opt. Prereq—One graduate-level research course, #) Conceptual models/studies on decision making about health care. Formulating research proposals to investigate health care decisions by health care professionals, health care policy makers, patients/clients, or families.

NURS 8177. Advanced Nursing Research Practicum. (2 cr; S-N or Aud. Prereq—[8181 or 8181], PhD nursing student, #, adviser consent) Students collaborate with research team under supervision of faculty member in designing/conducting a health-related research project.

NURS 8178. Methods for the Study of Family Health Phenomena. (3 cr; Stdnt Opt. Prereq—8124, 8100 or equiv or #) Conceptual and methodological approaches in study of family health phenomena from a nursing perspective. Research designs formulated to study questions in this area.

NURS 8180. Doctoral Proseminar I: Scholarly Development. (1 cr; S-N or Aud. Prereq—Doctoral nursing student) Transition to doctoral study. Begins socialization process to role of nursing scholar/scientist. Career trajectories of nursing scholars who have pursued various roles.

NURS 8182. Policy Implications of Nursing Research. (1 cr; S-N only. Prereq: Nursing doctoral student or #) Nursing research as a foundation for health policy. Research utilization for resolution of global, national, and state policy issues affecting population health and health service delivery. Political analysis to effect policy change.

NURS 8185. Qualitative Data Analysis for Health Care Research. (3-4 cr [max 4 cr, Stdnt Opt, Prereq-8170] or grad course in qualitative research methods) Techniques for descriptive, interpretive, and analytic data. Data preparation, management, and analysis. Transforming data from multiple texts to theoretical conceptualizations. Writing, dissemination of findings.

NURS 8190. Critical Review in Health Research. (2 cr; A-F or Aud. Prereq-Advanced statistics course, #) Skills needed to critique a body of scientific literature in focused areas of nursing research and related fields. Construction of literature reviews for planning research projects and for research utilization.

NURS 8193. Special Topics in Nursing Research. (0-4 cr [max 4 cr]; S-N only. Prereq: Prereq-#) Seminar and/or individual study of research design, methodologies, or instruments.

NURS 8194. Problems in Nursing - Plan B. (6-8 cr [max 6 cr]; S-N or Aud. Prereq-[8100 or &8110, 8170 or &8170], #) Using a scholarly process to address a specific issue relevant to science/practice of nursing.

NURS 8240. Advanced Practice Nursing: Roles and Issues. (2 cr; Stdnt Opt. Prereq-Admission to advanced practice area of study or #) Current most relevant professional/health care issues affecting diverse advanced practice nursing roles. Role theory, practice models, interdisciplinary team function, reimbursement, certification, scope of advanced practice nursing.

NURS 8241. Health Care Leadership for a Changing World. (2 cr [max 3 cr]; Stdnt Opt. Prereq-AHC grad student or #) Application of leadership theory/research to strengthen students' capacity to facilitate change in health care delivery system.

NURS 8242. Population Focused Health Care Delivery Systems. (2 cr; Stdnt Opt. Prereq-Grad nurs student or #) Health care organizations/delivery systems, their relation to health of diverse populations. Models of population focused care, use of research to improve health care delivery, effect of economic/social factors on health/health services.


NURS 8311. Specialized Focus in Research-based Clinical Reasoning and Management in Acute Care. (5-4 cr; Stdnt Opt. Prereq-5200, 5222, 8100, 8140, 8170, 8140, 8303, 8305, 8309, advanced pharmacology, [pathophysiology or immunobiology]) Synthesis/ utilization of knowledge/research in care of adults with acute/critical illness. Participation in (a clinical area of interest) in advanced decision making and in management of clients requiring restorative care.


NURS 8315. Advanced Practice Nursing for Adults. (4-5 cr [max 5 cr]; A-F or Aud. Prereq-5222, 5800, 8100, 8140, 8170, #) Development of clinical expertise in provision of advanced nursing care to adults with acute health problems needing restorative care. Students utilize theory/research to manage/evaluate acute health problems in a selected adult specialty area.

NURS 8316. Implementing Advanced Practice Roles in Adult Nursing. (4 cr; A-F or Aud. Prereq-5222, 5800, 8100, 8140, 8170, 8314, 8315) Clinical nurse specialist roles of case management, teaching, consultation, and collaboration. Students use theory/research to provide advanced nursing care to adults within context of selected specialty area.

NURS 8320. Multidisciplinary Seminar on Social Perspectives of Aging. (3 cr; Stdnt Opt) Literature/policy on key social aspects of aging, emphasizing service, policy, and ethical implications; generation of research questions.


NURS 8322. Primary Health Care for Elders. (3-6 cr [max 6 cr]; A-F or Aud. Prereq-8321, #) Data-based primary care management of common acute/chronic conditions of elderly. Physiological, psychosocial, and pharmacological interventions. Age-related, cultural, family, and community variations. Implementation, evaluation of interventions.

NURS 8323. Advanced Nursing Care of the Elderly II: For Clinical Nurse Specialists. (5-6 cr [max 6 cr]; A-F or Aud. Prereq-8322, 8xxx advanced gerontological nurs course, grad nurs major, #) Synthesis and application of theory to research and to effectively implement advanced gerontological nursing practice. Focuses on comprehensive primary care management across settings, evaluation of care, role analysis, and impact of contextual factors on health care services for the elderly.

NURS 8324. Advanced Nursing Care of the Elderly II: For Clinical Nurse Practitioners. (6 cr; A-F or Aud. Prereq-Grad nurs major, #) Synthesis and application of theory and research to effectively implement as an advanced gerontological nurse. Comprehensive assessment and research across settings, evaluation of care, role implementation, and influences of contextual factors on health care services for the elderly.

NURS 8331. Specialized Focus in Research-based Clinical Reasoning and Management in Acute Care. (5-4 cr; Stdnt Opt. Prereq-5200, 5222, 8100, 8140, 8170, 8140, 8303, 8305, 8309, advanced pharmacology, [pathophysiology or immunobiology]) Synthesis/ utilization of knowledge/research in care of adults with acute/critical illness. Participation in (a clinical area of interest) in advanced decision making and in management of clients requiring restorative care.

NURS 8340. Advanced Practice Psychiatric/Mental Health Nursing with Individuals and Their Families. (7 cr; Stdnt Opt. Prereq-5200, 5222, 5225, 5800, 8100, 8121, 8140, 8170) Evaluation of theory and research; their application to advanced clinical management of biological, psychological, and social responses of individuals and families to psychiatric illness. Developing clinical expertise in assessment, diagnosis, treatment planning, and management of individuals and their families.

NURS 8341. Advanced Practice Psychiatric/Mental Health Nursing in Groups and Community. (7 cr; Stdnt Opt. Prereq-5340, 8340, &8240, &8242) Application of theory and research to advanced practice psychiatric/mental health nursing with groups and community systems, including populations at risk. Clinical practicum provides experiences for developing advanced practice roles in variety of healthcare settings.

NURS 8360. Advanced Clinical Nursing. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq-Grad nurs major, #) Independent study or faculty seminar on special clinical topic when interest exists.

NURS 8361. Special Topics in Nursing. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq-Grad nurs major, #) Students select and study a topic of interest.

NURS 8402. Primary Care: Assessment and Management of Health for Advanced Practice Nurses. (2-4 cr [max 4 cr]; A-F or Aud. Prereq-5200, 5222, 5224, 8242) Data-based assessment/management of preventive health services and common acute/chronic conditions of primary care populations. Emphasizes clinical reasoning and independent/collaborative practice health care plans.


NURS 8406. Health Care of Children for the Family Nurse Practitioner. (3 cr; A-F or Aud. Prereq-#) Application of midrange theories, models, concepts applicable to promotion, maintenance, restoration of health of infants, children, adolescents within context of their families/communities. Current research evaluated/used for designing age-specific interventions for children and their families.


NURS 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

NURS 8450. Primary Care: Health Assessment and Care of Well Children. (3 cr; Stdnt Opt. Prereq–5200, 5222, &8451) Study of age-specific and family-centered assessment, prevention, and health promotion nursing interventions for infants through adolescents. Emphasis on theories and concepts related to comprehensive health supervision. Stresses use of critical thinking for clinical decision making to implement and evaluate advanced practice nursing interventions.

NURS 8451. Primary Care Practicum: Health Assessment and Care of Well Children. (2-3 cr; max 5 cr; A-F or Aud. Prereq–5200, &8450, #) Focus on age-specific, family-centered nursing assessments/interventions to promote wellness of children, infants through adolescence. Emphasizes compiling/evaluating interventions for children/families. Practicum includes exposure to models of primary prevention.

NURS 8452. Primary Care: Common Acute Health Conditions Affecting Children. (2 cr; Stdnt Opt. Prereq–8501, 8511, 8543, #) Research-based evaluation and management of common acute conditions affecting children from infancy through adolescence. Exploration of theories and models used to explain and predict physiologic and psychologic adaptation of children and their families.

NURS 8453. Primary Care Practicum: Common Acute and Chronic Health Conditions Affecting Children. (5 cr; Stdnt Opt. Prereq–8411, 8422, &8452, #) Focus on age-specific, family-centered nursing assessment and intervention of minor acute and chronic conditions of children within family context. Emphasis on nursing intervention strategies include diagnoses, interventions, education, and follow-up evaluation of outcomes.


NURS 8455. Health Care for Children and Youth with Special Health Care Needs. (2 cr; Stdnt Opt. Prereq–8454) Primary care of children and youth with special healthcare needs, emphasizing growth and development, pathophysiology, specific conditions, and holistic, family-centered, community-based, culturally competent, and coordinated approach to assessment and intervention.


NURS 8459. Advanced Nursing Care of Children With Acute Illness for Pediatric Clinical Nurse Specialists. (2 cr; Stdnt Opt. Prereq–Nursing grad student admitted to pediatric clinical nurse specialist area of study or #) Synthesis/application of theory/research to effectively implement pediatric clinical nurse specialist role. Focuses on comprehensive care management across settings, evaluation of role, role implementation, and contextual factors affecting health care for children with special health needs and families.


NURS 8502. Reproductive Health Care for Women at Risk. (2-6 cr [max 6 cr]; Stdnt Opt. Prereq–8503 or 8520) Theoretical and research basis for advanced practice nursing care of women and infants at risk for medical and/or psychosocial problems. Selected high-risk perinatal and complicated gynecologic and neonatal conditions.

NURS 8503. Nurse-Midwifery Care of the Childbearing Family. (4-10 cr [max 10 cr]; A-F or Aud. Prereq–#) Theoretical/research-based nurse-midwifery care. Drawns from research that provides basis for practice.

NURS 8504. Nurse Midwifery and Women’s Health Care Nurse Practitioner Primary Care Practicum. (2-3 cr; S-N or Aud. Prereq–5200, 5222, 8402) Application of advanced practice comprehensive health histories and physical assessments in formulating client centered databases. Development/implementation of care plans. Follow-up evaluation of primary care delivered to adult populations. Focuses on women.


NURS 8603. Public Health Nursing Leadership Practicum. (5 cr; S-N or Aud. Prereq–8100, 8170, 8221, 8242, 8600) Synthesis of leadership and advanced public health nursing theories and research; their applicability within public health nursing leadership situations.

NURS 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

NURS 8701. Nursing and Health Care Systems Administration I. (4 cr; A-F or Aud. Prereq–#) Intensive study of nursing and healthcare administration and leadership. Application of nursing, organization, care delivery, and population health improvement theories to health systems administrative practice. Planning, organizing, care systems, assembling, and developing material and human resources.

NURS 8702. Nursing and Health Care Systems Administration II. (4 cr; A-F or Aud. Prereq–8701, #) Intensive development of competencies associated with skilled administration of healthcare services. Application of organization, nursing, political, and economic theories in operationalizing and evaluating administrative and leadership practice of nurses in healthcare delivery systems.

NURS 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])

NURS 8800. Methods for the Study of Family Health Phenomena. (2 cr; Stdnt Opt. Prereq–8124, 8175 or equiv or #) Exploration of conceptual and methodological approaches in study of family health phenomena from a nursing perspective. Formulation of research design to study questions in family health.

NURS 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)
Course Descriptions

Nutrition (NUTR)  
Department of Food Science and Nutrition  
College of Food, Agricultural and Natural Resource Sciences  

NUTR 5621W. Macronutrient Metabolism. (4 cr; Stdtnt Opt. Prereq-BIO 3021, PHIL 3051, FSCN 4612)  

Nutritional, biochemical, and physiological aspects of vitamins/essential minerals in human/experimental-animal models.

NUTR 5623W. Regulation of Energy Balance. (2 cr; Stdtnt Opt. Prereq-5621 or FSCN 4621)  
Regulation of energy balance in humans, including regulation of food intake and energy expenditure.

NUTR 5624. Nutrition and Genetics. (2 cr; A-F or Aud. Prereq-Biochemistry)  

NUTR 5833. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)  
NUTR 6444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)  
NUTR 8610. Nutrition Graduate Seminar. (1 cr; S-N or Aud. Prereq-Nutr grad student, #)  
Presentation of thesis (M.S. or Ph.D.) or plan B project work in public seminar.

NUTR 8614. Advances in Nutrition: Advanced Energy Balance. (2 cr; Stdtnt Opt. Prereq-Grad student in nutr or related field)  
Recent literature on energy balance and body composition in animals and humans.

NUTR 8615. Advances in Nutrition: Exercise Metabolism. (2 cr; Stdtnt Opt. Prereq-Grad student in nutr or related field)  
Review of research on effects of diet on exercise metabolism.

NUTR 8616. Advances in Nutrition: Free Radicals, Trace Elements, and Other Macronutrients. (2 cr; Stdtnt Opt. Prereq-Grad student in nutr or related field)  
Free radical chemistry, cellular biology, and micronutrient nutrition considered in roles of pro-oxidants and antioxidants in human diseases and aging. Current understanding of biological action of free radicals and role of micronutrients in antioxidant protection in human and animal models.

NUTR 8617. Chemical Carcinogenesis and Chemoprevention. (3 cr; A-F or Aud. • PUBH 8162. Prereq-[BioC 3001, BioC 3021, BioC 4331] or equiv], [Chem 2302 or equiv])  
Fundamental background in chemical carcinogenesis, carcinogen activation, alkylation, DNA adduct formation, cellular oncogenesis, cancer chemoprevention, nutrition/cancer. Topics integrated/interrelated.

NUTR 8618. Neuoregulation of Energy Metabolism. (2 cr; A-F or Aud. Prereq-[FSCN 5621, FSCN 5623] or #)  

NUTR 8620. Advances in Nutrition. (2-3 cr [max 6 cr]; Stdtnt Opt. Prereq-#)  
Recent research or special topics (e.g., obesity, vitamin biochemistry, nutrition education).

NUTR 8621. Presentation Skills. (1 cr; S-N or Aud, Prereq-#)  
Orientation to nutrition graduate program. Presenting scientific seminars, using electronic presentation programs/quality.

NUTR 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

NUTR 8895. Independent Study: Nutrition. (1-10 cr [max 30 cr]; Stdtnt Opt. Prereq-#)  
Written report for master’s plan B project.

NUTR 8877. Thesis Credits: Master’s. (1-10 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

NUTR 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Max 18 cr per semester or summer; 24 cr required)

NUTR 8900. Advances in Nutrition: Advanced Lifestyle Nutrition. (2 cr; Stdtnt Opt. Prereq-#; PUBH 8900; Nutr grad major or Pub hllth nutr or EpH MPH or EpH Food sci grad major)  
Evaluation and discussion of research and research issues in nutrition during various stages of the life cycle. Methodological issues of applied human nutrition investigation, current status of knowledge, and implication of research results to public health policies, programs, and future research.

Occupational Therapy (OT)  
Department of Physical Medicine and Rehabilitation  
Medical School  
OT 5121. Issues in Mental Health. (1 cr; S-N or Aud. Prereq-One course gen psych, one course abnorm psych)  
Psychiatric/neuropsychological assessment/treatment. Issues related to medical/community management and to roles of OT/P with respect to clients with mental health needs. Interaction between physical/mental health and disability.

OT 5122. Descriptive Neurology. (2 cr; A-F or Aud. Prereq-OT student or #)  
Relates neuroanatomical/neuropsychological principles to neurologic conditions commonly seen in occupational/physical therapy practice.

OT 5161. Theory of Physical Medicine and Rehabilitation Applied to Medical Sciences. (2 cr; A-F or Aud. Prereq-OT student or #)  
Diagnostic procedures. Medical, surgical, and rehabilitation management of patient problems in orthopedics, surgery, pediatrics, dermatology, medicine, cancer, and speech. Correlation to current practice. Presentation of patients.

OT 5182. Functional Neuroanatomy and Neurophysiology. (4 cr; A-F or Aud. Prereq-Registered occupational therapy student or #)  
Neuroanatomic structures as functional systems, basic neurophysiologic concepts. Emphasizes applications for understanding/treating physical dysfunctions.

OT 5300. Concepts for Occupational Therapy Practice. (4 cr; A-F or Aud. Prereq-enrolled OT student or #)  
Critical thinking, ethics, professional resources/organizations, patient-therapist relationship. Level 1 fieldwork experience.

OT 5313. Therapeutic Occupation. (4 cr; A-F or Aud. Prereq-enrolled OT student or #)  
Occupational therapy philosophy, history, and frames of reference. Activity analysis applied to purposeful, therapeutic activities for individuals and groups.

OT 5341. Introduction and Intervention I. (4 cr; A-F or Aud. Prereq-5393 or #)  
Assessment concepts/techniques. Application to patient populations with both mental health/physical disabilities. Treatment planning/documentation.

OT 5342. Compensatory Rehabilitation: Evaluation and Intervention II. (4 cr; A-F or Aud. Prereq-5300, 5315 or #)  
Assessment of daily living performance areas; adaptation techniques to compensate for performance deficits. Level I fieldwork experience.

OT 5344. Neuorehabilitation: Evaluation and Intervention III. (4 cr; A-F or Aud. Prereq-5342 or #)  
Assessment/intervention related to perception, cognition, reflexes, sensory integration, and motor control. Application to individuals with multiple performance component deficits.

OT 5360. Dynamics of Group Models. (2 cr; A-F or Aud. Prereq-5313 or #)  
Application of group/team dynamics in diverse professional settings.

OT 5370. Theory of Occupation. (1 cr; A-F or Aud. Prereq-enrolled OT student or #)  
Occupational therapy frames of reference, role of activity, and historical development of profession.

OT 5375. Community Resources and Health-Care Issues. (2 cr; A-F or Aud. Prereq-[5300, 5342] or #)  
Analysis of community health-care systems, including cultural/family influences on individual health and decision making. Students identify current trends in health care and determine responses to them at social, political, or legislative level.

OT 5376. Adult Education and Planning. (1 cr; A-F or Aud. Prereq-5313 or #)  
Skills needed to plan, implement, and evaluate adult educational programs/materials for patient/family education, peer/professional education, and education of others in order to carry out the therapeutic interventions. Student teaching unit, community based activity.

OT 5380. Management of Occupational Therapy Services. (3 cr; A-F or Aud. Prereq-[5360, 5375, 5376] or #)  
Administration/management of occupational therapy services within managed care environment. Issues in Medicare, HMOs, TQM, consultation, human resources, promotion of profession. Emphasizes program development in current organizational structures.

OT 5391. Occupation Across the Life Span. (3 cr; A-F or Aud. Prereq-[5375, 5376] or #)  
The well elderly, school therapy, work-related injuries/industrial rehabilitation. Fieldwork.
Operations and Management Sciences (OMS)

Department of Operations and Management

Curtis L. Carlson School of Management

OMS 8651. Experimental Design. (3 cr [max 4 cr]; A-F or Aud. Prereq-MBA 6120 or equiv or business admin PhD student or #; offered all yrs) Analysis of variance for one-way, two-way, and multi-way data. Basic concepts of statistical design and analysis of results. Randomized block, Latin square, cross-over, factorial designs, confounding, estimation and comparison of effects, response surfaces, and applications to management.

OMS 8652. Regression Analysis. (3 cr [max 4 cr]; A-F or Aud. Prereq-MBA 6120 or equiv, business admin PhD student or #; offered all yrs) Regression and correlation models, inferences in simple and multiple regression, multicollinearity, indicator variables, variable selection techniques, treatment of assumption violations, applications to management problems, basic concepts of experimental design.

OMS 8661. Linear Programming. (3 cr [max 4 cr]; A-F or Aud. Prereq-Business admin PhD student or #) Revised simplex, primal-dual, and large-scale methods, including decomposition and partitioning and methods for bounded variables.

OMS 8671. Simulation Analysis. (3 cr [max 4 cr]; A-F or Aud. Prereq-credit will not be granted if credit has been received for: SCIC 8031) A treatment of underlying probabilistic and statistical aspects of computer simulation. Random number generators, variance and process generation, statistical analysis of simulation output, ranking and selection of simulation models, and variance reduction techniques.

OMS 8672. Stochastic Modeling and Analysis. (3 cr [max 4 cr]; A-F or Aud. Prereq-Business admin PhD student or #; offered all yrs) Probabilistic modeling of dynamic processes, including Markov chains; Poisson, renewal, continuous-time Markov processes, and queuing models. Statistical estimation of selected models; applications to managerial problems, such as brand shift, industrial migration, manufacturing, and computer/communications networks.

OMS 8681. Queuing Theory: A Computational Approach. (3 cr [max 4 cr]; A-F or Aud. Prereq-OMS 8672, business admin PhD student or #) Theory of Stochastic Service Systems (theory of queues) from an algorithmic point of view. Prepares students to model and analyze complex stochastic service systems via classical methods and algorithmic methods and approximations.

OMS 8711. Research in Operations Strategy. (3 cr [max 4 cr]; A-F or Aud. Prereq-Business admin PhD student or #; offered all yrs) Operations performance; competitive advantage; focused factory, product, and process innovation; and operations strategy implementation. Research results and methods.

OMS 8721. Management of Technological Operations. (3 cr [max 4 cr]; A-F or Aud. Prereq-Business admin PhD student or #; offered all yrs) Theories and models used to address problems of managing technological operations and operations in manufacturing and service firms. Technology strategy, economic/organizational perspectives on technology, productivity analysis, technology evaluation, project selection and evaluation, learning, etc.

OMS 8735. Operations Forecasting and Inventory Research. (3 cr [max 4 cr]; A-F or Aud. Prereq-Business admin PhD student or #; offered all yrs) Research on forecasting, inventory control, materials requirements planning, just-in-time manufacturing, aggregate planning, scheduling, routing, sequencing, and dispatching in manufacturing and service industries. Research papers and methods are discussed.


OMS 8800. Research Topics in Operations and Management Science. (2-4 cr [max 16 cr]; A-F or Aud. Prereq-Business admin Ph.D. student or #) Topics selected from new areas of research. Research methods, issues in operations/management science.

OMS 8892. Readings in Operations and Management Science. (1-8 cr [max 16 cr]; Stdt Opt. Prereq-Business admin PhD student or #) Readings useful to student’s individual program and objectives that are not available in regular courses.

OMS 8894. Graduate Research in Operations and Management Science. (1-8 cr [max 16 cr]; Stdt Opt. Prereq-Business admin PhD student or #) Individual research on an approved topic appropriate to student’s program and objectives.

Oral Biology (OBIO)

Department of Oral Sciences

School of Dentistry

OBIO 5001. Methods in Research and Writing. (2 cr; Stdt Opt) Skills necessary to begin a research project, including literature review, hypothesis formation, research design, and writing. Each student develops a research protocol.


OBIO 8022. Oral Neuroscience. (2 cr; Stdt Opt. Prereq-Dental specialist or oral research trainee or #) Background lectures and student presentations on current research topics to evaluate questions in general motor/sensory function related to oral/nasal structures. Taste, smell, and other chemical senses as they relate to those structures.


OBIO 8024. Genetics and Human Disease. (1 cr; Stdt Opt. Prereq-Dental specialist or oral research trainee or #) Principles of medical genetics. Emphasizes oral diseases. Twins, chromosomes, recombinant DNA, major gene traits, genes in populations, chromosomal abnormalities, complex traits, facial clefts, dental caries, periodontal diseases.

OBIO 8025. Topics in Cariology. (2 cr; A-F or Aud. Prereq-Dental specialist or oral research trainee or #) Lectures, assigned readings, and discussions of basic epidemiological, biological, and chemical aspects of dental caries. Etiology, epidemiology, and pathogenesis of dental caries. Influence of dietary, salivary, plaque, and microbial factors on caries process.
Course Descriptions


OBIO 8027. Structural and Biological Aspects of Dental Biomaterials. (1 cr; Sdnt Opt. Prereq- Dental specialist or oral research trainee or #) Relates composition/structure of dental biomaterials to their behavior in a biological environment. Cause/ mechanism of such effects. Materials that have beneficial effects. Dental implantology, guided tissue regeneration.

OBIO 8028. Molecular Basis of Cellular and Microbial Adhesion. (2 cr; A-F or Aud. Prereq- Dental specialist or oral research trainee or #) Biochemical basis of adhesion phenomena. Cells of immune system, development of organs, tissue formation, bacterial colonization of the human.

OBIO 8030. Oral Biology Seminar. (1 cr [max 10 cr]; S-N or Aud. Prereq- Dental specialist or oral research trainee or #) Faculty and student discussion of current topics in oral biology.

OBIO 8093. Tutorial in Oral Biology. (1-2 cr [max 2 cr]; S-N only. Prereq- #) Semester-long apprenticeship with faculty members to familiarize students with faculty research interests. Individual study of selected topics.

OBIO 8094. Directed Research. (1-10 cr [max 10 cr]; S-N or Aud. Prereq- #) OBIO 8033. FTE: Master’s. (1 cr; No grade. Prereq- Master’s student, adviser and DGS consent)

OBIO 8371. Mucosal Immunobiology. (3 cr; A-F or Aud. +CMB 8371, MICA 8371. Prereq- MICA 8001 or equiv or #) Host immune processes at body surfaces. Innate/ adaptive immunity at mucosal surfaces. Interactions/ responses of various mucosal tissues to pathogens. Approaches to target protective vaccination to mucosal tissues. Lectures, journal.

OBIO 8444. FTE: Doctoral. (1 cr; No grade. Prereq- Doctoral student, adviser and DGS consent)

OBIO 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq- Doctoral student who has not passed prelim oral; no required consent for lst/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

OBIO 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])

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

Otolaryngology (OTOL) Department of Otolaryngology Medical School

OTOL 5101. Introduction to the Basic Sciences in Otolaryngology II: Ear. (2 cr; A-F or Aud. Prereq- Otolaryngology major or #) Multidisciplinary introduction to the basic sciences of the ear. Acoustics and psychoacoustics, temporal bone anatomy, external and middle ear mechanisms, cochlear physiology, auditory neurophysiology, ear embryology, ear biochemistry, immunology, fine structures, vestibular mechanisms and measurement. S-N grading option for nonmajors only.

OTOL 5102. Introduction to the Basic Sciences in Otolaryngology II: Head and Neck. (2 cr; A-F or Aud. Prereq- Otolaryngology major or #) Multidisciplinary introduction to the basic sciences of the head and neck. Laryngeal anatomy and physiology, nasal anatomy and physiology, immune biology, embryology of head and neck. S-N grading option for nonmajors only.

OTOL 5993. Directed Studies. (1-12 cr [max 24 cr]; A-F or Aud. Prereq- #) Directed readings and preparation of reports on selected topics.

OTOL 8230. Clinical Otorhinolaryngology. (4 cr; A-F or Aud. Prereq- Grad otol major) Diagnostic and management instruction and experience in all phases of clinical otorhinolaryngology. Both inpatient and outpatient services are provided at Fairview-University Medical Center, St. Paul Ramsey Medical Center, Veterans Administration Medical Center, and Hennepin County Medical Center. Clinical practica and weekly special group conferences.

OTOL 8231. Surgery of the Ear, Nose, and Throat. (3 cr; A-F or Aud. Prereq- Grad otol major) Surgical training and experience with broad scope of surgical problems encountered in otorhinolaryngology provided at Fairview-University Medical Center, St. Paul Ramsey Medical Center, Veterans Administration Medical Center, and Hennepin County Medical Center. Clinical practica and weekly special group conferences.

OTOL 8232. Maxillofacial Surgery. (1 cr; A-F or Aud. Prereq- Grad otol major) Basic science and management principles of maxillofacial diseases. Problems of maxillofacial trauma. Experience with these problems in the hospitals of the training program, especially the county hospitals.


OTOL 8234. Anatomy of the Head and Neck and Temporal Bone Dissection. (2 cr; Sdnt Opt. Prereq- Grad otol major or #) Head and neck anatomy studied from cadaver through laboratory and experience dissection to learn anatomy and to practice otologic surgical procedures. S/N for nonmajors only.


OTOL 8236. Endoscopy. (1 cr [max 12 cr]; A-F or Aud. Prereq- Grad otol major) Didactic and practical instruction in laryngoscopy, esophagoscopy, bronchoscopy, and mediastinoscopy. General management principles emphasized.

OTOL 8238. Pathology of the Ear, Nose, and Throat. (1 cr [max 12 cr]; A-F or Aud. Prereq- Grad otol major) Gross pathology and histopathology of diseases of the ear, nose, throat, and related regions.

OTOL 8239. Otoneurology. (1-2 cr [max 12 cr]; Sdnt Opt. Prereq- Grad otol major or #) Instruction and experience in diagnosis and management of oto-neurologic problems, including training in electronystagmographic analysis of vestibular function.

OTOL 8240. Allergy. (1 cr [max 12 cr]; A-F or Aud. Prereq- Grad otol major) Concepts and management of otologaryngologic allergy.

OTOL 8241. Cancer of the Head and Neck. (1 cr [max 12 cr]; A-F or Aud. Prereq- Grad otol major) Clinical head and neck oncology, etiology, treatment (both surgical and nonsurgical), and other principles of management.

OTOL 8242. Audiology and Speech Pathology. (2 cr; Sdnt Opt. Prereq- Grad otol major or #) Clinical audiology and speech-language pathology, including diagnosis and treatment of conductive, sensorineural, and central hearing loss; voice disorders; swallowing disorders; velopharyngeal insufficiency related to cleft lip/palate and craniofacial anomalies; alaryngeal speech; and speech disorders related to head and neck cancer.

OTOL 8243. Introduction to Research Methodology. (1 cr; Sdnt Opt. Prereq- Grad otol major or #) Statistical methods, experimental design, and execution of otologaryngologic research. Ethics of research with human and animal subjects.

OTOL 8244. Seminar: Current Literature. (1 cr; Sdnt Opt. Prereq- Grad otol major or #) Presentation and discussion of selected articles. Required for all otolaryngology graduate students.


OTOL 8248. Directed Readings in Auditory Physiology. (1-2 cr [max 2 cr]; Sdnt Opt. +NSC 8248. Prereq- #) Current research on biophysics and physiology of auditory system; topics selected for each student. Written responses prepared and discussed.


OTOL 8250. Advanced Biochemistry of the Auditory System. (1 cr; Sdnt Opt. Prereq- MdBc 6100, MdBc 6101 or equiv or #) Review of recent progress in biochemical aspects of auditory end organs.

OTOL 8262. Advanced Clinical Audiology. (2 cr; Sdnt Opt. Prereq- Grad otol major, 8242 or #) Comprehensive reading and practicum in auditory evaluation of patients. Assumes basic knowledge of clinical audiology. Each session devoted to aspect of auditory evaluation or aural rehabilitation, including behavioral audiometry, electrophysiologic evaluation, hearing aid selection, and cochlear implants.
OTOL 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

OTOL 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

OTOL 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]. No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

OTOL 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])

OTOL 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Pharmacology (PHCL)

Department of Pharmacology

College of Pharmacy


PHM 8100. Seminar: Pharmacodynamics. (1 cr [max 4 cr]; S-N or Aud. Prereq–Grad Phm major)

PHM 8110. Readings in Pharmacodynamics. (1 cr [max 4 cr]; S-N or Aud. Prereq–Grad Phm major) Current literature.

PHM 8120. Readings in Central Nervous System (CNS) Drug Delivery. (1 cr [max 4 cr]; S-N only. Prereq–#) Weekly discussion of recent publications or new techniques, methods, and analyses on delivery of drugs to central nervous system. Topics vary. Informal presentations from CNS drug delivery researchers.

PHM 8150. Pharmacokinetics Research Seminar. (1 cr [max 12 cr]; S-N or Aud. =PHAR 6233, Prereq–Grad Phm major) Current concepts and literature review.

PHM 8295. Research Problems in Pharmacodynamics. (1 cr [max 20 cr]; S-N or Aud. Prereq–#) Experimental investigation of problems in pharmacodynamics.

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

PHM 8411. Stabilization of Pharmaceuticals. (3 cr; Stdnt Opt. Prereq–Physical and organic chem survey courses) Application of physicochemical principles (e.g., chemical kinetics) to elucidate and minimize stability problems in pharmaceutical systems.

PHM 8421. Advanced Pharmacokinetics. (4 cr; A-F or Aud) Topics in kinetics of drug absorption, distribution, metabolism, and excretion.

PHM 8431. Controlled Release: Materials, Mechanisms, and Models. (3 cr; A-F or Aud. =SHEN 8431, Prereq–Differential equations course including partial differential equations or #) Physical, chemical, physiological, and mathematical principles underlying design of delivery systems for drugs. Small molecules, proteins, genes. Emphasizes temporal controlled release. Concepts may be applicable to controlled release of other chemical agents.

PHM 8441. Solubility and Solid-State Properties of Drugs. (3 cr; A-F or Aud. Prereq–Physical chem survey course or #) Physical/physicochemical properties of drugs in solid state as related to drug delivery.

PHM 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

PHM 8481. Advanced Neuropharmaceutics. (4 cr; A-F or Aud. =CMR 8481, NSC 8481, Prereq–#) Delivery of compounds to central nervous system (CNS) to activate proteins in specific brain regions for therapeutic benefit. Pharmaceutical/pharmacological issues specific to direct drug delivery to CNS.

PHM 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

PHM 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])

PHM 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

PHM 8900. Spec Topics in Pharmacodynamics. (1-4 cr; A-F or Aud)

Pharmacology (PHCL)

Department of Pharmacology

Medical School

PHCL 5101. Pharmacology for Pharmacy Students. (3 cr; A-F or Aud. Prereq–2nd yr pharmacy student or #) Action/fate of drugs. Lectures, lab.

PHCL 5102. Pharmacology for Pharmacy Students. (2 cr; A-F or Aud. Prereq–5101 or #) Action/fate of drugs.

PHCL 5103. Pharmacology for Dental Students. (3 cr; Stdnt Opt. Prereq–enrolled dental student or #) Pharmacological principles/actions of drugs.

PHCL 5109. Problems in Pharmacology. (1-18 cr [max 18 cr]; Stdnt Opt. Prereq–Upper div or grad student or #) Research projects and special problems by arrangement.

PHCL 5110. Introduction to Pharmacology. (3 cr; A-F or Aud. Prereq–Grad student or #) Basic principles of Pharmacology. Focuses on molecular mechanisms of drug action.

PHCL 5111. Pharmacogenomics. (3 cr; A-F or Aud. Prereq–Grad student or #) Human genetic variation, its implications. Functional genomics, pharmacogenomics, toxicogenomics, proteomics. Interactive, discussion-based course.

PHCL 5112. A Graduate Student Toolkit: Scientific Speaking, Grant Writing, and Responsible Conduct of Research. (2 cr; A-F only. Prereq–#) Presentation skills, scientific writing, responsible conduct of research. Practical workshops in each area. Prereq–for preliminary exams.

PHCL 5115. Pharmacology. (1 cr; A-F or Aud. Prereq–Grad student or #) Principles of pharmacology. Meets with 6110.

PHCL 5117. Pharmacology. (2 cr; A-F or Aud. Prereq–5210 or #) Continuation of 5110. Meets with 6111. Lectures on the major classes of drugs.

PHCL 5122. Pharmacology. (3 cr; A-F or Aud. Prereq–5211 or #) Continuation of 5111. Meets with 6112


PHCL 5487. Neurosciences. (3 cr; Stdnt Opt. =NSC 5487, Prereq–#) Current research on drugs of abuse, their mechanisms of action, characteristics shared by various agents, and neural systems affected by them. Offered biennially, spring semester of even-numbered years.


PHCL 8200. Seminar: Selected Topics in Pharmacology. (1 cr [max 8 cr]; Stdnt Opt. Prereq–6112 or #) Student-presented seminars.

PHCL 8207. Seminar: Psychopharmacology. (1 cr; Stdnt Opt. =NSC 8207, PSY 8070, Prereq–#) For graduate students and postdoctorals interested in studies and research associated with psychotropic drugs and chemicals. Neurochemistry, pharmacology, and behavior as antecedent or consequent variables. Some seminars devoted to biomedical ethics.

PHCL 8208. Neuropsychopharmacology. (3 cr; A-F or Aud. Prereq–[5212, 6112, PSY 5021, PSY 5061] or #) Methodologies to study relationships between drugs and biochemical, behavioral, and neurophysiological consequences. Functional biogenic amine, peptidergic, other pathways. How manipulations alter neuronal function or behavior. Feedback mechanisms, induction, inhibition. Reinforcement of, tolerance to, or dependence on drugs of abuse: stimulants, hallucinogens, depressants, opiates. Student presentations. Offered alternate years.

PHCL 8209. Substance Abuse at the Bedside. (1 cr; Stdnt Opt. Prereq–Grad student in any basic science program) Clinical management of addictive diseases. Students discuss how observed clinical interactions can influence a basic science project in which they are involved.

PHIL 5202. Symbolic Logic II. (4 cr; Stndt Opt. Prereq–5201 or 5202) Elements of set theory, including the concepts of enumerability and nonenumerability. Turing machines and recursive functions; the results of Church, Godel, and Tarski and the philosophical significance of those results.

PHIL 5211. Modal Logic. (3 cr; Stndt Opt. Prereq–5201 or 1) Axiomatic and semantic treatment of propositional and predicate modal logics; problems of interpreting modal languages.

PHIL 5221. Philosophy of Logic. (3 cr; Stndt Opt. Prereq–5202 or 1) Attempts to answer, “What is logic?” Scope of logic. Disputes about alternative logics. Theories concerning logical truth (e.g., conventionalism: view that logical truths are contingent).

PHIL 5222. Philosophy of Mathematics. (3 cr; Stndt Opt. Prereq–College level logic or mathematics course or 1) Major philosophical questions arising in connection with mathematics. What is mathematics about? How do we know the mathematics we do? What is the relation between mathematics and the natural sciences? Selected readings of leading contributors such as Frege, Dedekind, Russell, Hilbert, Brouwer, Godel, Quine.

PHIL 5323. Education and Social Change. (4 cr; A-F or Aud. =PHIL 4325) Connections between education, social change. Theories of democratic/popular education, their application through in-depth practicum in community education setting.

PHIL 5324. Ethics and Education. (3 cr; Stndt Opt. =PHIL 4324. Prereq–6 cr in [philosophy or education] or 1) What constitutes good education in terms of educational outcomes and of processes that promote learning. Connections between concepts of good education and of good society.

PHIL 5325. Biomedical Ethics. (3 cr; Stndt Opt. Prereq–Grad or 1) A survey of major topics and issues in biomedical ethics including patients’ rights and duties, informed consent, confidentiality, ethical issues in medical research, the initiation and termination of medical treatment, euthanasia, abortion, and the allocation of medical resources.


PHIL 5415. Philosophy of Law. (3 cr; Stndt Opt. Prereq–1000-1 or 1004 or 3302 or social science major or 1) Analytical accounts of law and legal obligation.

PHIL 5510. Philosophy of the Individual Arts. (3 cr; Stndt Opt. =PHIL 4510. Prereq–3302) Aesthetic problems that arise in studying or practicing an art.

PHIL 5601. History of the Philosophy of Science. (3 cr; Stndt Opt. Prereq–1) History of logical thought from its European origins in first half of 20th century to its emergence as nearly universal account of science in post-war Anglo-American philosophy.


PHIL 5603. Scientific Inquiry. (3 cr; Stndt Opt. Prereq–1) Philosophical theories of methods for evaluating scientific hypotheses, of role of experiment in science, and of how hypotheses come to be accepted within a scientific community.

PHIL 5605. Space and Time. (3 cr; Stndt Opt. =PHIL 4605. Prereq–Courses in [philosophy or physics] or 1) Philosophical problems concerning nature/structure of space, time, and space-time.

PHIL 5606. Philosophy of Quantum Mechanics. (3 cr; Stndt Opt) Problems of interpretation in ordinary (nonrelativistic) quantum mechanics. Two-slit experiment, Schrodinger cat paradox (measurement problem), Einstein-Podolsky-Rosen paradox. Leading approaches to interpretation (Copenhagen, hidden variables, universal wave function) and their connections with philosophical issues.


PHIL 5760. Selected Topics in Philosophy. (3 cr; Stndt Opt. Prereq–3-5xxx-5xxx course in phil or 1) Philosophical problems of contemporary interest. Topics specified in Class Schedule.

PHIL 5993. Directed Studies. (1-3 cr [max 6 cr]; Stndt Opt. Prereq–1, 1) Guided individual reading or study.

PHIL 8010. Workshop in History of Philosophy. (1 cr [max 4 cr]; Stndt Opt. Prereq–&4xxx hist of phil course, 1) Topics vary by offering.


PHIL 8100. Workshop in Epistemology and Metaphysics. (1 cr [max 4 cr]; Stndt Opt. Prereq–&4xxx (epistemology or metaphysics) course, 1) Topics vary by offering.

PHIL 8110. Seminar: Metaphysics. (3 cr [max 6 cr]; Stndt Opt. Prereq–4101 or 1) Topics vary by offering.

PHIL 8131. Epistemology Survey. (3 cr; Stdnt Opt.)
Survey, against background of traditional issues, of contemporary developments in theory of knowledge.

PHIL 8180. Seminar: Philosophy of Language. (3 cr [max 6 cr]; Stdnt Opt. Prereq-[4231 or #])
Topics vary by offering.

PHIL 8182. Formal Semantics of Natural Language. (3 cr; A-F or Aud. =LING 8221. Prereq-Phil 5201 or #)
Truth-conditional model-theoretic semantics applied to treatment of opacity, intensionality, quantification, and related phenomena in natural language.

PHIL 8200. Workshop in Logic and Philosophy of Mathematics. (1 cr [max 4 cr]; Stdnt Opt. Prereq-[&4xxx logic or 4xxx phil of math], #) Topics vary by offering.

PHIL 8210. Seminar: Logical Theory. (3 cr [max 6 cr]; Stdnt Opt. Prereq-[5201, 5205] or #) Topics vary by offering.

PHIL 8220. Seminar: Philosophy of Mathematics. (3 cr [max 6 cr]; Stdnt Opt. Prereq-5202 or [4xxx math or 4xxx pol math])# Topics such as significance of limitative metatheorems (Gooden, et al), assessment of major foundational programs (set-theoretic, modern Hilbertian, constructivist, modal/structuralist alternatives to standard platonism).

PHIL 8300. Workshop in Moral and Political Philosophy. (1 cr [max 4 cr]; Stdnt Opt. Prereq-[&4xxx moral or 4xxx pol phil])# Topics vary by offering.

PHIL 8310. Seminar: Moral Philosophy. (3 cr [max 9 cr]; Stdnt Opt. Prereq-4310 or 4320 or 4330 or #)
Concepts/problems relating to ethical discourse.

PHIL 8320. Seminar on Medical Ethics. (3 cr [max 6 cr]; Stdnt Opt. Prereq-[4xxx moral or 5xxx ethics course])# Patients’ rights/duties, informed consent, confidentiality, ethical issues in medical research, initiation/termination of medical treatment, euthanasia, abortion, maternal/fetal conflicts, allocation of medical resources.

PHIL 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

PHIL 8410. Seminar: Philosophy of Law. (3 cr [max 6 cr]; Stdnt Opt. Prereq-5415 or #)
Primarily for law students and advanced political science, history, or sociology majors or minors.

PHIL 8420. Seminar: Political Philosophy. (3 cr [max 6 cr]; Stdnt Opt. Prereq-4521 or 4414 or #)
Topics vary by offering.

PHIL 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

PHIL 8500. Workshop in Aesthetics. (1 cr [max 4 cr]; Stdnt Opt. Prereq-[&4xxx aesthetics course], #) Topics vary by offering.

PHIL 8510. Seminar: Aesthetics Studies. (3 cr [max 6 cr]; Stdnt Opt) Topics vary by offering.

PHIL 8550. Seminar: Philosophy of Religion. (3 cr [max 6 cr]; Stdnt Opt. Prereq-4521 or #) Topics vary by offering.

PHIL 8600. Workshop in the Philosophy of Science. (1 cr [max 4 cr]; Stdnt Opt. Prereq-[&4xxx phil of sci course, #] Topics vary by offering.

PHIL 8606. Seminar: Philosophy of Medicine and the Biomedical Sciences. (3 cr; Stdnt Opt) Aims and goals of medicine; concepts of health, illness, and disease; nature of reasoning in clinical medicine; theoretical evolution in medicine; and role of values in practice of medicine and healthcare.


PHIL 8620. Seminar: Philosophy of the Biological Sciences. (3 cr [max 6 cr]; Stdnt Opt) Topics vary by offering.

Philosophical framework for analyzing cognitive sciences. Recent developments in metaphysics/epistemology. Nature of scientific theories, methodologies of cognitive sciences, relations among cognitive sciences. Relation of cognitive science to epistemology and to various philosophical problems. Topics vary by offering.

PHIL 8660. Seminar: Social and Cultural Studies of Science. (3 cr [max 6 cr]; Stdnt Opt. +SST 8240)
Review of recent work; analysis of theoretical and methodological differences among practitioners; selected responses from historians and philosophers of science.

PHIL 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 1% for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

PHIL 8670. Seminar: Philosophy of Science. (3 cr [max 6 cr]; Stdnt Opt. Prereq-#) Topics vary by offering.

PHIL 8710. Seminar: Feminist Philosophy. (3 cr [max 6 cr]; Stdnt Opt. Prereq-6622 or 5622 or WoSt 4122 or WoSt 5122 or #)
Topics vary by offering.

PHIL 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])

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

PHIL 8993. Directed Study. (1-3 cr [max 6 cr]; Stdnt Opt. Prereq-#)

PHIL 8994. Directed Research. (1-3 cr [max 6 cr]; Stdnt Opt. Prereq-#)

Physical Medicine and Rehabilitation (PMED)

Department of Physical Medicine and Rehabilitation

Medical School


PMED 8212. Electromyography. (1-15 cr [max 15 cr]; Stdnt Opt. Prereq-enrolled in PMed residency training program)

PMED 8214. Readings in Electromyography. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq-enrolled in PMed residency training program)


Physical Therapy (PT)

Department of Physical Medicine and Rehabilitation

Medical School

PT 8131. Research Seminar I. (1 cr; A-F or Aud. Prereq-Grad PT major)
Scientific thinking in physical therapy. Preparation to execute research project or literature review. Analysis of current literature. Basic features of research design. Elements of evaluating treatment efficacy. Students interact with their research adviser and with research faculty in various specialties.

PT 8132. Research Seminar in Physical Therapy II. (1 cr; A-F or Aud. Prereq-8131, Grad PT major)
Scientific thinking in physical therapy. Preparation to execute research project or literature review. Analysis of current literature. Basic features of research design. Elements of evaluating treatment efficacy. Students interact with their research adviser and with research faculty in various specialties.

PT 8193. Research Problems in Physical Therapy. (1-7 cr [max 7 cr]; A-F or Aud. Prereq-Grad PT major)
Process of developing/completing a scholarly research project or literature review related to rehabilitation science. Type of research experience is determined by adviser.

PT 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

PT 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])

Physics (PHYS)

School of Physics and Astronomy

Institute of Technology

PHYS 5001. Quantum Mechanics I. (4 cr; Stdnt Opt. Prereq-4101 or equiv or #)

PHYS 5002. Quantum Mechanics II. (4 cr; Stdnt Opt. Prereq-5001 or equiv)
Symmetry in quantum mechanics, space-time symmetries and the rotation group, Clebsch-Gordan coefficients and the Wigner-Eckart theorem. Scattering theory. Method of second quantization with elementary applications. Relativistic wave equations including Dirac equation.

PHYS 5011. Classical Physics I. (4 cr; Stdnt Opt. Prereq-4001, 4002 or #)
Classical mechanics: Lagrangian/Hamiltonian mechanics, orbital dynamics, rigid body motion, special relativity.
Course Descriptions


PHYS 5071. Physics for High School Teachers: Experimental Foundations and Historical Perspectives. (3 cr; Stdnt Opt. Prereq–Gen physics; #; no cr for physics grad or grad physics minor) In-depth examination of a conceptual theme in physics, its experimental foundations and historical perspectives. Kinematics and dynamics from Aristotle through Einstein; nature of charge and light; energy and thermodynamics; electricity, magnetism, and quantized fields; structure of matter.

PHYS 5072. Best Practices in College Physics Teaching. (1-3 cr [max 5 cr]; Stdnt Opt) Pedagogies for introductory physics classes. Topics from educational research/practice as applied to classroom.

PHYS 5081. Introduction to Biopolymer Physics. (3 cr; Stdnt Opt. PHYS 4911. Prereq–working knowledge of [thermodynamics, statistical mechanics]) Introduction to biological and soft condensed matter physics. Emphasizes physical ideas necessary to understand behavior of macromolecules and other biological materials.


PHYS 5402. Radiological Physics. (4 cr; Stdnt Opt. Prereq–1302 or 1402) Signal analysis, medical imaging, medical x-rays, tomography, radiation therapy, nuclear medicine, MRI, and similar topics.

PHYS 5701. Solid-State Physics for Engineers and Scientists. (4 cr; Stdnt Opt. Prereq–Grad or advanced undergrad in physics or engineering or the sciences) Crystal structure and binding; diffraction; phonons; thermal and dielectric properties of insulators; free electron model; band structure; semiconductors.

PHYS 5702. Solid State Physics for Engineers and Scientists. (4 cr; Stdnt Opt. Prereq–5701 or #) Magnetism and paramagnetism; ferromagnetism and antiferromagnetism; optical phenomena; lasers; superconductivity, surface properties; ferroelectricity.

PHYS 5950. Colloquium Seminar. (1 cr; S-N or Aud. Prereq–Grad student or advanced undergrad in physics, %) Colloquium of School of Physics and Astronomy.

PHYS 5980. Introduction to Research Seminar. (1 cr [max 3 cr]; S-N or Aud. Prereq–Grad or upper div phys major) Introduction to the research activities of the School of Physics and Astronomy.

PHYS 5993. Directed Studies. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq–Gen, %) Independent, directed study in physics in areas arranged by the student and a faculty member.

PHYS 5994. Directed Research. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq–Grad, Jr, %) Problems, experimental or theoretical, of special interest to students. Written reports.

PHYS 8001. Advanced Quantum Mechanics. (3 cr; Stdnt Opt. PreReq–5002 or #) Topics in non-relativistic quantum mechanics; second quantization. Introduction to Diagrammatic and Green’s function techniques and to relativistic wave equations. Applications of relativistic perturbation theory to particle interactions with electromagnetic field. Invariant interactions of elementary particles.


PHYS 8012. Quantum Field Theory II. (5 cr; Stdnt Opt. Prereq–8011 or #) Aspects of general theory of quantized fields, including space-time and discrete transformation properties, the CP theorem, and the spin-statistics connection. Introduction to functional and path-integral methods. Renormalization group and asymptotic freedom. Semi-classical methods and instantons in gauge theories.

PHYS 8013. Special Topics in Quantum Field Theory. (3 cr; Stdnt Opt. Prereq–8012 or #) Includes non-perturbative methods in quantum field theory, supersymmetry, two-dimensional quantum field theories and their applications, lattice simulations of quantum field theories, quantum field theory methods applied to condensed matter physics, and string theory.

PHYS 8100. Seminar: Problems of Physics Teaching and Higher Education. (1 cr [max 3 cr]; Stdnt Opt) Lectures and informal discussions of courses and curricula, techniques and materials important in undergraduate physics instruction; relation to general problems of higher education.

PHYS 8161. Atomic and Molecular Structure. (3 cr; A-F only. Prereq–Level of mathematics associated with B in physical sciences) Emphasizes interpretation of quantum numbers and selection rules in terms of symmetry. Experimental data summarized and compared with theoretical predictions.

PHYS 8200. Seminar: Cosmology and High Energy Astrophysics. (1 cr [max 6 cr]; S-N or Aud. Prereq–#) Current topics in cosmology and high energy astrophysics.


PHYS 8312. Biological Physics of Macroscopic Systems. (3 cr; Stdnt Opt. Prereq–[5201 or CHEN 4707], 5011 or #) Macroscopic systems, based on physics such as fluid dynamics, statistical mechanics, non-linear dynamics, and chaos theory. Super-molecular aggregates. Biological physics of the cell. Biological physics of populations/evolution.

PHYS 8333. FTE: Master’s. (1 cr; no grade. Prereq–Master’s student, adviser and DGS consent)

PHYS 8444. FTE: Doctoral. (1 cr; no grade. Prereq–Doctoral student, adviser and DGS consent)

PHYS 8500. Plan B Project. (4 cr; Stdnt Opt. Prereq–#; may be taken once to satisfy Plan B master’s project requirement; no cr toward PhD) Project topic arranged between student and instructor. Written report required.


PHYS 8600. Seminar: Space Physics. (1 cr [max 6 cr]; S-N or Aud) Current topics in space physics and plasma physics.


PHYS 8611. Cosmic Ray and Space Physics. (3 cr; Stdnt Opt. Prereq–5012 or #) Properties of energetic particles in heliosphere and in astrophysical environments; solar physics, including radiation and magnetic effects; solar wind and magnetospheric physics; physics of radiation belts.
PHYS 8650. Advanced Topics in Space and Plasma Physics. (3 cr; max 9 cr). Stdnt Opt. Prereq–8602 or 8611 or #
Topics in plasma waves and instabilities, solar physics, cosmic ray physics, atmospheric physics or planetary physics.

PHYS 8666. Doctoral Preliminary Exam. (1-6 cr; max 12 cr). No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

PHYS 8700. Seminar: Condensed Matter Physics. (1 cr; max 6 cr; S-N or Aud. Prereq–#) Current research.

PHYS 8702. Statistical Mechanics and Transport Theory II. (3 cr; Stdnt Opt. Prereq–8701 or #)
Equilibrium properties of macroscopic classical and quantum systems. Phase transitions and Renormalization Group. Transport theory. Applications to soft condensed matter systems.

PHYS 8711. Solid-State Physics I. (3 cr, Stdnt Opt. Prereq–4211, 5002 or #)

PHYS 8712. Solid-State Physics II. (3 cr; Stdnt Opt. Prereq–8711 or #)

PHYS 8750. Advanced Topics in Condensed Matter Physics. (3 cr; max 9 cr). Stdnt Opt. Prereq–8712 or #
Sample research topics: magnetism, superconductivity, low temperature physics, superfluid helium.

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])

PHYS 8800. Seminar: Nuclear Physics. (1 cr; max 6 cr; S-N or Aud)
Current research topics.

PHYS 8801. Nuclear Physics I. (3 cr; Stdnt Opt. Prereq–5001 or concurrent reg in 5001)
Properties of nuclei based on hadronic and quark-gluon degrees of freedom. Relativistic field theory at finite temperature and density applied to many-body problems, especially nuclear matter and quark-gluon plasma. Applications to lepton and hadron scattering, nuclear-nucleus collisions, astrophysics and cosmology.

PHYS 8802. Nuclear Physics II. (3 cr; Stdnt Opt. Prereq–8801 or #)
Properties of nuclei based on hadronic and quark-gluon degrees of freedom. Relativistic field theory at finite temperature and density applied to many-body problems, especially nuclear matter and quark-gluon plasma. Applications to lepton and hadron scattering, nuclear-nucleus collisions, astrophysics and cosmology.

PHYS 8850. Advanced Topics in Nuclear Physics. (3 cr; max 9 cr). Stdnt Opt. Prereq–8802 or #
Research topics.

PHYS 8888. Thesis Credit: Doctoral. (1-24 cr; max 100 cr; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

PHYS 8900. Seminar: Elementary Particle Physics. (1 cr; max 6 cr; S-N or Aud)
Elementary particle physics, high energy physics, particle astrophysics and cosmology.

PHYS 8901. Elementary Particle Physics I. (3 cr; Stdnt Opt. Prereq–8901 or #)

PHYS 8902. Elementary Particle Physics II. (3 cr; Stdnt Opt. Prereq–8901 or #)

PHYS 8911. Introduction to Supersymmetry. (3 cr; A-F only. Prereq–8901 or #)

PHYS 8950. Advanced Topics in Elementary Particle Physics. (3 cr; max 9 cr). Stdnt Opt. Prereq–8902 or #
Research topics.

Research under faculty direction.

### Physiology (PHSL)

#### Department of Physiology

##### Medical School

**PHSL 5061. Principles of Physiology for Biomedical Engineering.** (4 cr; Stdnt Opt. Prereq–Biomedical engineering grad, one yr college chem and physics and math through integral calculus)
Human physiology with emphasis on quantitative aspects. Organ systems (circulation, respiration, renal, gastrointestinal, endocrine, muscle, central and peripheral nervous systems), cellular transport processes, and scaling in biology.

**PHSL 5094. Research in Physiology.** (1-12 cr; max 24 cr). Stdnt Opt. Prereq–#
Independent lab research project in physiology, supervised by physiology faculty.

**PHSL 5095. Problems in Physiology.** (1-5 cr; max 20 cr). Stdnt Opt. Prereq–#
Individualized study in physiology. Students address selected problem through library or lab research, supervised by physiology faculty.

**PHSL 5101. Human Physiology.** (5 cr; Stdnt Opt. Prereq–Grad student)

**PHSL 5115. Advanced Clinical Physiology I for Nurse Anesthetists.** (3 cr; A-F or Aud. Prereq–#)
Respiratory physiology, acid-base physiology, gastrointestinal physiology, metabolism, endocrinology, physiology of pregnancy and labor.

Neural excitation (ion channels, excitation models, effects of neural morphology) using UNIX workstations to simulate empirical results. Includes the Hodgkin-Huxley model, nonlinear dynamic systems analysis, voltage and ligand gated ion channels, ion transport theories, and impulse initiation and propagation.

**PHSL 5315. Human Power, Sports Performance, and Disease Treatment.** (2 cr; Stdnt Opt. Prereq–Major in [physiology or medicine or physical therapy or kinesiology or coaching/elite athletic training])
Seminar. Multiple physiological systems in sports/exercise medicine and elite athletic performance.

#### Human power, sports performance, treatment of disease using exercise prescriptions. Students review literature, analyze data, make PowerPoint presentations.

**PHSL 5350. Humans in Extreme Environments.** (2 cr; Stdnt Opt. Prereq–[5061 or equiv])
Physiological systems, human factors, psychological reactions. Countermeasures to enhance performance and prevent negative health consequences. Readings, required paper, final exam.

**PHSL 5355. Directed Study: Humans in Extreme Environments.** (1-5 cr; max 25 cr). Stdnt Opt. Prereq–[5061 or equiv])
Individualized study on topics related to human physiology in extreme environments. Library or lab research.

**PHSL 5356. Research: Humans in Extreme Environments.** (1-5 cr; max 25 cr). Stdnt Opt. Prereq–[5061 or equiv])
Independent lab research on physiology in extreme environments.

**PHSL 5444. MuscLe.** (3 cr; Stdnt Opt. =BIOC 5444. Prereq–3061 or 3071 or 5061 or BioC 3021 or BioC 4331 or #)

**PHSL 5510. Advanced Cardiac Physiology and Anatomy.** (2-3 cr; Stdnt Opt. Prereq–)
Fundamental concepts and advanced topics related to clinical/biomedical cardiac physiology. Lectures, laboratories, workshops, anatomical dissections. Intense, one week course.

**PHSL 5511. Advanced Neuromuscular Junction Physiology.** (2-3 cr; Stdnt Opt. Prereq–)
Fundamental concepts and advanced topics related to clinical/biomedical aspects of neuromuscular junction physiology. Lectures, laboratories, workshops, anatomical dissections. Intense, one week course.

**PHSL 5520. Advanced Pulmonary Mechanics: Physiology and Pathophysiology.** (2-3 cr; Stdnt Opt. Prereq–)
Fundamental concepts and advanced topics related to mechanical aspects of pulmonary function (e.g., elastic recoil, airway resistance). Lectures, laboratories, demonstrations. Intense, one week course.

Topics in pharmacokinetics. Non-compartmental calculations of clearance and volume of distribution. Compartmental modeling, one-compartment approaches. Physiologically-based pharmacokinetic modeling. Course is designed around the pharmacokinetic program PKQuest.
Background information and review of selected current concepts. (1 cr; S-N or Aud) Experiments in plant physiology. Emphasizes quantitative aspects, including analysis of organ systems.

PBS 8212. Selected Topics in Autonomic and Neuroendocrine Regulation. (1 cr; S-N or Aud. =NSC 8210) Advanced seminar.

PBS 8222. Central Regulation of Autonomic Function. (3 cr; A-F or Aud. =NSC 8222. Prereq-NSC 5561 or #) Directed laboratory research.

PBS 829A. Research in Physiology. (1-18 cr [max 18 cr]; Stdnt Opt. Prereq-Grad cellular and integrative Phsl major, #) Directed laboratory research.

PBS 8310. Advanced Topics in Cellular Physiology. (1 cr [max 4 cr]; Stdnt Opt. Prereq-#) Discussion of primary research publications. Topics vary by semester.

PBS 8335. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent) Current scientific research.

PBS 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

PBS 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

PBS 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])

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

PBS 8900. Seminar. (1-2 cr [max 4 cr]; S-N or Aud) Independent research determined by student’s interests, in consultation with faculty mentor.

PBS 8910. Journal Club. (1 cr [max 4 cr]; S-N or Aud) Critical evaluation of selected current literature.

PBS 8993. Directed Studies. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq-PhD grad student, #)

PBS 8994. Research. (1-5 cr [max 10 cr]; Stdnt Opt. Prereq-PhD grad student, #) Independent research determined by student’s interests, in consultation with faculty mentor.

PBS 8995. Research Ethics in the Plant and Environmental Sciences. (1 cr; S-N or Aud. Prereq-Grad student or practicing health professional, #) Three-day intensive course. Physiology, bioenergetics, nutrition, and sports medicine. Focuses on application of principles to treatment of diseases and functional deficits. Lectures, demonstrations, hands-on experiences in an exercise medicine facility.

PBS 8500. Course Descriptions

PLA 5412. Plant Physiology. (3 cr; Stdnt Opt. Prereq-Biol 2022 or Biol 3002 or Biol 3007, Biol/BioC 3021 or BioC 4331) Physiological and biochemical bases of plant systems with emphasis on higher plants.

PLA 5416. Plant Morphology, Development, and Evolution. (4 cr; Stdnt Opt. Prereq-Biol 2022 or Biol 3002 or Biol 3007) Evolutionary history of land plants. Morphological changes in vegetative and reproductive structures. Morphology of green algal ancestors, nonvascular land plants, and spore bearing and seed bearing vascular plants are analyzed in an evolutionary framework.

PLA 5514. Plant Molecular Genetics and Development. (3 cr; Stdnt Opt. Prereq-BIOC 3021 or BIOL 4005 or BIOG 4352 or equiv) Survey topics in plant molecular biology. How advances in molecular/genomic biology are used to understand plant physiology and developmental biology. Uses of transgenic plants in research/biotechnology.

PLA 5516. Plant Cell Biology. (3 cr; Stdnt Opt. +PBIO 4516W. Prereq-[Biol 2022 or Biol 3007 or Biol 3022], [Biol 3021 or BioC 3021 or BIOL 4005 or BIOG 4352 or equiv] Structure, function, and dynamic properties of plant cellular components such as organelles, cytoskeleton, and cell wall. How cellular structures are assembled, how it contributes to cell growth/division. Cell fate/development. Responses to hormones and external signals.

PLA 5900. Special Topics. (1-3 cr [max 18 cr]; Stdnt Opt. Prereq-Plant biology course)

PLPA 5202. Field Plant Pathology. (2 cr; Stdnt Opt) Characteristics of a variety of plant diseases. Field trips to observe symptoms and effects of diseases, and to learn about prevention and control of diseases in field, forest, golf course, greenhouse, nursery, orchard, and urban environments.

PLPA 5203. Introduction to Fungal Biology. (3 cr; Stdnt Opt. Prereq-Biol 1009 or equiv) Kingdom fungi. Organisms classified as protists and straminipila. Morphological features, lifecycles, and ecology that make each group unique. Evolutionary relationships, applied aspects. Student seminars, lab visits, Web resources.


PLPA 5300. Current Topics in Molecular Plant Pathology. (1 cr max 2 cr; S-N only. Prereq- [Bio] 4125, course in plant pathology or microbiology), course in genetics, lab in molecular biology [Biotechnology] or equivalent] or #) Interactive class. Students read, discuss, and critique publications in molecular plant pathology. Each week, students focus on one article and examine it from different dimensions (underlying principles, experimental strategies, data analysis, impact on the broader discipline).

PLPA 5301. Plant Genomics. (5 cr; Stdnt Opt. +PBIO 5301. Prereq-Intro course in genetics or #) Introduction to genomics. Emphasizes plants and relevant model organisms. DNA marker/sequencing technology, comparative genomics, whole genome sequencing. DNA chips/microarrays, EST libraries and SAGE analysis, gene-knockout systems, genome databases, sequence comparison/clustering algorithms, visualization tools.


PLPA 5999. Special Workshop in Plant Pathology. (1-4 cr max 4 cr; Stdnt Opt) Workshop on a variety of topics in plant pathology offered at locations other than the Twin Cities campus. See Class Schedule or department for current offerings.

PLPA 8005. Supervised Classroom or Extension Teaching Experience. (2 cr; S-N or Aud. +AGRS 8005, HORT 8005, SOIL 8005. Prereq-#) Teaching experience in one of the following departments: Biosystems and Agricultural Engineering; Agronomy and Plant Genetics; Horticultural Science; Soil, Water, and Climate; or Plant Pathology. Discussions about effective teaching to strengthen skills and develop a personal teaching philosophy.

PLPA 8090. Advanced Procedures and Research in Plant Pathology. (1-8 cr max 8 cr; Stdnt Opt) Special assignment in lab and field problems in pathological research.

PLPA 8101. Causal Organisms of Plant Disease. (4 cr; Stdnt Opt. Prereq-5201 or equiv) Laboratory-based intensive examination of bacteria, viruses, and nematodes as causal agents of plant disease.


PLPA 8200. Seminar. (1 cr; A-F or Aud) Critical review and presentation of current problems and progress in plant pathology.

PLPA 8302. Genomics of Plant-Associated Microbes. (3 cr; A-F or Aud. Prereq-Bio [Bio] 4125, course in [plant pathology or microbiology], course in genetics, lab in molecular biology, biotechnology] or equivalent) or #) Identification/localization of genes in plant-microbe interactions. Analysis of plant pathogens, research methodologies. Linkage/gene/physical mapping, sequence analysis, gene silencing, knock-out, ESTs, microarrays, bioinformatics. Online training modules, field trips, guest lectures, individual/group projects.

PLPA 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)
Course Descriptions

POL 5280. Topics in Political Theory. (3-4 cr; Stdnt Opt. Prereq--: 4280; grad student) Topics in historical, analytical, or normative political theory. Topics vary, see Class Schedule.

POL 5306. Presidential Leadership and American Democracy. (3 cr; Stdnt Opt. +POL 5306. Prereq--grad student or #) Examines whether president’s political and constitutional powers are sufficient to satisfy citizens’ high expectations and whether president should be expected to dominate American politics.


POL 5309. Justice in America. (3 cr; Stdnt Opt. Prereq--: 4309; [1001 or 1002], [non-pol sci grad major or equiv or #]) American judiciary, selection of judges, how/why these individuals/institutions behave the way they do. Inflation and deflation. What impact decisions have. Why people comply with them.

POL 5310. Topics in American Politics. (3 cr; Stdnt Opt. Prereq--grad student or #) See Class Schedule for description.


POL 5322. Rethinking the Welfare State. (3-4 cr; Stdnt Opt. Prereq--: 4322; grad student) Competing arguments about welfare states in advanced industrial countries. Whether welfare states result from sectional interests, class relations, or citizenship rights. Compares American social policy with policies in other western countries.


POL 5331. Thinking Strategically in Domestic Politics. (3-4 cr; Stdnt Opt. Prereq--: 4331; grad student) Applications of rational-choice and game theories to important features of domestic politics in the United States and elsewhere.


POL 5410. Topics in Comparative Politics. (3 cr; Stdnt Opt. Prereq--grad student) Topics of current analytical or policy importance. Topics vary, see Class Schedule.


POL 5465. Southeast Asian Politics. (3 cr; Stdnt Opt) U.S. involvement in region. Progress toward and resistance to democratic political systems and economic development.


POL 5477. Struggles and Issues in the Middle East. (4 cr; Stdnt Opt. Prereq--: 4477; 1054 or 3051 or non-pol sci grad student or #) Turkey, Iran, Iraq, and selected Arab states. Domestic politics of religion/secular, ethnic, economic, environmental, and other policy/identity issues. Regional politics of water access, Israeli/Palestinian/ Arab world relationships, oil and Persian/Arabian Gulf, human rights.

POL 5478. Contemporary Politics in Africa and the Colonial Legacy. (4 cr; Stdnt Opt. +AFRO 4478, AFRO 5478. POL 4478W. Prereq--grad student or #) How current politics in mainly, though not exclusively, sub-Saharan Africa have been shaped by pre-colonial/colonial processes. Reality of independence, recurrent political/economic crises. Global context and prospects for effective democracy.


POL 5481. Governments and Markets. (3-4 cr; Stdnt Opt. +AFRO 4481; 1054 or 3051 or non-pol sci grad student or #) Connection between democracy and markets. Focuses on countries in North America, Europe, Asia.


POL 5491. Supreme Court and Constitutional Interpretation. (3 cr; Stdnt Opt. Prereq--grad student or #) Historical/analytical approaches to Court’s landmark decisions. Theory/techniques of judicial review. Court’s authority related to wider political/social context of American government.

POL 5502. Supreme Court, Civil Liberties, and Civil Rights. (3 cr; Stdnt Opt. Prereq--: 4502; 1001 or 1002 or equiv or non-pol sci grad student or #) Supreme Court’s interpretation of Bill of Rights, 14th amendment. Freedom of speech, press, religion. Crime/punishment. Segregation/de segregation, affirmative action. Abortion/privacy.

POL 5525. Federal Indian Policy. (3 cr; A-F or Aud. Prereq--: 4525, AmH 4525; grad student) Formulation, implementation, evolution, comparison of Indian policy from pre-colonial times to self-governance of new nations. Legal and theoretical approaches to federal Indian policy. Major federal Indian policies. Views/attitudes of policy-makers, reactions of indigenous nations to policies. Effect of bodies of literature on policies.

POL 5561. Comparative Legal Systems. (3 cr; Stdnt Opt. +POL 4561. Prereq--grad student or #) Survey of principal legal systems of Western world. Role of legal system in relation to various political/ economic systems. Contrast between common law and civil law traditions.


POL 5766. American Political Culture and Values. (3-4 cr; Stdnt Opt. Prereq--: 4766; 1001 or equiv or non-pol sci grad student or #) Individualism, freedom, equality. Dominant beliefs about democratic principles, materialism, capitalism, citizenship, patriotism/heroism.


POL 5810. Topics in International Politics and Foreign Policy. (3 cr [max 6 cr]; Stdnt Opt. Prereq--: 4810; grad student) Selected issues in contemporary international relations. Topics vary, see Class Schedule.

POL 5833. The United States in the Global Economy US For Econ Policy. (3-4 cr; Stdnt Opt. Prereq--: 4833; grad student; 3835 recommended) Domestic/international politics of United States. Foreign economic policy (trade, aid, investment, monetary, migration policies). Effects of policies and international economic relations on U.S. economy/ politics.

POL 5872. Global Environmental Politics. (3 cr; Stdnt Opt. Prereq--: 5872; non-pol sci grads only) Emergence of the environment as a key aspect of the global political agenda. Non-governmental and governmental international organizations. Politics of protection of the atmosphere, rain forests, seas and other selected issues. International security and the environment.


POL 5883. Global Governance. (3 cr; Stdnt Opt. Prereq--: 4883; 3835 or non-pol sci grad student or #) Rise/role of inter-governmental organizations such as United Nations, non-governmental organizations. Peacekeeping, trade, development, human rights, security and arms control, self-determination, refugees, health, environment. Seminar discussions, class simulations.

POL 5887. Thinking Strategically in International Politics. (3 cr; A-F or Aud. Prereq—POL 4873; grad student) Applications of game theory to international politics. Conflict/cooperation, global environmental commons, deterrence/reputation.

POL 5889. Governments and Global Trade and Money. (3 cr; Stdtnt Opt. = POL 4869. Prereq—5355 or grad student or #) Politics of international trade and monetary affairs, including north-south and east-west relations.

POL 5970. Individual Reading and Research. (1-4 cr [max 4 cr]; Stdtnt Opt. Prereq—#, %, @) Guided individual reading or study.

POL 8060. Research Proseminar in Political Science. (2 cr [max 8 cr]; S-N only. Prereq—POL sci grad student) Readings, discussions, guest speakers. Topics vary by semester.

POL 8070. Advanced Research and Writing in Political Science. (2 cr [max 4 cr]; S-N only. Prereq—ABD student in pol sci) Composing, guidance at all stages of dissertation research process, from conceptualization of topic to editing of nearly final drafts.

POL 8101. Introduction to Political Science. (3 cr [max 4 cr]; A-F or Aud. Prereq—Grad pol sci major or #) History, scope, and methods of political science as a discipline; current subfields; major research programs (including statism, pluralism, institutionalism, realism, behavioralism, rational choice, and critical theory); problems of theory, interpretation, concept-formation, comparison, measurement and experimentation; designs for research.


POL 8105. Professional Development II. (1 cr [max 2 cr]; S-N or Aud. Prereq—Pol sci student, ABD, %) Research ethics. Skills for teaching undergraduate courses in political science. Completion of dissertation prospecti or early chapter.

POL 8120. Core Course in Political Methodology: Modeling Political Processes. (3 cr; Stdtnt Opt. Prereq—Pol sci grad major or #) Methods used and potential for creating models of political processes. Designing political institutions, discerning/forecasting election outcomes, producing early warnings of international conflicts, increasing turnout in elections. Using mathematics to study political strategy and collective decision making in conferences/legislatures. Using statistics to measure political variables, design experiments with human subjects, and test micro/macroe political theories.

POL 8122. Positive Theory. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major or #) Survey of positive political theory and rational-choice models. Information and transaction costs; institutions; models of elections, voting, coalitions.

POL 8123. Introduction to Quantitative Political Research. (3 cr; A-F or Aud. Prereq—Pol sci grad student or #) Principles of regression analysis, use of regression model in political science.


POL 8125. Dynamic Analysis. (3 cr; Stdtnt Opt. Prereq—Pol sci grad student or #) Time series methods, application in political science.

POL 8126. Qualitative Methods. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major or #) Broad introduction to qualitative methods in social science. Practical, hands-on training through fieldwork projects devised and carried out during the semester. Interviewing, participant observation, narrative interpretation, ethical problems, and issues of gender and race in fieldwork.

POL 8127. Survey Research Methods: Measuring Public Opinion. (3 cr; Stdtnt Opt. Prereq—Pol sci grad major) Theoretical/empirical issues in survey research methodology aimed at assessing political attitudes/behavior (including questionnaire design, scientific sampling). Skill areas necessary to analyze, design, or conduct surveys; phenomena.

POL 8131. Advanced Methods and Models. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major, 6 cr 81xx seminars or #) Intersection of statistical methodology and deductive modeling; issues in merging inductive and deductive research. Sample topics: parties and elections, probabilistic voting, strategic modeling of international relations.

POL 8160. Topics in Models and Methods. (1-3 cr [max 12 cr]; Stdtnt Opt. Prereq—Grad pol sci major or #) Seminars on selected topics.

POL 8201. Understanding Political Theory. (3 cr [max 4 cr]; Stdtnt Opt. Prereq—Grad pol sci major or %) Key concepts and major approaches.

POL 8215. Philosophy of Political Inquiry. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major or #) Major schools in philosophy of science as applied to political inquiry: pragmatism, positivism, hermeneutics, critical rationalism, critical theory, realism. Themes of political inquiry: explanation, interpretation, theory, criticism. Political issues raised by philosophy of science: liberalism, democracy, control, multiculturalism.

POL 8225. American Political Thought. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major or #) Colonial era to present: Puritans, American Revolution, Constitution, rise of individualism, pro- and anti-slavery arguments, civil war and reconstruction, industrialism, westward expansion, Native Americans, immigration, populism, socialism, social Darwinism, growth of corporations and unions; Great Depression; growth of American power at home and abroad.

POL 8255. Democratic Theory. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major or #) Competing models of democracy: classical, republican, liberal, radical, Marxist, neo-Marxist, pragmatist, populist, pluralist, postmodern, participatory. Domestic and international struggles over meaning of “democracy”; social science models of and findings on democracy.


POL 8253. Late Modern Political Thought. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major or #) Theoretical responses to and rival interpretations of Western economy, society, politics, and democratic culture in the modern age; theories of history; class struggle; the end of metaphysics and the death of God; technology and bureaucracy; psychology of culture, in Hegel, Marx, Toqueville, Mill, Nietzsche, Weber, Freud.

POL 8260. Topics in Political Theory. (3 cr [max 6 cr]; Stdtnt Opt. Prereq—Grad pol sci major or #) Readings and research in special topics or problems.

POL 8275. Contemporary Political Thought. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major or #) From approximately World War II to the present. Survey of range of texts or intensive focus on such authors as Adorno, Arendt, Derrida, Foucault, Habermas, Horkheimer, Rawls, Said. Sample topics: feminism, postmodernism, communitarianism, Frankfurt School, postcolonialism.

POL 8301. American Politics. (3 cr [max 4 cr]; Stdtnt Opt. Prereq—Grad pol sci major or #) Seminar on main themes of theory and research in American politics, institutions, law, and policy. Major works on individual, mass, elite, and institutional behavior and their relationship to each other. Foundation for advanced seminars in American politics.

POL 8302. Public Opinion and Political Participation. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major or #) Major theoretical perspectives and research on political participation, voting behavior, and public opinion. Voter turnout, importance of party identification, effects of campaigns, long-term change in public opinion, and designing and conducting research.

POL 8303. Political Parties. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major or #) Party systems and subsystems; party organizational characteristics, goals, and incentives; distribution of power and authority within the party; party elite functions; party as an organizer of governmental power; determinants of party structure and role.

POL 8305. Interest Groups and Social Movements. (3 cr; Stdtnt Opt. Prereq—Grad pol sci major or #) Theoretical and empirical work on role of interest groups and social/political movements in American politics and policy-making processes. Theories of interest group and social/political movement formation, maintenance, and decline. How interest groups and social/political movements attempt to influence public policy. Impact/efficaciveness groups.movements as agents of democratic representation, particularly for marginalized groups.

POL 8307. Proseminar in Political Psychology I. (1 cr; S-N or Aud. = PSY 8211. Prereq—Grad pol sci major or pol psych minor or #) Readings, discussion, and guest speakers. Topics vary by semester.

POL 8308. Proseminar in Political Psychology II. (1 cr; S-N or Aud. = PSY 8212. Prereq—Grad pol sci major or pol psych minor or #) Readings, discussion, and guest speakers. Topics vary by semester.

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

POL 8311. Political Psychology and Socialization. (3 cr; A-F or Aud. Prereq–Grad pol sci major or pol psych minor or #) Introduction to political psychology. Personality and politics; political cognition, emotion, and political behavior; political expertise; media and politics; aggression, authoritarianism, and political behavior; altruism and politics.

POL 8312. Legislative Process. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Introduction to study of legislative politics; theories of legislative institutions and individual behavior; congressional elections; congressional committees, parties, and leaders.

POL 8313. Executive Process. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Tension between leadership and democracy in context of American presidency in terms of President's relationship with federal bureaucracy, Congress, and making of diplomatic and military policy.

POL 8314. Judicial Process. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Judicial systems and roles; selection of judges; organizing and supporting litigation; influences on judicial decisions; impact and enforcement of judicial decisions; courts and other institutions of government.

POL 8320. Social Psychology of Prejudice and Intergroup Relations. (3 cr; A-F or Aud) Approaches, findings, and controversies in research on social psychology of prejudice, racial attitudes, and intergroup relations. Focuses on approaches based in social psychology and on related work from political science and sociology.

POL 8321. Urban Politics. (3 cr; A-F or Aud. Prereq–Grad pol sci major or #) Selection of local leadership; relationship of political system to governmental forms and social institutions; role and impact of political institutions; policymaking at local level; studies in policy problems; the emerging metropolis.

POL 8325. State Politics and Intergovernmental Relations. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Theoretical approaches to comparative study of state politics; study of political culture and behavior, governmental institutions, and public policy at state level; federalism and subnational governments.

POL 8331. Constitutional Law. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Overview of substantive and theoretical debates in American constitutional law; role of law and constitutional processes in shaping American political institutions and American politics.

POL 8331. Constitutional Law. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Overview of substantive and theoretical debates in American constitutional law; role of law and constitutional processes in shaping American political institutions and American politics.

POL 8333. FTE: Master's. (1 cr; No grade. Prereq–Master's student, adviser and DGS consent) A-F or Aud. Prereq–Grad pol sci major or #) Theoretical approaches: incrementalism, innovation and policy learning, comparative policy outputs, policy process models, interest groups, and selected areas of public policy.

POL 8337. Welfare State Theories and American Social Policy. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Rival theoretical explanations for cause and nature of welfare state development in context of four American social policies: social security, welfare, education, and healthcare.

POL 8360. Topics in American Politics. (3 cr [max 9 cr]; Stdtnt Opt. Prereq–Grad pol sci major or #) Readings/research in special topics or problems.

POL 8401. International Relations. (3 cr [max 4 cr]; Stdtnt Opt. Prereq–Grad pol sci major or #) Basic theoretical approaches to study of international politics. Surveys representative work/central issues of scholarship.


POL 8403. International Norms and Institutions. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Origins, roles, and effectiveness of international norms and institutions; theoretical explanations and debates. Inclusion of sovereignty; rational choice versus constructivist perspectives; role of international law, international organizations, and non-governmental organizations; and international society and transnational networks.

POL 8404. International Hierarchy. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Asymmetric structures and processes of international relations; systemic conditions and implications of informal empire and structures of hegemony; cultural productions of difference and inequality.

POL 8405. International Political Economy. (3 cr; A-F or Aud. Prereq–Grad pol sci major or #) Theoretical and policy issues in international economic relations. Different approaches for understanding outcomes in international economy. Trade, finance, labor markets, creation and maintenance of international regimes, and “globalization” of economic liberalism.

POL 8406. Politics of International Finance. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Relationship between workings of the international political system and that of international markets for currency and capital.

POL 8407. Morality in World Politics. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Approaches to normative theorizing and empirical research on moral norms in world politics. Theoretical topics: realism, communitarianism, consequentialism, constructivism, postmodernism, cultural relativism. Substantive issue areas: famine and foreign aid, just war theory, nuclear weapons, covert operations, implications of technology, case study on war (Gulf War).

POL 8408. International Relations of the Environment. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Theory and practice of international environmental policies. Emergence of environment as major issue of international relations. Diversities of agendas and politics. Imperatives, templates, resistance in global efforts to forge an applied politics of environmental sustainability. Selected cases.

POL 8411. Political Psychology and Foreign Policy. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Foreign policy theories about decision makers and audiences. Impact of human nature, formal institutions, cultural and cross-cultural settings, and kinds of issues on foreign policy choice, control, and justification.

POL 8412. American Foreign Policy. (3 cr; Stdtnt Opt. Prereq–8410 or #) U.S. policy toward foreign states and peoples: heritage, motivations, policy processes, what the public generally knows and wants, specific policies. Rise of interstate issues and decline of enemy-focused foreign policy. Readings and research in advanced topics or problems. Recent topics: global environmental issues, morality in world politics, and norms and institutions in world politics.

POL 8416. Introduction to Comparative Politics. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Main theoretical approaches and issues: comparative method, the state and class; political culture; development, democratization, rational choice, social movements.


POL 8603. European Government and Politics. (3 cr; A-F or Aud. Prereq–Grad pol sci major or #) Main theories and approaches used to interpret European politics. Many of these theories have broad relevance for comparative politics, for example, theories about the state, cleavage and coalitional bases, parties and social movements, and constitutional structures and institutions have broad relevance for the field of comparative politics.

POL 8605. Government and Politics in Africa. (3 cr; A-F or Aud. Prereq–Grad pol sci major or #) Theoretical and methodological approaches to study of African politics, focusing on pre-colonial and colonial legacies for post-colonial reality. Local politics, social construction of identities, political economy of petty capitalism, and working class political and social movements, and prospects for democracy.

POL 8608. Government and Politics of Russia and the Commonwealth of Independent States. (3 cr; A-F or Aud. Prereq–Grad pol sci major or #) Framework for understanding politics of change underway in the former Soviet Union. Roots of current transformation, including causes and legacy of the Russian revolution and creation of the Soviet Union. Issues in current transformation, including nationalism, economic reform, and democratization. Prior knowledge of basic Soviet politics assumed.


POL 8615. The Political Economy of Contemporary Japan. (3 cr; Stdtnt Opt. Prereq–Grad pol sci major or #) Critical evaluation of literature and theoretical perspectives; comparative examination of social and political change and interaction between both processes; structure/agency nexus.
POL 8637. Comparative Political Economy. (3 cr; Stdnt Opt. Prereq–Grad pol sci major or #)
Connections between democracy and markets, emphasizing experiences of countries in North America and Europe.

POL 8641. Comparative Mass Political Behavior. (3 cr; A-F or Aud. Prereq–Grad pol sci major or #)
Examined from a cross-national perspective. Development of political participation, mobilization and its effects, development of political cleavages and political parties as vehicles of conflict, modes of political behavior under varied systems of representation and varied party systems.

POL 8643. Comparative Political Institutions. (3 cr; A-F or Aud. Prereq–Pol sci grad student or #)
Structure/operation of various political institutions in different settings. Theoretical approaches, comparative frameworks. Introduction to literature on political institutions. Preparation for comparative research on political institutions.

POL 8660. Topics in Comparative Politics. (3 cr [max 9 cr]; Stdnt Opt. Prereq–Grad pol sci major or #)
Readings in advanced topics or problems; supervised research and research training.

PORT 5520. Portuguese Literary and Cultural Studies. (3 cr [max 9 cr]; Stdnt Opt.)
Study of origins and development of modern Portuguese nation (late 15th to 20th century) using literature, cultural and literary criticism, history, sociology and various media (film, art, music, Internet). Main cultural problematics pertaining to Portugal as well as fundamental literary texts.

PORT 5530. Brazilian Literary and Cultural Studies. (3 cr [max 9 cr]; Stdnt Opt.)
Study of origins and development of modern Brazilian nation (late 16th to 20th century) using literature, cultural and literary criticism, history, sociology and various media (film, art, music, Internet). Main cultural problematics pertaining to Brazil as well as fundamental literary texts.

PORT 5540. Literatures and Cultures of Lusophone Africa. (3 cr [max 9 cr]; Stdnt Opt. Prereq–#)
Origins/development of Lusophone Africa (Angola, Mozambique, Cape-Verde, Guinea-Bissau, São Tomé, Principe). Literature, cultural/literary criticism, history, sociology, media (film, art, music).

PORT 5910. Topics in Lusophone Cultures and Literatures. (3 cr [max 9 cr]; Stdnt Opt.)
Cultural manifestations in Portuguese-speaking world (Portugal, Brazil, Lusophone Africa). Literature, history, film, intellectual thought, critical theory, popular culture. Topics may include writers (e.g. Machado de Assis) groups of writers (e.g. Lusophone women writers), or problematics such as (post-) colonialism or Luso-Brazilian modernities.

PORT 5970. Directed Readings. (3 cr [max 9 cr]; Stdnt Opt. Prereq–MA or PhD candidate, #, %, @)
Graduate-level research in literatures and cultures of the Portuguese-speaking world. Topics vary.

PORT 8333. FTE: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Master’s student, adviser and DGS consent)
Graduate-level research in literatures and cultures of the Portuguese-speaking world. Topics vary.

PORT 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])
PORT 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq. Max 18 cr per semester or summer; 24 cr required)
PORT 8990. Directed Readings and Research in Political Science. (1-7 cr [max 7 cr]; Stdnt Opt. Prereq–16 cr 8xxx pol sci courses, #, %)
Topics for preservation research project. Students discuss possible projects with faculty/peers. Students present final proposal for research project.

Preventive Science Minor (PREV)

PREV 8001. Prevention Science Core. (3 cr Prereq–Grad student)

PREV 8005. Prevention Science Capstone Course. (1 cr Prereq–8001)
Topics for preservation research project. Students discuss possible projects with faculty/peers. Students present final proposal for research project.

Psychology (PSY)

Department of Psychology
College of Liberal Arts

PSY 5012. Learning and Cognition in Animals. (4 cr; Stdnt Opt. Prereq–3011 or 4011 or honors or grad student or #)
Review/evaluation of key questions, methods, theories, and data about forms of learning and elementary cognitive processes. Emphasizes animal models. Implications for human learning/behavior.

PSY 5014. Psychology of Human Learning and Memory. (3 cr; Stdnt Opt. Prereq–3011 or 3051 or honors or grad student or #)

PSY 5015. Cognition, Computation, and Brain. (3 cr; Stdnt Opt. Prereq–3051 [except for honors/grad students])
Human cognitive abilities (perception, memory, attention) from different perspectives (e.g., cognitive psychological approach, cognitive neuroscience approach).

PSY 5018H. Mathematical Models of Human Behavior. (3 cr; Stdnt Opt. Prereq–Math 1271 or #)
Mathematical models of complex human behavior, including individual/group decision making, information processing, learning, perception, and overt action. Specific computational techniques drawn from decision theory, information theory, probability theory, machine learning, and elements of data analysis.

PSY 5031W. Perception. (3 cr, Stdnt Opt. Prereq–3011 or 3051 or 3031 or 3011 or #)
Cognitive, computational, and neuroscientific perspectives on visual perception. Topics include color vision, pattern vision, image formation in the eye, object recognition, reading, and impaired vision.

PSY 5036W. Computational Vision. (3 cr; Stdnt Opt. Prereq–[[3011 or Math 1272 or equiv]] or #)
Applications of psychology, neuroscience, computer science to design principles underlying visual perception, visual cognition, action. Compares biological/physical processing of images with respect to image formation, perceptual organization, object perception, recognition, navigation, motor control.

PSY 5037. Psychology of Hearing. (3 cr; Stdnt Opt. Prereq–NSC 5037, Prereq–3021 or #)
Biological and physical aspects of hearing, auditory psychophysics, theories and models of hearing, perception of complex sounds including music and speech, clinical, and other applications.

PSY 5038W. Introduction to Neural Networks. (3 cr, Stdnt Opt. Prereq–[[3061 or NSC 3102, MATH 1282 or 2243]] or #)
Parallel distributed processing models and neural/cognitive science. Linear models, Hebbian brain self-organization, non-linear networks, optimization, representation of information. Applications to sensory processing, perception, learning, memory.

PSY 5051W. Psychology of Human-Machine Interaction. (3 cr; Stdnt Opt. Prereq–3031 or 3051 or #)

PSY 5054. Psychology of Language. (3 cr; Stdnt Opt. Prereq–3001W or equiv) or honors or grad student
Theories/experimental evidence in past/present conceptions of psychology of language.

PSY 5061. Neurobiology of Behavior. (3 cr; Stdnt Opt. Prereq–PSY 3061 or 3051 or #)
Physiological/neuroanatomical mechanisms underlying behavior of animals, including humans. Neural basis of learning/memory, sleep, wakefulness, and attention processes. Effects of drugs on behavior.

PSY 5062. Cognitive Neuropsychology. (5 cr; Stdnt Opt. Prereq–3031 or 3051 or #)

PSY 5064. Brain and Emotion. (3 cr; A-F or Aud. Prereq–3031 or 3051 or #)
Introduction to affective neuroscience. How brain promotes emotional/motivated behavior in animals/humans. Biological theories of emotion in historical/current theoretical contexts. Fundamental brain motivational systems, including fear, pleasure, attachment, stress, and regulation of motivated behavior. Implications for emotional development, vulnerability to psychiatric disorders.

For definitions of course symbols, numbers, and abbreviations, see page 214.
Course Descriptions

PSY 5065. Functional Imaging: Hands-on Training. (3 cr; Stdnt Opt. Prereq--[2801 or 4801 or equiv], [5061 or NSCI 3101] or #) Basic neuroimaging techniques. Emphasizes functional magnetic resonance imaging (fMRI). Theory/background. Students design/execute fMRI experiment on Siemens 3 Tesla scanner, incorporating techniques that compensate for distortion and other imaging artifacts.

PSY 5101. Personality Psychology. (3 cr; Stdnt Opt. +PSY 3101. Prereq--[3001W or equiv], [honors undergrad or grad student]) Theories and major issues/findings on personality functioning, personality structure, and personality assessment. Historically important and currently influential perspectives.

PSY 5135. Psychology of Individual Differences. (3 cr; Stdnt Opt. +PSY 3155 or 5135, 5862 or equiv or #) Differential methods in study of human behavior. Psychological traits. Influence of age, sex, heredity, and environment in individual/group differences in ability, personality, interests, and social attitudes.

PSY 5166. Human Abilities. (3 cr; Stdnt Opt. Prereq--5135 or 5135, 5862 or equiv or #) Theory, methods, and applications of research in human abilities. Topics include intelligence, aptitude, achievement, specific abilities, information processing/learning and intelligence, aptitude/trait interactions, and quantitative measurement issues.


PSY 5138. Psychology of Aging. (3 cr; Stdnt Opt. Prereq--5001W or equiv) Theories/findings concerning age-related changes in physical/mental health, personality, cognitive functioning, productivity, etc.; reviewed/interpreted within context of multiple biological, social, and psychological changes that accompany age.

PSY 5202. Attitudes and Social Behavior. (3 cr; Stdnt Opt. Prereq--5201 or #) Theory/research on social psychology of beliefs/attitudes. Persuasion principles.

PSY 5204. Psychology of Interpersonal Relationships. (3 cr; A-F only. Prereq--[honors or grad student], #) Introduction to interpersonal relationship theory/research findings.

PSY 5205. Applied Social Psychology. (3 cr; Stdnt Opt. Prereq--5201 or grad student or #) Applications of social psychology research/theory to domains such as physical/mental health, education, the media, desegregation, the legal system, energy conservation, public policy.

PSY 5206. Social Psychology and Health Behavior. (3 cr; A-F only. Prereq--5201 or grad student or #) Survey of social psychological theory/research pertaining to processes by which people develop beliefs about health/wellness. Relationship between these beliefs, adoption of health-relevant behaviors. Effect of psychological factors on physical health.

PSY 5207. Personality and Social Behavior. (3 cr; A-F or Aud. Prereq--3101 or 3201 or honors or grad student or #) Conceptual/methodological strategies for scientific study of individual differences in their social worlds. Applications of theory/research to issues of self, identity, and social interaction.

PSY 5301. Vocational and Occupational Health Psychology. (3 cr; Stdnt Opt. Prereq--5001W or equiv or #) Survey of history, concepts, theories, methods, and findings of vocational/occupational health psychology. Burnout, personality, violence, stressors/stress-relations, counter productive behaviors, coping in workplace. Vocational development/assessment, career decision-making/counseling, person-environment fit.

PSY 5604H. Abnormal Psychology. (3 cr; Stdnt Opt. +PSY 3604. Prereq--honors or grad student or #) Comprehensive review of psychopathological disorders. Etiology, diagnostic criteria, clinical research findings.

PSY 5606. Clinical Psychopharmacology. (3 cr; Stdnt Opt. Prereq--[5001W or equiv], [3061 or 5061], [3604 or 5041] or #) How psychopharmacological methods such as autonomic/central nervous system recording are used in studying major psychopathological disorders.

PSY 5701. Organizational Staffing and Decision Making. (3 cr; Stdnt Opt. Prereq--[2801 or equiv], 3711) or #) Application of psychological theory/research to issues in personnel recruitment/selection and to measurement of job performance. Applying principles of individual differences, psychological measurement to decision making in organizations (recruitment, selection, performance appraisal).

PSY 5703. Psychology of Organizational Training and Development. (3 cr; Stdnt Opt. Prereq--[2801 or equiv], 3711) or #) Theories, methods, and research pertaining to improving performance of individuals at work through Training-needs analysis, instructional design, aptitude/trait interactions, measurement of training outcomes, training evaluation, knowledge structures.

PSY 5708. Organizational Psychology. (4 cr; Stdnt Opt. +PSY 5702, PSY 5705. Prereq--[5001W or equiv], 3711) or #) Psychological causes of behavior in work organizations. Consequences for individual fulfillment and organizational effectiveness. Individual differences, social perception, motivation, stress, job design, leadership, job satisfaction, teamwork, organizational culture.


PSY 5960. Topics in Psychology. (1-4 cr; max 8 cr; Stdnt Opt. Prereq--1001, [jr or sr student]) Special course or seminar. Topics listed in psychology office.

PSY 5993. Research Laboratory in Psychology. (3 cr; max 18 cr; Stdnt Opt. Prereq--#) Laboratory instruction and seminars in faculty research areas.

PSY 8004. Philosophical Psychology. (3 cr; S-N. Prereq--Logic or phil course. [psych or IC&D or phil PhD student] or #) Selected philosophical/methodological problems.

PSY 8010. Advanced Topics in Learning. (3 cr, [max 12 cr]; S-N or Aud. Prereq--5012 or #) Contemporary topics in learning and behavior theory.

PSY 8020. Seminar in Conditioning and Learning. (3 cr, [max 12 cr]; S-N or Aud. Prereq--5012 or grad psych major or #) Review and discussion of ongoing research and prospectsives on future research.


PSY 8036. Topics in Computational Vision. (3 cr, [max 12 cr]; Stdnt Opt. Prereq--5031 or 5036 or equiv or #) Recent research in visual psychophysics, visual neuroscience, and computer vision.


PSY 8055. Seminar: Cognitive Neuroscience. (3 cr; Stdnt Opt. Prereq--5015 or #) Recent advances in analysis of neural bases of cognitive functions.

PSY 8056. Seminar: Psychology of Language. (3 cr; A-F or Aud. Prereq--Grad psych major or #) Selected topics in psycholinguistics.

PSY 8060. Seminar: Neural Substrates of Mental Processes. (3 cr, [max 12 cr]; Stdnt Opt. Prereq--5012 or 5061 or 5062 or 5064 or NSCI 5661 or 8010 or CPsy 8301 or NSCI 8401 or #) Neurobiological substrates of psychological processes such as memory, attention, and emotion. Neurobiological substrates of mental dysfunction.

PSY 8061. Neuropsychopharmacology. (3 cr; A-F or Aud. Prereq--3xxx coursework in biological psych or neuroscience or pharmacology or #) Relationships between biochemical, neurophysiological, psychological, and behavioral effects of drugs. Research in neuropsychopharmacology, behavioral pharmacology, and pharmacology of addiction.

PSY 8070. Seminar: Psychopharmacology. (1-3 cr; max 12 cr; Stdnt Opt. +NSC 8027, PHCL 8207. Prereq--#) Basic issues, contemporary research. Lectures, student presentations.


PSY 8112. Psychopathology II. (3 cr; A-F or Aud. Prereq--[8111, psych grad student] or #) Etiological bases of psychopathology. Theory/research. Evaluation of current theoretic models and empirical findings regarding nature/causes of varying behavior disorders.


PSY 8203. Impression Management. (3 cr; Stdnt Opt. Prereq–Grad psyh major; 8208 recommended; #) Classical and contemporary theory and research concerning interpersonal strategies of impression management and interplay between private and public self.

PSY 8204. Social Psychology of Prejudice and Intergroup Relations. (3 cr; Stdnt Opt) Approaches, findings, and controversies in research on social psychology of prejudice, racial attitudes, and intergroup relations. Focuses on approaches based in social psychology and on related work from political science and sociology.

PSY 8205. Proseminar: Research in Social Psychology. (3 cr; S- or Aud. Prereq–Psych PhD student) Contemporary theoretical positions and related research.

PSY 8206. Proseminar: Research in Social Psychology. (3 cr; S- or Aud. Prereq–8205, Psych PhD student) Contemporary theoretical positions, related research.

PSY 8208. Social Psychology: The Self. (3 cr; A-F or Aud. Prereq–Psych background especially in personality and soc psych) Social psychological theory and research concerning the self and social behavior.


PSY 8210. Law, Race, and Social Psychology. (3 cr; A-F only. Prereq–2nd or 3rd yr law student or PhD student in social science doctoral program) Interdisciplinary seminar. Scientific foundations for and legal implications of implicit (vs explicit) racial or gender bias in four socio-legal domains: criminal law, affirmative action, employment discrimination, and legislative redistricting.

PSY 8211. Proseminar in Political Psychology I. (1 cr; S- or Aud. Prereq–POL 8307, Prereq–Political Psychology grad minor) Readings, discussion, and guest speakers. Topics vary each semester.

PSY 8212. Proseminar in Political Psychology II. (1 cr; S- or Aud. Prereq–POL 8308, Prereq–Political Psychology grad minor) Readings, discussion, and guest speakers. Topics vary each semester.

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

PSY 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

PSY 8501. Counseling Psychology: History and Theories. (3 cr; Stdnt Opt. Prereq–Counseling psychology grad student or #) Introduction to history of counseling psychology and to primary theoretical orientations used by counseling psychologists. For each theory: basic principles, application to counseling practice, and research support.


PSY 8503. Interviewing and Intervention. (3 cr; Stdnt Opt. Prereq–8501, 8502 or #) Skills-based course: conceptualization of counseling process, stages of counseling, development of counseling skills, and strategies for behavior change.

PSY 8510. Counseling Psychology Beginning Practicum: General. (1-6 cr [max 6 cr]; S- or Aud. Prereq–Counseling psychology grad student, 8501, 8502 or 8503 or equiv. #) Beginning applied experiences in counseling psychology settings.

PSY 8511. Counseling Psychology Beginning Practicum: General. (1-6 cr [max 18 cr]; S- or Aud. Prereq–Counseling psychology grad student, 8501, 8502, 8503 or equiv.) Counseling psychology grad student or #) Beginning applied experiences in counseling psychology settings.

PSY 8512. Counseling Psychology Beginning Practicum: General. (1-6 cr [max 18 cr]; S- or Aud. Prereq–Counseling psychology grad student, 8501, 8502, 8503 or equiv.) Beginning applied experiences in counseling psychology settings.

PSY 8514. University Counseling Practicum I. (4-6 cr [max 6 cr]; S- or Aud. Prereq–EPSY 8513, Prereq–Counseling psychology grad student, 8501, 8502, 8503 or equiv.) Integrates science with supervised practice in University Counseling and Consulting Services (UCCS) involving career, academic, and personal counseling clients.

PSY 8515. University Counseling Practicum II. (4-6 cr [max 6 cr]; S- or Aud. Prereq–EPSY 8514, Prereq–Counseling psychology grad student, 8501, 8502, 8503 or equiv, 8514, #) Integrates science with supervised practice in University Counseling and Consulting Services (UCCS) involving career, academic, and personal counseling clients.

PSY 8541. Multicultural Psychology. (3 cr; Stdnt Opt. Prereq–Grad psychology grad student or #) Approaches, findings, and controversies in research on psychology of ethnic/racial minorities and other cultural populations. Emphasizes counseling/ community applications of theory/research. Lecture, discussion, lab.

PSY 8542. Ethics in Psychology. (3 cr; S- or Aud. Prereq–Counseling or clinical psychology grad student or #) Ethical principles and codes of conduct for psychologists. Ethical dilemmas faced by researchers, practitioners, and teachers.

PSY 8544. Vocational and Occupational Health Psychology Research. (3 cr; Stdnt Opt. Prereq–[8501, 8502, 8503 or equiv], counseling psychology grad student, †) Research problems specific to special populations, vocational research, assessment/testing, findings in these areas useful to counseling psychology practice.

PSY 8545. Counseling Psychology Process and Outcome Research. (3 cr; Stdnt Opt. Prereq–[8501, 8502, 8503 or equiv], counseling psychology grad student, #) Introduction to methods/content domains. Research design, methodological issues, analogue research, process/outcome research.

PSY 8554. Career and Occupational Health Psychology Assessment. (3 cr; Stdnt Opt. Prereq–Counseling psychology grad student, or #) History of vocational interest inventories/measures related to career development, and of assessments used in occupational health psychology. Scale construction methodology, research applications. Interpretation/use of instruments.

PSY 8560. Counseling Psychology Advanced Practicum I: General. (1-6 cr [max 6 cr]; S- or Aud. Prereq–[[8501, 8502, 8503 or equiv]], [8510, 8511 or [8514, 8515 or equiv]], counseling psychology grad student or #) Applied practice experience in counseling psychology settings and seminars. May include guest speakers, readings, and student presentations on topics relevant to clients and settings of practice experiences.

PSY 8562. Counseling Psychology Advanced Practicum III: General. (1-6 cr [max 6 cr]; S- or Aud. Prereq–Counseling psychology grad student, 8501-8502-8503 or equiv, 8510-8511 or 8514-8515 or equiv, #) Applied practice experience in counseling psychology settings and seminar that may include guest speakers, readings, and student presentations on topics relevant to clients and settings of practice experiences.

PSY 8563. Counseling Psychology Advanced Practicum I: Vocationa Assessment Clinic. (1-6 cr [max 6 cr]; S- or Aud. Prereq–EPSY 8510-8511 or 8514-8515 or equiv, #) Applied practice experience in vocational assessment clinic of Department of Psychology. Career/vocational testing, assessment, decision making.

PSY 8564. Counseling Psychology Advanced Practicum II: Vocationa Assessment Clinic. (1-6 cr [max 6 cr]; S- or Aud. Prereq–8501-8502, 8503 or equiv, 8514, 8515 or equiv) Applied practice experience in Vocational Assessment Clinic of Department of Psychology. Career and vocational testing, assessment, and decision making.

PSY 8565. Counseling Psychology Advanced Practicum II: Vocationa Assessment Clinic. (1-6 cr [max 6 cr]; S- or Aud. Prereq–8501-8502, 8503 or equiv, 8514, 8515 or equiv) Applied practice experience in Vocational Assessment Clinic of Department of Psychology. Career and vocational testing, assessment, and decision making.

PSY 8570. Counseling Psychology Internship I. (1-12 cr [max 36 cr]; S- or Aud. Prereq–Counseling psychology grad student, or #) First part of counseling psychology internship.

PSY 8571. Counseling Psychology Internship II. (1-12 cr [max 36 cr]; S- or Aud. Prereq–Counseling psychology grad student, or #) Second part of counseling psychology internship.

PSY 8572. Counseling Psychology Internship III. (1-12 cr [max 36 cr]; S- or Aud. Prereq–Counseling psychology grad student, or #) Third part of counseling psychology internship.

PA 5036. Regional Economic Analysis. (1.5 cr; A-F only. Prereq–Major in public policy or [science, tech, env policy] or urban/regional planning or #) Economic data analysis techniques for practitioners in planning and economic development working at local/ regional levels. Shift-share analysis, econometric base model, base multipliers, location quotient analysis, minimum requirements method, economic impact analysis. Individual/group projects.

PA 5037. Regional Demographic Analysis. (1.5 cr; A-F only, Prereq–Major in public policy; or science, tech, and env. policy; or urban and regional planning; or instructor consent) Demographic data analysis, population projection techniques for practitioners in planning, social service delivery, and community development at local/regional levels. Population extrapolation using curve fitting methods, demographic indicators, cohort-component method of population projection, estimation of fertility/migration rates, life tables. Individual/group projects.

PA 5080. Capstone Preparation Workshop. (1 cr; S-N only. Prereq–58081) Project management, qualitative research, and critical framework needed to successfully complete Capstone course. Students complete draft of client project group norms and client contract.

PA 5101. Management and Governance of Nonprofit Organizations. (3 cr; Stdnt Opt. Prereq–5011 or 5941 or grad nonprofit mgmt cert or #) Theories, concepts, and real world examples of managerial challenges. Governance systems, strategic management practices, effect of funding environments, management of multiple constituencies. Types of nonprofits using economic/behavioral approaches.


PA 5103. Leadership and Change in an Innovation Society. (3 cr; Stdnt Opt. Prereq–5011 or 5941 or grad nonprofit mgmt cert or #) Models of change/leadership. How leaders can promote personal, organizational, and societal change. Case studies, action research. Framework for leading change in innovation society.

PA 5104. Strategic Human Resource Management. (3 cr; A-F or Aud. Prereq–5011 or 5941 or grad nonprofit mgmt cert or #) Theories/practice of developing, utilizing, and aligning human resources to improve culture/outcomes of nonprofit/public organizations. HR strategy, individual diversity, leadership, selection, training, compensation, classification, performance appraisal, future HR practices.


PA 5113. State and Local Public Finance. (3 cr; Stdnt Opt. Prereq–Grad or #) Theory/practice of financing. Providing public services at state/local level of government. Emphasizes integrating theoretical understandings to specific policy areas, and documenting wide range of institutional arrangements across/within the 50 states.

PA 5122. Law and Public Affairs. (3 cr; Stdnt Opt. Prereq–Grad or #) Overview of evolution of American legal system. Role of courts, legislatures, and political actors in changing law. How law is used to change public policy.


PA 5132. Mediation Training. (3 cr; Stdnt Opt. Prereq–Grad or #) Creating an arena for mediation. Skills/expectations needed to mediate disputes between individuals, among groups: balanced (peer or colleague), unbalanced (position/ differentials). Role playing, group debrising, critique.

PA 5190. Topics in Public and Nonprofit Leadership and Management. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq–5011 or 5941 or grad nonprofit mgmt cert or #) Selected topics.

PA 5203W. Geographical Perspectives on Planning. (3 cr; Stdnt Opt. +GEOG 5035V, GEOG 5060V, GEOG 5065V, Prereq–Grad student or #) Includes additional weekly seminar-style meeting and bibliographic project on topic selected in consultation with instructor.

PA 5204. Urban Spatial and Social Dynamics. (3 cr; Stdnt Opt. Prereq–Grad student or #) Behavioral theories of internal spatial arrangement, functioning, and characteristics of cities at macro level and how they combine to produce a system of cities. Factors influencing urban spatial structure over time. Urban form, land use/rent. Spatial expression of economic, social, and political forces.

PA 5211. Land Use Planning. (3 cr; Stdnt Opt. Prereq–Grad student or #) Physical/spatial basis for land use planning at community/regional level. Role of public sector in guiding private development. Land use regulations, comprehensive planning, growth management, innovative land use planning/policies.


PA 5221. Private Sector Development. (3 cr; Stdnt Opt. Prereq–Grad or #) Roles of various participants in land development. Investment objectives, effects of regulations. Overview of development process from private/public perspective.


PA 5232. Transportation Policy, Planning, and Deployment. (4 cr; Stdnt Opt. Prereq–Sr or grad student or #) Development of transportation policy, making of transportation plans, development and implementation of transportation technologies. Lectures, interactive case studies, role playing.

PA 5251. Strategic Planning and Management. (3 cr; A-F or Aud. Prereq–Grad student or #) Theory/practice of strategic planning/management for public/nonprofit organizations/organizations. Strategic planning process, management systems; stakeholder analyses. Tools/techniques such as purpose expansions, SWOT analyses, portfolio analyses, and logic models.


PA 5290. Topics in Planning. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq–Grad student or #) Selected topics.


Course Descriptions

PA 5405. Implementation of Social Policy. (3 cr; A-F or Aud)
Theory, tools, and practice of the implementation of social policy in the United States.

PA 5412. Aging and Disability Policy. (3 cr; Stdt Opt. Prereq-Grad or #)
Policy debates concerning populations that are aging or disabled. Students learn/practice analyses in context of important health, social, and economic policy debates. Readings on current theory/evidence.

PA 5414. Child Labor and Education. (3 cr; Stdt Opt. Prereq-Grad or student or #)
International child labor issues. Options for improving child well-being, including policies/programs that have potential to affect the lives of millions of children.

PA 5421. Racial Inequality and Public Policy. (3 cr; Stdt Opt. Prereq-Grad or #)
Historical roots of racial inequality in American society. Contemporary economic consequences. Public policy responses to racial inequality. Emphasizes thinking/analysis that is critical of strategies offered for reducing racism and racial economic inequality.

PA 5431. Public Policies on Work and Pay. (3 cr; Stdt Opt. Prereq-{[PA 5031 or equiv], grad student]} or #)
Public policies affecting employment, hours of work, and institutions in labor markets. Public programs impacting wages, unemployment, training, collective bargaining, job security, and workplace governance. Policy implications of the changing nature of work.

PA 5441. Education Policy and the State Legislature. (3 cr; Stdt Opt. Prereq-Grad or #)

PA 5442. Policy Design for Education and Human Development. (3 cr; Stdt Opt. Prereq-Grad or #)
Designing effective educational policies. Using interdisciplinary approaches to identify/understand core variables (economic, psychological, etc.) Work on policy design.

PA 5451. Immigrant Health Issues. (3-4 cr [max 4 cr]; A-F only. +PBUB 6281. Prereq-Grad student or #)
How to access demographic, health, background information on U.S. immigrants. Characteristics and health needs of immigrants. Designing culturally competent health programs. How to advocate for change to promote immigrant health. Community visits required. Online course.

PA 5452. Immigration and Public Policy. (3 cr; Stdt Opt. Prereq-Grad student or #)
How to employ an analytical framework to analyze a current immigration policy proposal. Topics vary (e.g., president’s guest worker proposal, democratic alternative proposals).

PA 5480. Topics in Race, Ethnicity, and Public Policy. (1-3 cr [max 9 cr]; Stdt Opt. Prereq-Jr or sr or grad student or #)
Link between race/ethnicity and public policy. How to identify/measure racial/ethnic disparities and their historical/cultural origins and policy impacts and to craft politically feasible remedies. Topics may include criminal justice, housing, child welfare, and education.

PA 5490. Topics in Social Policy. (1-4 cr [max 9 cr]; Stdt Opt. Prereq-Grad student or #)
Selected topics.

PA 5501. Economic Development. (3 cr; Stdt Opt. Prereq-Grad or #)

PA 5511. Community Economic Development. (3 cr; Stdt Opt. Prereq-Grad or #)
Contexts/motivations behind community economic development activities. Alternative strategies for organizing/initiating economic development projects. Tools/techniques for economic development analysis/ planning (market analysis, feasibility studies, development plans). Implementation at local level.

PA 5521. Development Planning and Policy Analysis. (4 cr; Stdt Opt. Prereq-5501 or &5501 or 85204 or &85204 recommended)

PA 5522. International Development Policy, Families, and Health. (3 cr; Stdt Opt. Prereq-Grad student or #)

PA 5590. Topics in Economic and Community Development. (1-3 cr [max 9 cr]; Stdt Opt. Prereq-Grad student or #)
Selected topics.

PA 5601. Survey of Women, Law, and Public Policy in the United States. (3 cr; Stdt Opt. Prereq-Grad or #)

PA 5611. Feminist Economics. (2 cr; Stdt Opt. Prereq-[5021, grad student] or #)

PA 5621. Board Service in Women and Public Policy. (1 cr; S-N only. Prereq.-#)
Students serve as full members of a board of directors for a women’s nonprofit organization. Organizational leadership. How to be an effective board member. Twin Cities feminist nonprofit organizations.

PA 5690. Topics in Women and Public Policy. (1-3 cr [max 9 cr]; Stdt Opt. Prereq-Grad student or #)
Selected topics.

PA 5701. Science and State. (3 cr; Stdt Opt. Prereq-Grad or #)

PA 5711. Science and Technology Policy. (3 cr; Stdt Opt. Prereq-Grad student or #)
Effect of science/technology on relations among nations in such matters as autonomy, national security, economic strength, environment, cultural identity, and international cooperation. Negotiating international agreements with S&T implications.

PA 5721. Energy and Environmental Policy. (3 cr; Stdt Opt. Prereq-Grad or #)
Impact of energy production/consumption choices on environmental quality at national, regional, and other economic/social goals. Emphasizes public policy choices for environment, energy, linkages between them.

PA 5722. Environmental and Resource Economics Policy. (3 cr; Stdt Opt. Prereq-{Intermediate microeconomics, intermediate policy analysis, grad student] or #)

PA 5790. Topics in Science, Technology, and Environmental Policy. (1-3 cr [max 9 cr]; Stdt Opt. Prereq-Grad or #)
Selected topics.

PA 5801. Global Public Policy. (3 cr; Stdt Opt. Prereq-Grad student or #)
Creation of rules, norms, and institutions to regulate global activities. How to increase one’s influence in process. Discussions with persons who influence global policy. Community visits required. Online course.

PA 5802. Computer Applications in Public Affairs. (2 cr [max 6 cr]; S-N or Aud)
Introduction to computer systems/applications in public affairs practice.

PA 5901. Developing Your Public Service Career. (1 cr; S-N or Aud. Prereq-Major in [public affairs or public policy or urban/regional planning or science, technology/environmental policy] or #)
Students investigate/analyze interests, skills, and abilities and combine them in a career plan. Students develop tools to demonstrate their abilities, document their experiences/knowledge, and explore public service career options.

PA 5912. Politics of Public Affairs and Civic Engagement. (3 cr; A-F only. Prereq-Grad student or #)
Potential for public affairs professionals to be agents/architects of democracy in a rapidly changing, diverse, global landscape of governance.

PA 5920. Skills Workshop. (5.5-4 cr [max 12 cr]; Stdt Opt. Prereq-Grad student or #)
Topics on public policy or planning skills. Topics specified in Class Schedule.

PA 5931. Role of the Media in Public Affairs. (3 cr; Stdt Opt. Prereq-Grad or #)
Historical/contemporary role of news media in defining/shaping public opinion/policy, primarily in the United States. Emphasizes critical research, professional skills in three forms of journalism: hard news coverage, investigative reporting, documentaries. Field experience, practice in governmental public relations.

PA 5941. Leadership for the Common Good. (4 cr; Stdt Opt. Prereq-Major in public affairs or #)
Personal, team, organizational, visionary, policy, and ethical aspects of leadership. Emphasizes building/experiencing a learning community.

PA 5952. Global Commons Seminar II. (2 cr; A-F only. Prereq-HHH International fellow)
Research/presentations related to professional development projects. Each week selected students assign readings, deliver a presentation on their professional development project, and distribute a summary of the talk. Presentations are developed in collaboration with at least one faculty specialist in the subject area.
PA 5990. Topics: Public Affairs--General Topics. (1-5 cr [max 9 cr]; Stdt Opt. Prereq-Grad student or #) General topics in public policy.

PA 8001. Transforming Public Policy. (4 cr; A-F or Aud. Prereq-[5041 or #]) Development of interdisciplinary understanding of one or more policy areas through explorations of theory, readings, cases, and model-building exercises. Articulating policy/system improvements and leadership implications for formulating/implementing them.

PA 8002. Synthesis Workshop. (4 cr; A-F or Aud. Prereq-[5001, grad PA major or #] Development of public policy to advance public interest, common good. Recommendations flow from interdisciplinary understanding of problem, stakeholder analyses, modeling/analysis. Political feasibility, marketing, entrepreneurship, advocacy.

PA 8081. Capstone Workshop. (3 cr; A-F or Aud. Prereq-[Grad major in public policy or [urban and regional planning] or [science, technology, and environment policy], completion of core courses] or #) Project on external client on issue agreed upon by student, client, and instructor. Students apply interdisciplinary methods, approaches, and perspectives studied in core courses to the issue. Written report includes analysis of issue and policy recommendations. Oral presentation of major findings. Concentration/topic vary term-to-term.

PA 8082. Working Group. (3 cr; A-F or Aud. Prereq-[Grad major in public policy or [urban and regional planning] or [science, technology, and environment policy], completion of core courses] or #) Project on external client on issue agreed upon by student, client, and instructor. Students apply interdisciplinary methods, approaches, and perspectives studied in core courses to the issue. Written report includes analysis of issue, policy recommendations. Concentration/topic vary term-to-term.

PA 8190. Advanced Topics in Public and Nonprofit Leadership and Management. (1-3 cr [max 6 cr]; Stdt Opt) Selected topics.


PA 8202. Networks and Places: Transportation, Land Use, and Design. (4 cr; A-F or Aud. Prereq-[Urban and regional planning] grad student or #) Relationship between land use and transportation. Developing synthetic design skills for linking land-use transportation in urban/regional settlements. Economic, political, legal, institutional frameworks for planning. Parallel computer lab, practicum assignment.


PA 8204. Creating Good Work: Economic and Workforce Development. (4 cr; A-F or Aud) Job-centered economic development. Theories on how/why jobs are created. Tools used by communities and economic developers (e.g., tax abatement, infrastructure, job training, entrepreneurship). Strategy, politics, effectiveness.

PA 8290. Advanced Topics in Planning. (1-3 cr [max 6 cr]; Stdt Opt) Selected topics.


PA 8312. Analysis of Discrimination. (3 cr; Stdt Opt) Introduces students of policy analysis and other applied social sciences to tools for measuring and detecting discrimination in market and nonmarket contexts. Application of modern tools of labor econometrics and race relations research to specific problems of market and nonmarket discrimination.

PA 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

PA 8336. Research Methods in Social and Labor Policy. (3 cr; A-F or Aud. +HRIR 8013. Prereq-5032 or 5033, 5022 or equiv) Use of social science research methods in analyzing and developing public policies.

PA 8390. Advanced Topics in Advanced Policy Analysis Methods. (1-3 cr [max 6 cr]; Stdt Opt) Selected topics.

PA 8490. Advanced Topics in Social Policy. (1-3 cr [max 6 cr]; Stdt Opt) Selected topics.

PA 8590. Advanced Topics in Economic and Community Development. (1-3 cr [max 6 cr]; Stdt Opt) Selected topics.

PA 8626. Feminist Organizations. (3 cr; A-F or Aud) Uses social movement literature and histories of U.S. second-wave feminism to study feminist organizations. Recurring issues and conflicts within organizations and movements examined through comparative studies of feminism in Latin America, Eastern Europe, Britain, and Italy. Methods and sources for studying feminism.

PA 8627. Women and Electoral Politics. (3 cr; A-F or Aud) Political science and women’s studies literature on American women and electoral politics.

PA 8690. Advanced Topics in Women and Public Policy. (1-3 cr [max 6 cr]; Stdt Opt) Selected topics.

PA 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])

PA 8790. Advanced Topics in Science, Technology, and Environmental Policy. (1-3 cr [max 6 cr]; Stdt Opt) Selected topics.

PA 8811. Strategic Issues in International Economic Policy. (3 cr; Stdt Opt) Compares/contrasts experiences of industrial/developing countries in trade, investment, exchange rates, and immigration.

PA 8821. National Security Policy. (3 cr; Stdt Opt) Policies and economics of national security policy. Defense policy, military strategy, and weapons procurement. While emphasis is on the United States, other countries also discussed.

PA 8890. Advanced Topics in Foreign Policy and International Affairs. (1-3 cr [max 6 cr]; Stdt Opt) Selected topics.

PA 8991. Independent Study. (1-3 cr [max 6 cr]; Stdt Opt. Prereq-#)

Public Health (PUBH)

School of Public Health

PUBH 8100. Topics: Environmental Health. (1-4 cr [max 20 cr]; Stdt Opt) New course offerings or topics of interest in environmental health.

PUBH 8120. Occupational Health and Safety Research Seminar. (1 cr [max 12 cr]; S-N or Aud. Prereq-[6120, 6330 or 6341], 6450, environmental health major, [OPRTP specialty or equiv] or #) Facilities student research training in occupational injury prevention. Roundtable discussions, interdisciplinary involvement.

PUBH 8140. Validity Concepts in Epidemiologic Research. (2 cr; S-N only) Conceptual basis for validity in observational epidemiologic research. Recognizing, evaluating, preventing, and correcting for confounding specification error, measurement-error bias, and selection/follow-up bias.


PUBH 8142. Epidemiologic Uncertainty Analysis. (2 cr; S-N only. Prereq-8140) Scientific interpretation of statistical analysis as dependent on both data and assumptions. Techniques that enable an investigator to incorporate uncertainty about assumptions into a quantitative analysis.

PUBH 8160. Advanced Toxicology. (2 cr; Stdt Opt. Prereq-[6160, one course in biochem, one course in molecular bio] or #) Cellular/molecular mechanisms by which xenobiotics cause toxicity. Investigative approaches to current research problems in toxicology/carcinogenesis. Apoptosis, cell cycle regulation, genetic toxicology, molecular mechanisms of chemical carcinogenesis, genetic basis for susceptibility to environmental toxicants.

PUBH 8161. Current Literature in Toxicology. (1 cr [max 3 cr]; S-N or Aud. Prereq-6104) Modern methods in toxicology, critical thinking skills. Topics vary each semester. Students read/discuss toxicological literature.

PUBH 8162. Chemical Carcinogenesis and Chemoprevention. (3 cr; A-F or Aud. +NUTR 8617. Prereq-[BioC 3001, BioC 3021, BioC 4331 or equiv], [Chem 2302 or equiv]) Fundamental background in chemical carcinogenesis, carcinogen activation/detoxification, carcinogen-DNA adduct formation, cellular oncogenesis, cancer chemoprevention, nutrition/cancer. Topics integrated/interrelated.
PUBH 8425. Latent Variable Measurement Models and Path Analysis. (3 cr; Stdnt Opt. [PUBH 7455, Preq- Biostatistics PhD student or #])

Introduction to use of statistical techniques known collectively as latent variable models. Exploratory/confirmatory factor analysis, path analysis, structural equation modeling, latent trait models, latent class models. SAS/AMOS software are used.

PUBH 8444. FTE: Doctoral. (1 cr; No grade. Prereq- Doctoral student, adviser and DGS consent)

PUBH 8545. Statistics for Human Genetics and Molecular Biology. (3 cr; Stdnt Opt. Preq- [Stat 8101, Stat 8102 or equiv], PhD student or #; some background with molecular biology desirable)

Introduction to statistical problems arising in molecular biology. Problems in physical mapping (radiation hybrid mapping, DDP), genetic mapping (pedigree analysis, lod scores, TDT), biopolymer sequence analysis (alignment, motif recognition), and micro array analysis.

PUBH 8813. Measurement of Health-Related Quality of Life. (3 cr; Stdnt Opt. Preq- [Grad or professional school] student or #)

Principles of health-related quality of life measures. Qualitative and quantitative methods to measure health-related quality of life. Focus on development and evaluation of outcome measures. Emphasis on understanding the relationship between the quality of life and health.
Recreation Resource Management (RRM)
Department of Forest Resources
College of Food, Agricultural and Natural Resource Sciences
RRM 5101. Nature and Heritage Based Tourism. (3 cr; A-F or Aud. Prereq-Grad student or #)
Interaction of resource based tourism with cultural/natural environments. Impacts of tourism on environment.

RRM 5201. Introduction to Travel and Tourism. (3 cr; A-F only. -RRM 3101. Prereq-Grad student or #)

RRM 5232. Managing Recreational Lands. (4 cr. A-F or Aud. -RRM 4232W. Prereq-Grad student or #)
Recreation management tools from a public agency perspective. Social carrying capacity, recreation opportunity spectrum, limits of acceptable change, benefits based management, visitor experience/resource protection. Various projects. Group project to develop a management plan.

RRM 5259. Visitor Behavior Analysis. (5 cr. Stdnt Opt. Prereq-RRM major or ENR major or ESPM major or grad student or #)
Application of social science theory/methods to recreation and resource-based tourism visitor behavior. Analysis of surveys, observations, and content. Implications for sustainable resource management. Course is online or in-person, depending on semester.

RRM 5301. International Tourism. (3 cr. Stdnt Opt. Prereq-Sr or grad student)

RRM 5480. Topics in Recreation Resource Management. (1-4 cr. [max 6 cr. Stdnt Opt.]
Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule.

Recreation, Park, and Leisure Studies (REC)
School of Kinesiology
College of Education and Human Development
REC 5101. Foundations of Recreation. (3 cr. A-F or Aud. Prereq-MED or grad student or #)
Investigation of the rational, sociological, psychological, and philosophical foundations of the recreational use of leisure in contemporary society. Includes a survey of leisure services.

REC 5111. Sports Facilities. (3 cr. A-F or Aud. Prereq-Kin or Rec major or #)
Steps in planning and building facilities for athletics, physical education, and sport for college, professional, and public use.

REC 5115. Event Management in Sport. (3 cr. A-F or Aud. Prereq=- Kin 5115; Grad student; #)
Techniques/principles of planning, funding, and managing sport events. College athletic championships, non-profit events/benefits, professional events.

REC 5161. Recreation Land Policy. (3 cr. A-F or Aud. Prereq-1501 or 5101 or #)
Historical development of recreational land policy in the United States and related contemporary issues in policy, management, interpretation, and research.

REC 5191. Commercial Recreation and Tourism. (3 cr. A-F or Aud. Prereq-5551 or #)
Scope and development of profit-oriented recreation agencies, including an emphasis on the tourism industry.

REC 5211. Introduction to Therapeutic Recreation. (3 cr. A-F or Aud. Prereq-1501 or 6510, rec major or #)
Purposeful intervention; roles of specialist/recreation therapists in meeting cognitive, physical, emotional, social needs of people with disabling conditions through recreation services; roles of specialist/recreation therapists changing societal attitudes toward illness and disability and the self-concepts of individuals with impairments.

REC 5215. Assess and Monitor Patient/Client Functioning in Recreation Therapy. (3 cr. Stdnt Opt. Prereq-TR major or academic health professional or #; majors A-F only)
Guided development of written plans including development of protocols and critical pathways, intervention programs/activities, individual treatment plans and standards for appropriate placement of individuals in group intervention, and management of patient/client service delivery, record keeping, and administrative responsibilities.

REC 5231. Therapeutic Recreation and Diagnostic Groups. (3 cr. A-F or Aud. Prereq-5211 or #)
Definitions, philosophies, methodologies regarding therapeutic recreation services for persons in diagnostic groups of cognitive, physical, sensory, communication, and psychiatric impairments/disabilities. Lectures, group discussion. Presentations by parents, professionals, and self-advocates. Clinical or community practicum assignment.

REC 5241. Functional Intervention: Recreation Therapy in Geriatric Care. (3 cr. A-F or Aud. Prereq-3541 or 5111 or #)
Role of leisure in maintenance of mental, physical, social-emotional health/functioning. Issues related to prevention of impairment/disability. Rehabilitation, support of vital life influence, effect on design/delivery of recreation services.

REC 5271. Community Leisure Services for Persons with Disabilities. (3 cr. A-F or Aud. Prereq-1501, Rec major or #)
Exploration and application of concepts and techniques of normalization and least restrictive environment strategies to leisure service delivery in inclusive community settings for a range of individuals with disabilities.

REC 5301. Wilderness and Adventure Education. (4 cr. A-F or Aud)
Rationale for, methods in applying wilderness/adventure education programs in recreation, therapeutic recreation, corporate, human service settings. Emphasizes adventure/wilderness program management.

REC 5311. Programming Outdoor and Environmental Education. (3 cr. A-F or Aud)
Methods, materials, and settings for developing and conducting environmental and outdoor education programs.

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

REc 5371. Sport and Society. (3 cr; A-F or Aud. Prereq-[3126, grad student] or #) Sport, sportizing processes, social influences, systems, and structures that have affected and exist within/among societies, nations, and cultures. Issues concerning social differentiation. Social concerns such as violence and honesty.

REc 5421. Sport Finance. (3 cr; A-F or Aud. Prereq-Grad student or #) Introduction to financial analysis in sport. Cash flow statements, budgeting issues, traditional/innovative revenue producing strategies available to sport organizations. Discussion, practical analysis of current market.

REc 5461. Foundations of Sport Management. (3 cr; A-F or Aud. Prereq-Kin or rec or postbac or grad student or #) Theories/techniques in administering/managing sport enterprises. Organizational theory/policy. Practical examples of sport management skills/strategies.

REc 5511. Women in Sport and Leisure. (3 cr; A-F or Aud. Prereq-Kin or rec or postbac or grad student or #) Critically examines women’s involvement in/ contributions to sport, physical activity, and leisure.

REc 5601. Sport Management Ethics and Policy. (3 cr; A-F or Aud. Prereq-Grad student or # #) Ethical concepts that underpin or inform sport policies. Evaluating sport policies from a normative point of view. Selected sport policy issues are used to illustrate relevance of ethical considerations in policy development, ethical implications of sport policy.

REc 5651. Programming and Promotion in Sport. (3 cr; A-F or Aud. Prereq-Kin or rec or grad student or #) Introduction to marketing concepts as they apply to sport industry. Consumer behavior, market research, marketing mix, corporate sponsorship, licensing concepts. Discussion, practical application.

REc 5701. Positive Youth Development Programming. (3 cr; A-F only. Prereq-Upper div under grad or grad student or #) Youth development programming for out-of-school time. Philosophy/purpose of youth development programs. Principles/procedures for developing out-of-school time programs.

REc 5801. Legal Aspects of Sport and Recreation. (4 cr; A-F or Aud. Prereq-5551 or 5401 or #) Legal issues related to recreation, park, and sport programs/facilities with public/private sectors.

REc 5900. Special Topics: Contemporary Issues in Leisure Services. (1-12 cr [max 12 cr]; Stdnt Opt) Contemporary issues emphasizing administrative and supervisory functions for recreation and allied professionals; individual offerings, to be determined by faculty, focus on special issues and professional groups.

REc 5981. Research Methodology in Kinesiology, Recreation, and Sport. (3 cr; A-F or Aud. Prereq-Kin or rec or grad student or #) Defines/reviews various types of research in exercise and sport science, physical education, and recreation studies. Qualitative research, field studies, and introspective research strategies as alternatives to traditional scientific paradigm.

REc 5992. Readings: Recreation. (1-5 cr [max 9 cr]; Stdnt Opt. Prereq-REC major, #) Independent study under tutorial guidance by faculty member on particular topic(s) not covered in regular coursework.

REc 5995. Problems in Recreation, Park, and Leisure Studies. (1-12 cr [max 30 cr]; Stdnt Opt. Prereq-[MED or grad student]. #) Independent study of leisure service programs, systems, facilities, or policies. Focuses on conduct of recreation programs. Scholarly projects (e.g., library or field research, demonstration projects.

REc 8128. Doctoral Sport Management Seminar. (3 cr; A-F only. Prereq-8128. Prereq-PHD student, #) Analysis of current literature, theoretical constructs, research methodology, and design relative to sport management. Focuses on student-selected topics, research problems.

REc 8310. Seminar: Leisure Services. (3 cr; A-F or Aud. Prereq-Rec MED or grad student or #) Critical study and special problems in recreation, park, and leisure services and in therapeutic recreation.

REc 8320. Seminar: Theoretical Perspectives in Leisure Behavior. (3 cr; A-F for Aud. Prereq-5101 or #) Major theoretical paradigms and empirical findings, where appropriate, from leisure studies in particular and social sciences in general.

REc 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent) A-F or Aud. Prereq-Med student, adviser and DGS consent

REc 8590. Seminar: Administrative Problems in Leisure Services and Therapeutic Recreation. (3 cr; A-F or Aud. Prereq-Rec MED or grad student or #) Administrative and management issues and problems in leisure services and therapeutic recreation.

REc 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))

REc 8980. Graduate Research Seminar in Recreation, Park, and Leisure Studies. (1-3 cr [max 3 cr]; S-N or Aud. Prereq-5081, EPsy 5261 or #) Analyzing, designing, and reporting on research problems in leisure studies.

REc 8985. Research Problems in Recreation, Park, and Leisure Studies. (1-4 cr [max 16 cr]; S-N or Aud. Prereq-#) Individual scholarly research.

Rehabilitation Science (RSC)

Department of Physical Medicine and Rehabilitation

Medical School

RSC 5155. Advanced Biomechanics I: Kinematics. (3 cr; A-F or Aud. Prereq-#) How to describe/move movement. Basic applied biomechanics, pathokinesiology, and rehabilitation literature. Lecture, lab, seminar discussion. Meets with RSC 8135.

RSC 5294. Independent Study in Rehabilitation Science. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq-Rehabilitation science student or program approval) Independent exploration into topics related to rehabilitation science.

RSC 5814. Age, Exercise, and Rehabilitation. (2 cr; Stdnt Opt. Prereq-Rehabilitation science student or program permission) Overview of normal physiological responses to exercise in the elderly. Comparison of exercise-induced responses of physiological systems throughout aging process. Focuses on importance of exercise from rehabilitation perspective. Offered Fall semesters of even-numbered years.

RSC 5841. Rehabilitation Science Instrumentation and Methodology. (4 cr; A-F or Aud. Prereq-[PHYS 5051, Phys 1052] or equiv., #) [rehabilitation science student or program permission] Theory/application of kinesiology EMG and other common instruments used to measure human motion.

RSC 8100. Rehabilitation Science Seminar. (1 cr [max 6 cr]; A-F or Aud. Prereq-Rehabilitation science student or program permission) Critically reading/discussing rehabilitation science literature. Identifying important researchable questions, methods to answer them. Speaking/writing persuasively on scientific topics.

RSC 8130. Current Literature Seminar. (1 cr; A-F or Aud. Prereq-Grad student in PT or rehabilitation science major or #) Critical review of literature to evaluate efficacy of selected physical therapy interventions.

RSC 8135. Advanced Kinesiology. (3 cr; A-F or Aud. Prereq-[Rehabilitation science student or program permission], #) How to describe/move movement. Basic applied biomechanics, pathokinesiology, and rehabilitation literature. Lecture, lab, seminar discussion.

RSC 8170. Special Topics in Rehabilitation Science. (1 cr [max 3 cr]; A-F or Aud. Prereq-[Rehabilitation science student or program permission], #) Research practicum on selected topic. Use of systematic literature search. Critical analysis of scientific literature. Specific measurement systems. Data collection/reduction methods of on-going or new research projects. Preparing/defending research reports.

RSC 8188. Teaching Practicum. (1-5 cr [max 5 cr]; A-F or Aud. Prereq-[Rehabilitation science student or program permission], #) Supervised experience in teaching/evaluation. Effective use of instructional materials in lecture/lab courses. Students create learning objectives for teaching unit(s), conduct a review of current literature on topic, prepare/deliver presentations, compose test questions. Offered by individual arrangement with faculty.

RSC 8192. Research Design in Rehabilitation Science. (4 cr; A-F or Aud. Prereq-#) Critical appraisal of current medical literature. Fundamentals of research design, data analysis, and medical writing.

RSC 8282. Problems in Human Movement. (4 cr; A-F or Aud. Prereq-[Rehabilitation science student or program permission], #) Fundamental principles of neurophysiology, neurology, motor control, and motor learning as a basis for therapeutic intervention in motor dysfunction.

RSC 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent) A-F or Aud. Prereq-Master’s student, adviser and DGS consent

RSC 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

RSC 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral, no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)
Religious Studies (RELS)

Department of Classical and Near Eastern Studies
College of Liberal Arts


RELS 5070. Topics in Religious Studies. (3 cr [max 18 cr]; Stdnt Opt. Prereq-#) Topics specified in Class Schedule and Course Guide.

RELS 5071. Greek and Hellenistic Religions. (3 cr; Stdnt Opt. Prereq-#) Greek religion from the Bronze Age to Hellenistic times. Sources include literature, art, and archaeology. Homer and Olympian deities; ritual performance; prayer and sacrifice; temple architecture; death and the afterlife; mystery cults; philosophical religion, Near Eastern salvation religions. Meets with 3071.


RELS 5076. Apostle Paul: Life, Letters, and Legacy. (3 cr; Stdnt Opt) How/what can we know about Paul. What his message was. What he was fighting. How he was later understood by friends/foes.


Course Descriptions

RUSS 5409. 19th-Century Russian Novel. (3 cr; Stdnt Opt. = RUSS 5409)
The Russian realistic novel from origin to decline; social, political, and intellectual circumstances that led to its emergence as the dominant genre of the “age of realism” in Russia.

RUSS 5411. Dostoevsky in Translation. (3 cr; Stdnt Opt. = RUSS 5411)
Novels, stories, and other writings of Fyodor Dostoevsky.

RUSS 5421. Literature: Middle Ages to Dostoevsky in Translation. (3 cr; Stdnt Opt. = RUSS 5421)
Russian literature from about 1000 A.D. to mid-19th century; emphasizing writers of the first half of the 19th century.

RUSS 5422. Literature: Tolstoy to the Present in Translation. (3 cr; Stdnt Opt. = RUSS 5422)
Survey of Russian literature from mid-19th century to the present: realism, modernism, feminism and other trends.

RUSS 5601. Methods of Translating Fiction From Russian to English. (3 cr; Stdnt Opt. = RUSS 5601. Prereq—3102 or equiv)
Learning to appreciate various literary styles through experience of translation.

RUSS 5900. Topics in Russian Language, Literature, and Culture. (1-4 cr [max 3 cr]; Stdnt Opt. = RUSS 5900. Prereq—1102 for language topics)
Variable topics in Russian language, literature, and culture.

RUSS 5993. Directed Studies. (1-4 cr [max 16 cr]; Stdnt Opt. = RUSS 5993. Prereq—#, %, @)
Guided individual study.

Sanskrit (SKT)

Department of Classical and Near Eastern Studies

College of Liberal Arts

SKT 5001. Beginning Sanskrit. (4 cr; Stdnt Opt)
Introduction to the classical language of ancient India.

SKT 5002. Beginning Sanskrit. (4 cr; Stdnt Opt. Prereq—5001 or equiv)
Introduction to the classical language of ancient India.

SKT 5201. Intermediate Sanskrit. (3 cr; Stdnt Opt. Prereq—5002 or equiv)
Readings in Sanskrit literature.

SKT 5202. Intermediate Sanskrit. (3 cr; Stdnt Opt)
Readings in Sanskrit literature.

SKT 5710. Topics: Language and Literature. (3 cr, Stdnt Opt)
Selected reading and/or study of linguistic problems in Sanskrit.

SKT 5992. Directed Readings. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq—#, %, @)
Guided individual reading or study.

SKT 6993. Directed Studies. (1-12 cr [max 50 cr]; Stdnt Opt. Prereq—#, %)
Guided individual reading or study.

Scottish (SCAN)

Department of German, Scandinavian, and Dutch

College of Liberal Arts

SCAN 5501. Scandinavian Mythology. (3 cr; Stdnt Opt)
Study of Scandinavian mythology based on primary sources represented by Saxo Grammaticus, Snorri Sturluson’s Edda and Ynglinga Saga, and the poetic Edda. Myths are analyzed using contemporary critical approaches. All readings in translation.

SCAN 5502. The Icelandic Saga. (3 cr; Stdnt Opt)
Study of the sagas written in 13th-century Iceland. Discussion includes cultural and historical information about medieval Iceland and analysis of a selection of saga texts using contemporary critical approaches. All readings in translation.

SCAN 5613. Contemporary Scandinavian Literature. (3 cr; Stdnt Opt)
An investigation of issues which emerged as extremely important after 1945 in Scandinavia, as articulated by writers and analyzed by researchers in social sciences. All readings in translation.

SCAN 5615. Ibsen and the Beginnings of Modern Drama. (3 cr; Stdnt Opt)
Close reading of Ibsen's modern tragedies. From A Doll's House (1879) to When We Dead Awaken (1899). Focus is on the dialectics between Ibsen and his society, and dramatic structure and staging conventions in the context of modern theater. Readings in English for nonmajors.

SCAN 5616. Strindberg and the Drama in Revolt and Change. (3 cr; Stdnt Opt)
Strindberg as the master of naturalistic drama and the precursor of modernity in European and American theater. Close reading of plays with emphasis on dramatic structure and staging conventions in the context of modern theater. All readings in English for nonmajors.

SCAN 5670. Topics in Scandinavian Studies. (3 cr [max 9 cr]; Stdnt Opt)
Topic may focus on a specific author, group of authors, genre, period, or subject matter. Topics specified in Class Schedule. Readings in English for nonmajors. May meet with 3670.

SCAN 5701. Old Norse Language and Literature. (3 cr; Stdnt Opt)
Acquisition of a reading knowledge of Old Norse; linguistic, philological and literary study of Old Norse language and literature.

SCAN 5710. Topics in Old Norse Literature. (3 cr [max 9 cr]; Stdnt Opt. Prereq—5701 or equiv)
Topic may focus on Old Norse prose or poetry. Primary texts read in Old Norse. Critical literature about texts, medieval Icelandic culture in English. Topics specified in Class Schedule.

SCAN 5993. Directed Studies. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq—#, %, @)
Guided individual reading and study.

SCAN 8500. Seminar in Medieval Scandinavian Languages and Literature. (3 cr [max 9 cr]; Stdnt Opt)
Sample topics: [Volsunga Saga], studies in Snorri Sturluson's [Edda], dialogue analysis in the Icelandic saga.

SCAN 8994. Directed Research. (1-3 cr [max 12 cr]; Stdnt Opt. Prereq—#; may be taken as tutorial with #, %)

Scientific Computation (SCIC)

Institute of Technology

SCIC 8001. Parallel High-Performance Computing. (3 cr; Stdnt Opt. Prereq—Undergrad degree in field using sci comp or #)
Interdisciplinary overview of computer science aspects of scientific computation, both hardware and techniques. Parallel computing, architectures, programming, and algorithms; restructuring compilers and data structures.

SCIC 8011. Scientific Visualization. (3 cr; Stdnt Opt. Prereq—Undergrad degree in field using sci comp or #)
Basic issues in scientific visualization, visualization software, graphics, representation of scientific data, modeling, hardware for visualization, user interface techniques, output, commonly used algorithms and techniques for visualization, animation, information visualization, higher dimensional data, case studies, and examples of successful visualizations.

SCIC 8021. Advanced Numerical Methods. (3 cr; Stdnt Opt. Prereq—Undergrad degree in field using sci comp or #)

SCIC 8031. Modeling, Optimization, and Statistics. (3 cr; Stdnt Opt. Prereq—Undergrad degree in field using sci comp or IT grad student or #)
Interdisciplinary overview of mathematical modeling, optimization, and statistics techniques for scientific computation. Nonlinear equations and nonlinear optimization, statistics, control theory, modeling, and simulation.

SCIC 8041. Computational Aspects of Finite Element Methods. (3 cr; Stdnt Opt. Prereq—Undergrad degree in field using sci comp or IT grad student or #)
Fundamental concepts and techniques of finite element analysis. Variational equations and Galerkin's method; weak formulations for problems with nonsymmetric differential operators; Petrov-Galerkin methods; examples from solid and fluid mechanics; properties of standard finite element families, implementation.

SCIC 8095. Problems in Scientific Computation. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq—Undergrad degree in field using sci comp or #)
Selected topics in interdisciplinary aspects of scientific computing.

SCIC 8199. Supercomputer Research Seminar. (1 cr [max 3 cr]; Stdnt Opt. Prereq—Undergrad degree in field using sci comp or #)
Series of seminars by distinguished lecturers.

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

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

SCIC 8594. Scientific Computation Directed Research. (1-4 cr [max 9 cr]; Stdnt Opt. Prereq—Undergrad degree in field using sci comp or #)
For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

SW 5319. Adolescents: Norms, Culture, and Health. (2 cr; Stndt Opt)

Relationships among familial, social, societal, political, economic, environmental, psychosocial, and cultural determinants of adolescent behavior that affect health; major public health issues and problems of adolescence.

SW 5481. Child Abuse Prevention I: Research and Theory. (3 cr; Stndt Opt. Prereq-Bachelor’s degree or #)

Foundation of research/theory for level I child abuse prevention studies certificate.


Design and evaluation of policies and programs of interventions to prevent child abuse. This is the second course in the Level I Child Abuse Certificate program.

SW 5483. Child Abuse Prevention III: Skill Building I—Cultural and Legal Issues. (3 cr; Stndt Opt. Prereq-Bachelor’s degree or #)

Risk factors, protective factors, resilience in cultural settings. Identifying/designing strategies appropriate to cultural characteristics. First course for level II child abuse prevention certification.

SW 5484. Child Abuse Prevention IV: Skill Building II—Risk Assessment and Interviewing. (3 cr; Stndt Opt. Prereq-Bachelor’s degree or #)


SW 5512. Developing and Managing an Agency Budget. (1 cr; Stndt Opt. Prereq-MSW student or #)

Preparing/monitoring agency budgets, interpreting/utilizing financial reports. Information systems. Fiduciary responsibilities geared to ethics, organizational mission, and positive client outcomes.

SW 5513. Grant Writing and Fund-raising. (1 cr; Stndt Opt. Prereq-MSW student or #)

Procuring/managing financial resources ethically in human services settings. Designing a strategic fund-raising plan. Researching sources of support, developing relationships with grant makers, preparing/submitting grant requests.

SW 5514. Strategic Risk Management in Agencies. (1 cr; Stndt Opt. Prereq-MSW student or #)

Strategies to minimize risk to agency, its assets, and its resources. Relationship between mission, risk management, and board role. Agency internal systems, controls, and prevention strategies. Liability/insurance. Agency exposure to risk, including volunteer program management.

SW 5519. Mediation and Conflict Resolution. (3 cr; Stndt Opt. Prereq-5519)

Develop mediator skills for making informed decisions regarding the appropriateness of mediation for conflicts that frequently confront social worker practitioners such as divorce, neighborhood disputes, conflicts between parents and adolescents, conflicts between spouses, and conflicts between crime victims and offenders.

SW 5525. Global Perspectives on Social Welfare, Peace, and Justice. (3 cr; Stndt Opt. Prereq-5520)

Role of international social welfare in meeting basic human needs and promoting human rights, social justice, and peace. Theories, models, and social policies in different economic and political systems with emphasis on Third World nations.

SW 5705. Violence in Families. (3 cr; Stndt Opt. Prereq: 5707; grad student or adult special or #)

Prevention/intervention with perpetrators, survivors, and social institutions. Perpetration, effects on victims, social responses to family violence. Child abuse/ neglect, domestic abuse of women/vulnerable adults. Roles of gender, race, culture, age, physical ability, and sexual orientation.

SW 5706. Issues and Interventions in Child Sexual Abuse. (2 cr; Stndt Opt. Prereq-Grad student or adult special or #)


SW 5707. Interventions with Batterers Women and Their Families. (2 cr; Stndt Opt. Prereq-5705; grad or non-degree seeking student or #)

Current theories, research, and evaluation of interventions with battered women and their families. Focus on practice, e.g., direct work with social institutions, victim-survivors, and assailants and their families.

SW 5708. Substance Abuse and Social Work. (3 cr; Stndt Opt. Prereq-Grad or non-degree seeking student or #)

Assessment and intervention in situations involving substance abuse with special emphasis on cross cultural practices. Relationships of substance abuse to areas such as child welfare, mental illness, and violence within families are examined.

SW 5709. Applied Psychopharmacology for Human Service Professionals. (2 cr; A-F or Aud)

Categories of psychoactive drugs. Medications to treat mental disorders. Legal drugs such as alcohol, nicotine, cocaine, and marijuana. What is occurring physiologically when someone takes a psychoactive drug.

SW 5711. Co-Occurring Addictive and Mental Health Disorders. (2 cr; A-F or Aud. Prereq-Cannot be taken for cr by MSW students)

Mentally ill, chemically abusive, or dependent clients. Intervention, advocacy, education, and support for client and those who are part of his or her environment. Social, environmental, and multicultural factors. Meets partial state requirements for becoming licensed as an alcohol/drug counselor.

SW 5810. Seminar: Special Topics. (1-4 cr [max 10 cr]; Stndt Opt)

Topics specified in Class Schedule.

SW 5811. Social Work Ethics. (2 cr; Stndt Opt. Prereq-5801; grad student or non-degree seeking student or #)

Acquire knowledge base and develop skills required to identify ethical issues, resolve ethical dilemmas, and make ethical decisions within the context of the professional practice of social work. Values base and ethical standards of the profession and ethical decision-making models examined in-depth.

SW 5813. Child Welfare and the Law. (2 cr; Stndt Opt. Prereq-2nd yr MSW or advanced standing or #)

Social work practice in juvenile court. Child abuse/neglect reporting laws, risk assessment, reasonable cause judgment, case custody proceedings, permanency planning, termination of parental rights, child testimony, social worker testimony, adoption laws.

SW 5991. Independent Study in Social Work. (1-4 cr [max 4 cr]; Stndt Opt)

Independent study in areas of special interest to students and faculty.

SW 8010. Seminar: Field Practicum I. (1-8 cr [max 8 cr]; S-N or Aud. Prereq-8201)

Integrates classroom learning with direct experience of a social work field internship. Professional support/learning groups focus on student-and facilitator-identified issues. Students discuss professional/personal biases, ethical dilemmas, and supervisory issues. Cross-cultural understanding, implications of cross-cultural practice.

SW 8020. Field Practicum II. (1-6 cr [max 6 cr]; S-N or Aud. Prereq-8010)

Integrates classroom learning within a concentration with the direct experience of an internship. Students expand competency in cross-cultural practice.

SW 8030. Advanced Standing Social Work Practicum. (1-8 cr [max 8 cr]; S-N or Aud. Prereq-Adv standing)

Integrates classroom learning with direct experience of a social work field internship. Professional support/learning groups discuss issues raised in field placement. Groups focus on professional/personal biases, ethical dilemmas, supervisory issues, cross-cultural issues, and implications of students’ privilege/power in relation to client systems.

SW 8041. Specialized Field Placement. (1-4 cr; S-N or Aud. Prereq-8030, MSW adv-standing)

Internship within an agency or a specific population. Applied practical experience in specialized concentration area of practice.

SW 8051. Psychopathology and Social Work Practice. (3 cr; A-F only. Prereq-All foundation courses for full program or advanced standing or #)

Psychopathology from an ecosystemic perspective. Biopsychosocial influences on incidence, course, treatment of common mental disorders diagnosed from infancy through adulthood. Differential effects on populations at risk. Diagnostic skills, alternative intervention strategies, social work roles.

SW 8101. Social Policy and Delivery Systems for Child Welfare and Family Services. (3 cr; A-F only. Prereq-[8211, advanced standing or #)

Federal, state, and local policies related to contemporary child welfare system and system of social services to families. Current debates about policies, financing, and structure and organization of service delivery; process of influencing policy changes in children and family services.

SW 8103. Health and Mental Health Policy. (3 cr; A-F only. Prereq-[8211, advanced standing or #)

Factors affecting health and mental health status of variety of populations. Policies on organizational, local, state, and federal levels affecting health status; financing; and delivery of health and mental health services. Ethical issues embedded in policies, issues in need of policy development.

SW 8105. Economic Security of Disadvantaged Populations. (3 cr; A-F only. Prereq-[8211, advanced standing or #)

Impact of social policy and macroeconomic trends on economic security of disadvantaged populations. Focuses on antipoverty/welfare programs in the United States, although international perspective is used as well.

SW 8109. Special Topics in Social Policy. (1-9 cr [max 9 cr]; Stndt Opt)

SW 8201. Social Work Methods: Practice With Individuals and Systems. (3 cr; A-F or Aud. Prereq-MSW student)

Introduction to theories, knowledge, values, skills in initial phases of social work practice. Practice phases: assessment, goal setting, intervention, treatment. Developing relationships, interviewing skills in practice with diverse populations. Ecological problem-solving framework for empowerment orientation.


SW 8301. Advanced Child Welfare Practice. (3 cr; A-F only. Prereq—All foundation courses for full program or advanced standing or #) Child welfare policies. Use of multisystemic interventions. Impact of poverty, race, ethnicity, and gender on policy/practice. Developments in family preservation, relative placement, foster care, adoptions, and Indian child welfare. Role of social work in child protection services.

SW 8302. Advanced Mental Health Practice With Adults. (3 cr; A-F only. Prereq—8051) or SW 8051 or all foundation courses for full program or advanced standing or #) Theory/practice of cognitive, cognitive-behavioral, and psychodynamic social work treatment in community-clinical settings. Criteria for differential applications, including brief treatment and crisis-oriented approaches. Cultural/social aspects of mental health, issues important to populations at risk.

SW 8304. Advanced Practice With Children and Adolescents. (3 cr; A-F only. Prereq—All foundation courses for full program or advanced standing or #) Practice with children, adolescents, and their families. Ecosystemic model that undergirds assessment/intervention. Mastery of developmental tasks and enhanced social functioning as protective mechanisms. Biopsychosocial focus. Integrates familial/community contributions, especially in face of loss or disruption.

SW 8312. Advanced Social Work Practice With Groups. (3 cr; Stdt Opt. Prereq—8201, 8202, adv standing) or #) Advanced clinical social work practice with groups. How to differentiate among available models of group work and select an appropriate model based on needs of client/population and on context in which they are served.

SW 8313. Professional Practice in Interdisciplinary Teams and Collaboratives. (3 cr; Stdt Opt. Prereq—Foundation curriculum, [advanced standing or grad student in health and human service or in educational professional program]) or #) Principles of interdisciplinary/interorganizational collaboration in human services, health, and educational settings. Team building, decision-making models, engaging value differences, managing conflict on team, role/status disparities, relational communications. Emerging approaches to interorganizational collaboration.

SW 8314. Social Work Interventions With Families. (3 cr; Stdt Opt. SW 5318. Prereq—8313, adv standing or 8202 or #) Interventions based on systems perspective of family as center of focus, in environmental context. Policy/practice principles of working with families in their home, community environment.

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

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

SW 8501. Planning, Marketing, and Program Development. (3 cr; A-F only. Prereq—[Foundation curriculum, advanced standing] or #) Principles, applied practice of management concepts in human service settings. Management theories, organizational planning, program development, marketing/communications. Management practice that is client/community-focused, results-oriented, and seeks to achieve positive social change.


SW 8505. Advanced Community Organization and Advocacy. (3 cr; A-F only. Prereq—[Foundation curriculum, advanced standing] or #) Methods for stimulating/supporting joint action for constructive change to fulfill community needs. Principles of working with local organizations. Social action to accomplish specific changes.

SW 8507. Community Practice Seminar. (1 cr; Stdt Opt. Prereq—Foundation curriculum, advanced standing or #) Links content from human services management and from community organization and advocacy. Integrating framework that draws upon knowledge/skill used in agency/organizational management and in community organization/change.

SW 8519. Mediation and Conflict Resolution for Social Workers. (3 cr; Stdt Opt. Prereq—1519; MSW student or grad conflict mgmt minor or #) Advanced mediator skills for social workers; appropriateness of mediation for conflicts that frequently confront social work practitioners, such as divorce, neighborhood disputes, and conflicts between parents and adolescents, between spouses, and between crime victims and offenders.

SW 8525. Global Perspectives on Social Welfare, Peace, and Justice. (3 cr; A-F only. Prereq—[8211, advanced standing] or #) Role of international social welfare in meeting basic human needs and promoting human rights, social justice, and peace. Theories, models, and strategies of social welfare in different economic/political systems. Emphasizes Third World nations. Skills for social workers and other professionals in the helping professions.

SW 8601. Social Work Research Methods. (3 cr; A-F or Aud. Prereq—MSW student or #) Introduction to quantitative and qualitative social work research skills fundamental to development and critical use of information relevant to social work practice decision-making, program development, policy levels. Social research ethics, development of research questions, sampling, measurement, research design, data collection and analysis.

SW 8602. Direct Practice Evaluation. (2 cr; A-F only. Prereq—8601 or equiv or #) Students design evaluations that incorporate current evaluation methods and principles derived from research, theory, practice wisdom, their own experience. Evaluation methods include single/system designs, client-focused evaluations, practitioner-focused evaluations, and use of event analyses, standardized instruments, self-constructed instruments.

SW 8603. Program Evaluation. (2 cr; A-F only. Prereq—8601 or equiv or #) Conceptual, methodological, political, psychological, and administrative factors related to conduct and consequences of social work program evaluation. Social programs as cause and effect; models, types, and strategies of evaluation; appraisal of selected research literature.

SW 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

SW 8693. Directed Study. (1-6 cr [max 6 cr]; Stdt Opt. Prereq—#) Independent study under tutorial guidance.

SW 8694. Directed Research. (1-6 cr [max 6 cr]; Stdt Opt. Prereq—#) Individual or small group research inquiry translating introductory course content into research design and study. Projects may be conducted in conjunction with field learning experiences or other coursework.

SW 8702. Advanced Social Work Practice With Diverse Populations. (2 cr; A-F only. Prereq—All foundation courses for full program or advanced standing or #) Models of ethnic-sensitive social work practice applied in human service management or direct practice settings. Critical examination of human needs and organizational responses to racially and culturally competent practice with populations at risk.

SW 8801. Social Work Ethics and Legal Issues. (3 cr; Stdt Opt. Prereq—5811; foundation courses or adv standing or #) Develops knowledge base and skills required to identify and understand legal, ethical issues, resolve ethical dilemmas, and make ethical decisions within social work. Values base, ethical standards, ethical decision-making models, and laws and legal procedures related to social work. Legal aspects of child welfare practice.


SW 8851. Social Welfare History and Historical Research Methods. (3 cr; A-F only. Prereq—Completed research courses for soc work PhD student or [equiv research methods courses, grad student]) Methods of historical research in, and survey of, history/evolution of social welfare/work, using primary/secondary source materials.

SW 8855. Social Policy Formulation and Analysis. (3 cr; A-F only. Prereq—Soc wk PhD student or #) Application of theoretical perspectives, conceptual frameworks, and research methodologies to analysis of social issues and analysis/formulation of social welfare policy.
SW 8861. Theory and Model Development in Social Work. (3 cr; A-F only. Prereq: Soc wk PhD student or #) Intervention research methods, contemporary social work practice models. Direct intervention in systems, from individual to community. Theoretical, value, empirical foundations of practice models for intervention research.

SW 8863. Social Work Teaching Methods and Educational Issues. (3 cr; A-F only. Prereq: Soc wk PhD student or 2nd-yr MSW student or #) Teaching methods, skills, strategies, and issues related to Teaching, scholarship, and service roles in social work education. Issues, including curriculum development. Teaching experience in a social work class.

SW 8871. Social Work Research Seminar I. (3 cr; A-F only. Prereq: Soc wk PhD student or #) Concepts/methods of social research. Issues in social science, social work research, and knowledge development. Development of research questions. Sampling, measurement, data collection in qualitative/quantitative research.

SW 8872. Social Work Research Seminar II. (3 cr; A-F only. Prereq: SW 8871 or #) Methods/design of quasi-experiments, surveys, descriptive research. Grounded theory. Analysis of quantitative/qualitative data.

SW 8875. Research Practicum. (2 cr [max 6 cr]; S-N or Aud. Prereq: Soc wk PhD student or #) Experience in conduct of research, following completion of 8871 and 8872. Students work under faculty direction.

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

Sociology (SOC) Department of Sociology College of Liberal Arts

SOC 5090. Topics in Sociology. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq: Undergrad soc majors/minors must register A-F) Topics specified in [Class Schedule].

SOC 5455. Sociology of Education. (3 cr; Stdnt Opt. EDPA 5041. Prereq: 1001 or equiv or #; soc majors/minors must register A-F) Structures/processes within educational institutions. Links between educational organizations and their social contexts, particularly as these relate to educational change.


SOC 8001. Sociology as a Profession. (1 cr [max 2 cr]; S-N or Aud. Prereq: Grad soc major) Sample topics: role of sociology in society, professional organizations, employment opportunities, professional ethics, and writing for publication or grant proposals.

SOC 8011. Sociology of Higher Education: Theory and Practice. (3 cr; Stdnt Opt. Prereq: Grad soc major or #) Social/political context of teaching. Ethical issues, multiculturalism, academic freedom. Teaching skills (e.g., lecturing, leading discussions). Active learning. Evaluating effectiveness of teaching. Opportunity to develop a syllabus or teaching plan.

SOC 8090. Topics in Sociology. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq: #) Topics specified in [Class Schedule].

SOC 8091. Independent Study. (1-5 cr [max 20 cr]; Stdnt Opt) Independent study of an established 8xxx course.

SOC 8093. Directed Study. (1-4 cr [max 20 cr]; Stdnt Opt. Prereq: Grad soc major or #) Directed study in sociology.

SOC 8094. Directed Research. (1-4 cr [max 20 cr]; Stdnt Opt) May be used to fulfill sociology graduate requirement for advanced methodological training.

SOC 8101. Sociology of Law. (3 cr; Stdnt Opt) Sociological analysis of law and society. In-depth review of research on why people obey the law, of social forces involved in creation of law (both civil and criminal), procedures of enforcement, and impact of law on social change.

SOC 8111. Criminology. (3 cr; Stdnt Opt) Overview of theoretical developments and empirical research. Underlying assumptions, empirical generalizations, and current controversies in criminological research.

SOC 8144. Law, Society, and the Mental Health System. (3 cr; A-F or Aud. Prereq: Grad student, 4148 or #) Intensive survey of psychopathology. Reference to criminal behavior, criminal justice system.

SOC 8190. Topics in Law, Crime, and Deviance. (3 cr [max 9 cr]; Stdnt Opt. Prereq: Grad student in sociology or #) Advanced topics in law, crime, and deviance. Social underpinnings of legal/illegal behavior and of legal systems.

SOC 8201. Social Stratification and Mobility. (3 cr; Stdnt Opt. Prereq: 5811 or equiv or #) Form and content of hierarchical arrangements. Relationship of hierarchy to social order and individual behavior. Structures of social stratification. Status attainment. Mobility. Inequality and economic development, social development, and technological change. Economic status in relation to social status, including race, gender.

SOC 8211. Race Relations Theory. (3 cr; Stdnt Opt) Major theoretical debates. Classic and contemporary theoretical approaches to studying U.S. race relations; contemporary and historical experiences of specific racial and ethnic groups.

SOC 8221. Sociology of Gender. (3 cr; Stdnt Opt. WOST 8202) Organization, culture, and dynamics of gender relations and gendered social structures. Sample topics: gender, race, and class inequalities in the workplace; women's movement; social welfare and politics of gender inequality; theoretical and methodological debates in gender studies; sexuality; science; sociology of emotions.

SOC 8290. Topics in Social Stratification. (3 cr [max 12 cr]; Stdnt Opt) Comparative perspectives on racial inequality; race, class, and gender; quantitative research on gender stratification; stratification in post-communist societies; institutional change and stratification systems; industrialization and stratification. Topics specified in [Class Schedule].

SOC 8311. Political Sociology. (3 cr; Stdnt Opt) Social dimensions of political behavior and social origins of different forms of the state. How various theoretical traditions—Marxist, Weberian, and feminist—address key issues in political sociology, including citizenship, revolution, state formation, origins of democracy, welfare state, and fascism.

SOC 8333. FTE: Master’s. (1 cr; No grade. Prereq: Master’s student, adviser and DGS consent)

SOC 8360. Topics in Political Sociology. (3 cr [max 12 cr]; Stdnt Opt. Prereq: Soc grad student or #) Topics with common focus on social underpinnings of political behavior/change. Sample topics: democracy and development, international legal and political systems, power and protest in advanced capitalist states, xenophobia and international migration, and civil society and democracy. Topics specified in Class Schedule.


SOC 8421. Work and Occupations. (3 cr; Stdnt Opt) Sociological analysis of work, occupations, and labor markets, including contemporary theory and research. Course emphasis varies with instructor.

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

SOC 8490. Advanced Topics in Social Organization. (3 cr [max 12 cr]; Stdnt Opt. Prereq: #) Content varies with instructor. Sample topics: gender and organizations, interorganizational relations, comparative study of organizations, nonprofit organizations, consumer behavior, industry and technology, social networks, conflict, coercion, and social exchange. Topics specified in [Class Schedule].
SOC 8501. Sociology of the Family. (3 cr; Stdt Opt)
Theoretical and empirical works from contemporary family sociology. Content varies with instructor. Sample topics: definitions of the family, family roles, family interactions, marriage and divorce, childcare, parenthood, and cultural variations in families.

SOC 8540. Topics in Family Sociology. (3 cr [max 12 cr]; Stdt Opt)
Families and mental health; families, work, and the labor market; historical/comparative research on the family. Topics specified in [Class Schedule].

SOC 8551. Social Structure and the Life Course. (3 cr; Stdt Opt. Prereq-Soc grad major or #)
Central concepts/premises of life course analysis as applied to intersocial (comparative); intrasocial (empirical research on the family, social groups/categories (e.g., gender, race, class, lifestyle)).

SOC 8590. Advanced Topics in Sociological Theory. (3 cr [max 12 cr]; Stdt Opt)
Sample topics: theories of conflict; theories of purposive action, Marxism, and structure-agency debate.

SOC 8601. Sociological Research Methods. (4 cr; A-F or Aud. Prereq-Grad soc major or #)
Multiple objectives of social research and how they inform research design. Conceptualization and measurement of complex concepts. Broad issues in research design and qualitative and quantitative approaches to data collection and management.

SOC 8811. Advanced Social Statistics. (4 cr; A-F or Aud. Prereq-S 5811 or equiv, grad soc major or #)
Statistical methods for analyzing social data. Sample topics: advanced multiple regression, logistic regression, dependent variable analysis, analysis of variance and covariance, log-linear models, structural equations, and event history analysis. Applications to datasets using computers.

SOC 8821. Research Practicum. (3 cr; Stdt Opt. Prereq-Sociology grad student or #)
Writing a scholarly paper. Framing the question within the literature. Selecting appropriate data methods. Conducting initial analysis. Writing a preliminary draft.

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

SOC 8890. Advanced Topics in Research Methods. (4 cr [max 12 cr]; Stdt Opt. Prereq-Grad soc major or #)
Advanced quantitative methods (e.g., multilevel models) and historical/comparative, field, and survey research. Topics specified in [Class Schedule].

Software Engineering (SENG)
Department of Computer Science
Institute of Technology

SENG 5115. Graphical User Interface Design, Evaluation, and Implementation. (3 cr; A-F or Aud. Prereq-Grad SEng major)
Design and evaluation of interactive applications. Interactions, user-oriented tasks, and interaction design. Guidelines for graphical design, interface evaluation techniques, current interface trends, including web interfaces and information visualization. Group projects that include designing, prototyping, and implementing an interface.

SENG 5116. Graphical User Interface Toolkits. (2-3 cr [max 3 cr]; A-F or Aud. Prereq-Grad SEng major)
Toolkit-centered introduction to GUI development and implementation. Students learn to use a GUI toolkit to implement a graphical interface. Introduction to advanced techniques, including constraint-based data management, 3D visualization tools, and toolkit structure and design.

SENG 5131. Network Programming: Distributed Objects. (3 cr [max 23 cr]; A-F or Aud. Prereq-Grad SEng major)
Java programming, concurrent programming, workflow, distributed database, security, collaborative computing, object-oriented architecture/design, network publishing, messaging architecture, distributed object computing, and intranet.

SENG 5139. Topics in Software Engineering. (2-3 cr [max 6 cr]; A-F or Aud. Prereq-Grad SEng major)
Topics specified in Class Schedule.

SENG 5511. Artificial Intelligence. (2-3 cr [max 3 cr]; A-F or Aud. Prereq-Grad SEng major)

SENG 5551. Introduction to Intelligent Robotic Systems. (3 cr; A-F or Aud. Prereq-Grad SEng major)
Transformations, kinematics and inverse kinematics, dynamics, and control. Sensing (robot vision, force control, tactile sensing), applications of sensor-based robot control, robot programming, mobile robotics, and micro-robotics.

SENG 5707. The Principles of Database Systems. (3 cr; A-F or Aud. Prereq-Grad SEng major)
Fundamental concepts; conceptual data organization; database models; data manipulation languages; database design; security and integrity; performance evaluation; query optimization; distributed database systems.

SENG 5708. Advanced Database Management. (2-3 cr [max 3 cr]; A-F or Aud. Prereq-Grad SEng major)

SENG 5801. Software Engineering I: Software Life Cycle, Requirements Specification, and Design. (5 cr; A-F or Aud. Prereq-Grad SEng major)
Developing cost-effective software. Software engineering life cycles, problem specification/analysis, system design, techniques, documentation. Lectures, project.

SENG 5802. Software Engineering II: Advanced Software Engineering. (3 cr; A-F or Aud. Prereq-Grad SEng major)
Topics in software engineering and in object-oriented software development. Software design/implementation using UML, object-oriented techniques, object-oriented languages such as Java. Lectures, project.

SENG 5811. Software Testing and Verification. (2 cr; A-F or Aud. Prereq-5801, grad SEng major)
Theory and practical aspects of testing, debugging, and system verification. Analyzing a requirements document for test conditions. Writing a test plan. Designing, creating, and executing test cases. Recording defects. Writing a test report.

SENG 5831. Software Development for Real-Time Systems. (2-3 cr [max 3 cr]; A-F or Aud. Prereq-Grad SEng major)
Analysis, design, verification, and validation of real-time systems. Periodic, aperiodic, and sporadic processes, scheduling theory. Pragmatic issues.

SENG 5841. Model-based Development. (3 cr; A-F or Aud. Prereq-Grad SEng major)
Formal specification of software artifacts. Applicability of formal specifications. Methods such as Z, SCR, and Statecharts. Formal analysis. Theorem proving. Reachability analysis. Model checking. Tools such as PVS, Statemate, SPIN, and SMV.

SENG 5851. Software Project Management. (3 cr; A-F or Aud. Prereq-Grad SEng major)
Concepts used to manage software projects. Project management cycle: initiation, planning/controlling, status reporting, review, post-project analysis. Leadership and motivation strategies. Lecture, discussion, individual/team presentations/projects.
Course Descriptions

SENG 5852. Quality Assurance and Process Improvement. (3 cr; A-F or Aud. Prereq–Grad SEng major)
Theory and application of capability maturity model: process assessment, modeling, and improvement techniques. Life cycle issues related to development and maintenance of quality, safety, and security assurance; project management; and automated support environments. Group projects and case studies.

SENG 5861. Introduction to Software Architecture. (3 cr; A-F or Aud. Prereq–2nd year, MSSE grad student)
Software/systems architecture. Representation/design, how they fit into software engineering process. Description of architectures, including representation and quality attributes.

SENG 5899. Software Engineering Seminar. (1 cr [max 2 cr]; Stdnt Opt. Prereq–Grad SEng major, #)
Software engineering trends. Talks by invited speakers, selected readings.

SENG 5900. Directed Study. (1-3 cr [max 3 cr]; Stdnt Opt)
Directed study/research in software engineering. Topics/segments decided in collaboration with instructor.

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

SENG 8494. Capstone Project (Plan B Project). (3 cr; S-N or Aud. Prereq–SENG-SEng major)
Students work in teams on software project using tools, techniques, and skills acquired during previous coursework. Each team works with a client to establish requirements, agree upon design, and achieve a successful acceptance test of resulting software system.

SENG 8891. Independent Project. (2-6 cr [max 12 cr]; Stdnt Opt)
Independent project arranged with faculty.

Soil, Water, and Climate (SOIL)

Department of Soil, Water, Climate

College of Food, Agricultural and Natural Resource Sciences

SOIL 5005. Lab and Field Techniques in Soil Science. (2 cr; A-F only. =SOIL 4005. Prereq–2125)
Field/lab experiences for analysis of soils/landscapes. Students describe soils along a hillslope sequence, take soil samples, and perform a suite of chemical, biological, and physical soil analyses. Lab analytical techniques, safety, quality control issues.

SOIL 5111. Practicum Internship in Precision Agriculture. (2-5 cr [max 5 cr]; S-N or Aud)
Practical experience in precision agriculture in industry/business. Content and extent of work at the internship site is jointly decided by the instructor, host business representative, and student’s principal adviser.

SOIL 5125. Soil Science for Teachers. (1 cr; Stdnt Opt. =SOIL 1125, SOIL 2125)
Basic physical, chemical, and biological properties of soil. Soil genesis classification and principles of soil fertility. WWW used for lab. Soil survey information used to make a land-use plan. Similar to 2125 with less emphasis on chemistry.

SOIL 5232. Vadose Zone Hydrology. (3 cr; Stdnt Opt. Prereq–[Math 1271 or equiv.; Phys 1042 or equiv])
Basic soil physical processes/processes governing transport of mass/energy in soils. Emphasizes water/solute transport through unsaturated root/vadose zones, their impact on subsurface hydrology and on water quality. Lectures, hands-on laboratory exercises, discussion of real world problems, problem solving.

SOIL 5311. Soil Chemistry and Mineralogy. (3 cr; Stdnt Opt. Prereq–[Chem 1022 or equiv., Phys 1102, grad or #])

SOIL 5480. Special Topics in Land and Atmospheric Science. (1-4 cr [max 6 cr]; Stdnt Opt. Prereq–Grad student)
Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule.

SOIL 5551. Soil Genesis and Landscape Relations. (3 cr; A-F or Aud. Prereq–2125 or #)
Basic soil morphology and soil profile descriptions; pedogenic processes and models of soil development; soil geomorphology, hydrology, and hillslope processes; digital spatial analysis; soil classification; soil surveys and land use; soil geography.

SOIL 5555. Wetland Soils. (3 cr; A-F or Aud. =ESPM 5555. Prereq–1125 or 2125 or equiv or #; 4411 recommended)
Morphology, chemistry, hydrology, formation of mineral/organic soils in wet environments. Soil morphological indicators of wet conditions, field techniques of identifying hydric soils for wetland delineations. Peatlands. Wetland benefits, preservation, regulation, mitigation. Field trips, lab, field hydric soil delineation project.

SOIL 5611. Soil Biology and Fertility. (3 cr; Stdnt Opt. Prereq–2125, Biol 1009 or equiv, Chem 1021 or equiv, Sr or grad; BioC 34xx, MiscB 3xxx recommended)

SOIL 5711. Forest Soils. (2 cr; Stdnt Opt. Prereq–1125 or 2125)
Factors affecting tree growth, estimation, modification, and management effects on site productivity; regeneration.

SOIL 8005. Supervised Classroom or Extension Teaching Experience. (2 cr; S-N or Aud. =AGRO 8005, BBE 8005,HORT 8005, PLPA 8005. Prereq–#)
Teaching experience in one of five departments: Biosystems and Agricultural Engineering; Agronomy and Plant Genetics; Horticultural Science; Soil, Water, and Climate; or Plant Pathology. Participation in discussions about effective teaching to strengthen skills and develop a personal teaching philosophy.

SOIL 8110. Colloquium in Soil Science. (1-5 cr [max 6 cr]; S-N or Aud)
Research or intellectual areas in soil science or climatology not covered in regular courses. Topics vary; contact department for current offerings.


SOIL 8128. Seminar in Soils. (1 cr [max 2 cr]; S-N or Aud)
Students present an open seminar on an advanced topic and attend seminars presented by other graduate students.

SOIL 8195. Research Problems in Soils. (1-5 cr [max 10 cr]; Stdnt Opt. Prereq–[Grad major in soil sci or related field, #])
Directed research on special topics of interest in soil science or climatology supervised by individual or small groups of faculty.

SOIL 8252. Advanced Soil Physics. (2 cr; Stdnt Opt. Prereq–[5232, differential equations] or #)

SOIL 8282. Modeling Water, Carbon, and Nitrogen Dynamics in the Soil-Plant-Air System. (3 cr; A-F or Aud)
Integrative/quantitative treatment of dynamics of water, carbon, and nitrogen in soil-plant-air continuum.

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

SOIL 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

SOIL 8510. Advanced Topics in Pedology. (2-4 cr [max 12 cr]; A-F or Aud. Prereq–5515)
Sample topics: soil-landscape relations, soil genesis, landscape evolution, land use and management, precision agriculture, digital terrain modeling, forest soils.

SOIL 8541. Aquatic and Soil Chemistry. (3 cr; A-F or Aud. Prereq–CE 8541, 5311 or CE 4541)

SOIL 8550. Teaching Experience. (1 cr [max 6 cr]; S-N or Aud. Prereq–Grad major in soil sci or related field, #)
Provides students with practical experiences in instructional techniques in a university setting.

SOIL 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

SOIL 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])

SOIL 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)
Spanish (SPAN)

Department of Spanish and Portuguese Studies
College of Liberal Arts

SPAN 5106. The Literature of the Reconquest and Feudal Spain. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or Portuguese)

The major literary genres developed in Spain from the Reconquest to 1502, with reference to the crucial transformations of the Middle Ages, including primitive lyric, epic, clerical narrative, storytelling, debates, collective chronicles, "exempla," and the Celestina (1499-1502).

SPAN 5107. The Literature of the Spanish Empire and Its Decline. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or Portuguese)

Major Renaissance and Baroque works of the Spanish Golden Age (16th- and 17th-century poetry, nonfiction prose, novel, drama) examined against the historical background of internal economic decline, national crisis, and ideological apparatus developed by the modern state.

SPAN 5108. Don Quixote. (3 cr; Stdnt Opt. Prereq-three 3xxx or 5xxx literature courses in Spanish or Portuguese)

Analysis of Cervantes’ [Don Quixote] in its sociohistorical context, with emphasis on the novel’s reception from the romantic period to postmodern times.

SPAN 5109. The Crisis of the Old Regime: Spanish Literature of the Enlightenment and Romanticism. (3 cr; Stdnt Opt. Prereq-three 3xxx or 5xxx literature courses in Spanish or #)

Major literary works and intellectual movements and conflicts represented in written culture, of the 18th and early 19th centuries (1680-1845), examined as expressions of the long crisis of Spain’s Old Regime and the rise of bourgeois liberalism.

SPAN 5110. Discursive Formations at the Threshold of 20th-Century Spain. (3 cr; Stdnt Opt. Prereq-three 3xxx or 5xxx literature courses in Spanish or #)

Theory and representative examples of the realist/naturalist novel (Galdós, Pardo Bazán) in the context of its antecedents ("costumbrismo"), opposites (the primitive lyric, epic, clerical narrative, storytelling), transformations of the Middle Ages, including "costumbrismo," opposites (the

SPAN 5111. Contemporary Spanish Literature. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or #)


SPAN 5221. Spanish Drama of the 17th-Century. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or Portuguese)


SPAN 5526. Colonial Discourse in Spanish American Writing. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or Portuguese)

Discourse production in Spanish America between 1492 and 1700. Conquest and colonial writing/counterwriting. Historical origin, evolution, and impact of cultural, political, and socioeconomic factors.

SPAN 5527. Nineteenth Century Latin America: Enlightened Thought, Nation Building, Literacy, Cultural Discourse. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or Portuguese)


SPAN 5528. Latin American Cultural Integration in the Neocolonial Order. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or #)


SPAN 5531. Hispanic Literature of the United States. (3 cr; Stdnt Opt. Prereq-three 3xxx or 5xxx Spanish or Portuguese literature courses or #)

Interdisciplinary approach providing a framework for deconstructing issues of national identity, marginalization, and gender. U.S. Hispanic theatre/literature and its ethno-racial differences, regional variations, cultural links, and scope of its genres.

SPAN 5711. The Structure of Modern Spanish: Phonology. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx linguistic courses in Spanish or #)

Formulating and evaluating a phonological description of Spanish. Approaches to problems in Spanish phonology within metrical, autosegmental, and lexical phonological theories.

SPAN 5715. The Structure of Modern Spanish: Semantics. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx linguistic courses in Spanish or #)

Applying semantic theory to Spanish: conceptual organization and the structuring of experience; meaning and cultural values, semantic fields, categorization and prototypes; cognitive model theory; metaphor, metonymy, and mental imagery as source and change of meaning.

SPAN 5716. Structure of Modern Spanish: Pragmatics. (3 cr; Stdnt Opt.)

Conducts in current literature in Spanish pragmatics. Deixis, presupposition, conversational implicature, speech act theory, conversational structure.

SPAN 5717. Spanish Sociolinguistics. (3 cr; Stdnt Opt. Prereq-Two 3xxx or 5xxx linguistic courses in Spanish or #)

Sociolinguistic variation, cross-dialectal diversity in different varieties of Spanish in Latin America and Spain. Impact of recent cultural, political, and socioeconomic transformations on language.

SPAN 5718. Spanish Language Contact. (3 cr; Stdnt Opt. Prereq-Two 3xxx or 5xxx linguistic courses in Spanish or #)

Analysis of different types/results of Spanish language contact globally, taking into account varying social conditions under which contact occurs.

SPAN 5721. Spanish Language Pragmatics. (3 cr; A-F or Aud. Prereq-[5711, honors] or grad student or #)

Core literature on Spanish language pragmatics. Phonology from a laboratory perspective. Students evaluate laboratory research methodologies, perform basic acoustic analyses, and design laboratory phonology studies.

SPAN 5910. Topics in Spanish Peninsular Studies. (3 cr; 3xxx or 5xxx linguistics courses in Spanish or Portuguese)

Cultural Discourse production in Spanish America between important groups, movements, trends, methods, and genres. Specific approaches depend on topic and instructor. Topics specified in Class Schedule.

SPAN 5920. Topics in Spanish-American Linguistics. (3 cr; max 9 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or Portuguese)

Problems in Hispanic linguistics; a variety of approaches and methods.

SPAN 5970. Directed Readings. (1-4 cr; max 9 cr; Stdnt Opt. Prereq-MA or PhD candidate, #, @)

Students must submit reading plans for particular topics, figures, periods, or issues. Readings in Spanish and/or Spanish-American subjects.

SPAN 5985. Sociolinguistic Perspectives on Spanish in the United States. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx linguistic courses in Spanish or #)

Sociolinguistic analysis of issues such as language maintenance/shift in U.S. Latino communities, code switching, attitudes of Spanish speakers toward varieties of Spanish and English, language change in bilingual communities, and language policy issues.

SPAN 5990. Directed Research. (1-4 cr; max 9 cr; Stdnt Opt. Prereq-#, @)

SPAN 5991. The Acquisition of Spanish as a First and Second Language. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx linguistic courses in Spanish or #)

Analysis of issues such as the acquisition of Spanish and English by bilingual children; Spanish in immersion settings; developmental sequences in Spanish; classroom language learners’ attitudes, beliefs, and motivation; development of pragmatic competence.
SPAN 8100. Research in Sociohistorical Approaches to Spanish Literature. (3 cr [max 9 cr]; Stdt Opt. Prereq—5xxx courses in Span literature and culture) Sociohistorical functions of Spanish literary works and major theories concerning literary production of texts. Testing modern theories in terms of representative fictional discourses from specific historical periods.

SPAN 8200. Spanish Literary Texts: Theories of Formal Structures. (3 cr [max 9 cr]; Stdt Opt. Prereq—5xxx courses in Span literature and culture) Advanced research in methods of literary analysis of discourse. Emphasizes theoretical and practical frameworks within which representative texts are analyzed and interpreted from differing perspectives.


SPAN 8300. The Construction of Spanish Literary History. (3 cr [max 9 cr]; Stdt Opt. Prereq—Two 5xxx courses in Span literature and culture) Origins and development of Hispanic literary canon: sociocultural theories of Spanish literary histories as academic and historiographic disciplines. Critiques of modern literary theories through analysis of literary works by major writers.

SPAN 8312. Two Spanish Masterpieces: [Libro de Buen Amor] and [La Celestina]. (3 cr; Stdt Opt. Prereq—5106, 5107 or 5xxx course in Portuguese) Cultural reappraisal of the late Middle Ages by reference to two Spanish masterpieces: the Archpriest's [Book of True Love] and Rojas' [La Celestina] (1499-1502). Emphasizes historical function of varied genres, motifs, and sources adapted by the authors.

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

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

SPAN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 6 cr for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)


SPAN 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])

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

SPAN 8900. Spanish Seminar. (3 cr [max 9 cr]; Stdt Opt. Prereq—5xxx series required for MA or #) Projects relying heavily on advanced research in Spanish problems. Investigation of assigned fields, analysis of problems, appraisal of principles. Limited to small group of students. For list of sample seminars, consult department and director of graduate studies.

SPAN 8940. Advanced Research in Spanish-American Literary Historiography. (3 cr [max 9 cr]; Stdt Opt) Sources and procedures that have given rise to institutionalizations of Spanish-American literary history. Evaluation and review of epistemological principles and assumptions in theory of literary criticism and histories of literature.

SPAN 8960. Workshop: Research in Hispanic Cultural Issues. (3 cr [max 9 cr]; A-F or Aud. Prereq—Reading knowledge of Spanish and Portuguese) Individualized support and advice in framing, theorizing, problematizing, and interpreting areas of cultural research. Taught in Spanish, Portuguese, and English.

SPAN 8990. Advanced Comparative Research of Caribbean Genres. (3 cr [max 9 cr]; Stdt Opt. Prereq—5525 or #) Major literary works and genres of Caribbean literature studied against the background of sociohistorical vicissitudes of the process leading to the formation and consolidation of the national states.

Spanish and Portuguese (SPPT)

SPPT Department of Spanish and Portuguese Studies

College of Liberal Arts

SPPT 5930. Selected Topics in Hispanic and Lusophone Cultural Discourse. (3 cr [max 9 cr]; A-F or Aud. Prereq—Reading knowledge of Spanish and Port) Cultural discourses in Spanish- and Portuguese-speaking areas. Historical intersections/divergences. Taught in Spanish or Portuguese, and in English when cross-listed. Topics specified in Class Schedule.

SPPT 5999. The Teaching of College-Level Spanish: Theory and Practice. (3 cr; Stdt Opt. Prereq—Grad or #) Theoretical grounding in the general principles of second language acquisition and guidance with their practical applications to the teaching of first- and second-year Spanish at the college-level.

SPPT 8400. Topics in Modern Hispanic and Lusophone Culture. (3 cr [max 9 cr]; Stdt Opt. Prereq—Three 5xxx SPAN or PORT courses) Advanced research in methods of analysis of cultural products, including but not limited to literature. Emphasizes historical, ideological, and theoretical frameworks within which representative texts/events may be interpreted.

SPPT 8920. Critical Theory Seminar. (3 cr [max 9 cr]; Stdt Opt. Prereq—Grad student) Critical theory as it intersects with cultural issues related to Hispanic/Lusophone worlds. Content varies according to faculty expertise, but remains within geopolitical parameters of nations/regions of Spanish/Portuguese-speaking worlds.


Speech-Language-Hearing Sciences (SLHS)

College of Liberal Arts


SLHS 5501. Fluency and Phonological Disorders. (3 cr; Stdt Opt. Prereq—Grad student or #) Description, nature, and treatment of fluency disorders in children/adults. Involvement in therapeutic/research activities.


SLHS 5603. Language and Cognitive Disorders in Children. (3 cr; Stdt Opt. Prereq—[3303 or CDIS 3303 or equiv or grad student or #] Language assessment, teaching procedures used with children/adolescents. Procedures apply to children who face language disabilities such as developmental delays, autism, learning disabilities.


SLHS 5606. Introduction to Augmentative and Alternative Communication. (3 cr; Stdt Opt) Description of the range of augmentative and alternative communication applications for persons with developmental and acquired disabilities.

SLHS 5607. Electronic Communication Aids. (3 cr; Stdt Opt. Prereq—5606 or #) Topics in cultural diversity, bilingualism, and second language learning needed for clinical competency in speech-language pathology. Basic/applied issues across a broad range of culturally/linguistically diverse populations.
SLHS 5801. Audiologic Assessment I. (3 cr; Stdnt Opt. Prereq-4801 or CDIs 4801 or #) Basic audiomteric battery, including pure tones, speech, masking, and inmittance in adults. Industrial audiologly, otoacoustic emissions.

SLHS 5802. Hearing Aids I. (3 cr; Stdnt Opt. Prereq-[3505, 4801] or [CDIs 3505, CDIs 4801] or #) Survey of modern hearing aids including history of development, electroacoustic functions, clinic and laboratory measurement techniques, sound field acoustics, techniques for selection.

SLHS 5803. Hearing Loss in Children: Diagnosis. (3 cr; Stdnt Opt. Prereq-4801 or CDIs 4801 or #) Behavioral, physiological approaches to assessment and intervention, development of the auditory mechanism, etiologies of hearing losses in infants, children, selection of sensory aids, principles of care in management with children and families.


SLHS 5806. Auditory Processing Disorders. (2 cr; A-F or Aud. Prereq-4802 or CDIs 4800) Normal/disordered auditory processing abilities. Anatomy/physiology of central auditory pathway; assessments to evaluate auditory processing skills, techniques to address auditory processing weaknesses. Current/historical theories/controversies surrounding auditory processing assessment.


SLHS 5808. Hearing Disorders. (5 cr; A-F or Aud. Prereq-[8801, 8802] or [CDIs 8801, CDIs 8802]) Disorders of auditory system, including anatomical, physiological, perceptual, and audiological manifestations of pathologies affecting hearing.

SLHS 5810. Laboratory Module in Audiology. (1-2 cr [max 5 cr]; Stdnt Opt. Prereq-4801 or CDIs 4801 or #) Intensive study of clinical methods in audiology. Supplements didactic courses in audiology curriculum. Laboratory study, individually or in small groups.

SLHS 5820. Clinical Research and Practice: Grand Rounds. (1-6 cr [max 6 cr]; S-N or Aud. Prereq-4801 or CDIs 4801 or equiv or #) Students participate in group discussions of current professional issues in audiology. Case presentations, guest presentations on current technology, clinical/research ethics. Group meet for an hour weekly with faculty coordinator who leads discussion. Integrates academic/clinical education.

SLHS 5900. Topics: Communication Disorders. (1-3 cr [max 6 cr]; Stdnt Opt) Topics listed in Speech-Language-Hearing Sciences office.

SLHS 5993. Directed Study. (1-12 cr [max 18 cr]; Stdnt Opt. Prereq-#) Directed readings and preparation of reports on selected topics.

SLHS 8333. FTE: Masters. (1 cr; No grade. Prereq-Master's student, adviser and DGS consent) Advanced study involving application of experimental and quasi-experimental research designs used in single-subject and group research.

SLHS 8420. Seminar: Teaching. (3 cr; Stdnt Opt) Advanced study to prepare doctoral students for careers in undergraduate and graduate teaching.

SLHS 8430. Proseminar in Speech-Language-Hearing Sciences. (1 cr [max 10 cr]; S-N only. Prereq-Intended for students in Department of Speech-Language-Hearing Sciences) Presentations/discussions led by faculty and PhD students in the department, based on research or issues in the discipline.

SLHS 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent) Advanced study and analysis of research in speech science and speech pathology.

SLHS 8501. Interdisciplinary Management in Cleft Palate and Craniofacial Disorders. (3 cr; Stdnt Opt. Prereq-3505 or CDIs 3505 or #) Communication problems associated with cleft palate and craniofacial disorders within interdisciplinary context; structural bases for speech problems, and physical and behavioral approaches to speech treatment; interdisciplinary medical and dental concerns and management.

SLHS 8530. Seminar: Speech. (3 cr [max 12 cr]; Stdnt Opt) Advanced study and analysis of research in speech science and speech pathology.


SLHS 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before or after 2007 must register up to four terms, up to 60 combined cr)

SLHS 8720. Clinical Education in Speech-Language Pathology. (1-8 cr [max 24 cr]; S-N or Aud. Prereq-Grad CDIs major, adviser, DGS consent) Clinical experience.

SLHS 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])

SLHS 8801. Audiologic Assessment II. (3 cr; Stdnt Opt. Prereq-5801 or CDIs 5801 or #) Auditory brainstem response and balance function in adults. Case studies and development of clinical protocols allowing for integration of topics from both courses in this sequence.

SLHS 8802. Hearing Aids II. (3 cr; Stdnt Opt. Prereq-5802 or CDIs 5802 or #) Instrumentation and methods for fitting and evaluating personal hearing aids; ear impression techniques and materials; repair and modification of hearing aids.

SLHS 8803. Signals and Systems in Audiology. (3 cr; Stdnt Opt. Prereq-[3505, 3506, 4801] or [CDIs 3505, CDIs 3506, CDIs 4801] or #) Introduction to electronics, digital signal processing, and calibration of instruments used to assess hearing. Lab sessions on such topics as sound-field calibration, earphone calibration, filters, spectra of transient signals, and use of an artificial mastoid.


SLHS 8806. Audiology Capstone. (1-6 cr [max 6 cr]; S-N or Aud. Prereq-8801, 8807) Students research a case history of patient with an auditory disorder, write paper that summarizes the literature on the disorder, and recommend assessment tools and treatment plans.


SLHS 8820. Clinical Education in Audiology. (1-8 cr [max 24 cr]; S-N or Aud. Prereq-Grad CDIs major) Clinical experience.

SLHS 8830. Seminar: Hearing. (3 cr [max 12 cr]; Stdnt Opt) Advanced study and analysis of research in hearing science and audiology.

SLHS 8840. Audiology Externship. (1-7 cr [max 7 cr]; S-N or Aud. Prereq-[8802, 8807] or [CDIs 8802, CDIs 8807]) Students intern at external clinical setting under supervision of certified audiologist. Entry-level knowledge/skills required for professional practice as clinical audiologist. External internship settings may include hospitals, schools, private otolaryngology practices, hearing aid dispensing practices, industrial settings, and community clinics.

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

Course Descriptions

Statistics (STAT)
School of Statistics
College of Liberal Arts

STAT 5021. Statistical Analysis. (4 cr; Stdt Opt. ANSC 2211, ESPM 3012, STAT 3011. Prereq.:n 3011; College algebra or #; Stet course recommended)
Intensive introduction to statistical methods for graduate students needing statistics as a research technique.

STAT 5031. Statistical Methods for Quality Improvement. (4 cr; Stdt Opt. Prereq. [3012 or 4102 or 5021 or 5102 or 8102], Math 1272)

STAT 5041. Bayesian Decision Making. (3 cr; Stdt Opt. Prereq. 4101 or 5021 or 5101 or #)

Logical development of probability, basic issues in statistics. Probability spaces. Random variables, their distributions and expected values. Law of large numbers, central limit theorem, generating functions, multivariate normal distribution.


STAT 5201. Sampling Methodology in Finite Populations. (3 cr; Stdt Opt. Prereq.—3011 or 5021 or 5102 or #)

STAT 5302. Applied Regression Analysis. (4 cr; Stdt Opt. Prereq.—3022 or 4102 or 5021 or 5102 or #)

STAT 5303. Designing Experiments. (4 cr; Stdt Opt. Prereq.—3022 or 4102 or 5021 or 5102 or #)

STAT 5401. Applied Multivariate Methods. (3 cr; Stdt Opt. Prereq.—5302 or 5021 or 5102 or #)

STAT 5421. Analysis of Categorical Data. (3 cr; Stdt Opt. Prereq.—5302 or #)

STAT 5511. Time Series Analysis. (3 cr; Stdt Opt. Prereq.—Theoretical understanding)

STAT 5601. Nonparametric Methods. (3 cr; Stdt Opt. Prereq.—5302 or 4102 or 5021 or 5102 or #)
Order statistics. Classical rank-based procedures (e.g., Wilcoxon, Kruskal-Wallis). Goodness of fit. Topics may include smoothing, bootstrap, and generalized linear models.

STAT 5931. Topics in Statistics. (3 cr; Stdt Opt.)
Topics vary according to student needs and available staff.

STAT 5932. Topics in Statistics. (3 cr; Stdt Opt.)
Topics vary according to students’ needs and available staff.

STAT 5993. Tutorial. (1–6 cr; max 12 cr; Stdt Opt. Prereq.—#)
Directed study in areas not covered by regular offerings.

STAT 8051. Applied Statistical Methods 1: Computing and Generalized Linear Models. (4 cr; A–F or Aud. Prereq.—Statistics grad major or #)

STAT 8052. Applied Statistical Methods 2: Design of Experiments and Mixed-Effects Modeling. (4 cr; A–F or Aud. Prereq.—8051 or #)
Classical experimental designs, mixed effect models. How to recognize designs. How to design/analyze experiments. ANOVA for factorial designs, contrasts, multiple comparisons, complete/incomplete block designs, unbalanced data, confounding, fractional factorials, response surfaces, nested designs, split-plots, random effects, mixed effects, repeated measures, longitudinal data.


STAT 8054. Statistical Methods 4: Advanced Statistical Computing. (3 cr; A–F or Aud. Prereq.—8053 or #)
Optimization, numerical integration, Markov chain Monte Carlo, related topics.

STAT 8055. Applied Project. (2 cr; S–N only. Prereq.—[8054, 8801] or #)
Collaborative applied statistical practice with a member of University community, including consulting, problem solving, presentation/documentation of results.

STAT 8101. Theory of Statistics 1. (4 cr; Stdt Opt. Prereq.—Statistics grad major or #)

STAT 8102. Theory of Statistics 2. (4 cr; Stdt Opt. Prereq.—8101, Statistics graduate major or #)

STAT 8111. Mathematical Statistics I. (3 cr; Stdt Opt. Prereq.—[5102 or 8102 or #], [Math 5615, Math 5616] or real analysis, matrix algebra)
Probability theory, basic inequalities, characteristic functions, and exchangeability. Multivariate normal distribution. Exponential family. Decision theory, admissibility, and Bayes rules.

STAT 8112. Mathematical Statistics II. (3 cr; Stdt Opt. Prereq.—8111)

STAT 8121. Theories of Inference. (3 cr; Stdt Opt. Prereq.—8102, 8112, or #)
Topics vary according to instructor and student interests. Sample topics: conditional distributions and sufficiency; estimation theory; comparison of statistical inference theories; Neyman-Pearson hypothesis-testing theory and its extensions; confidence regions; invariance; nonparametric, sequential, likelihood, and Bayesian inference.

STAT 8131. Predictive Inference. (3 cr; Stdt Opt. Prereq.—8112 or equiv)
Traditional frequentist and nontraditional predictive approaches. Bayesian predictive methods and the purpose for which data are used. Theoretical apparatus discussed using a variety of common statistical paradigms. Model selection, comparisons and allocation, perturbation analysis and control.

STAT 8141. Probability Assessment. (3 cr; Stdt Opt. Prereq.—5102)
Probability as a language of uncertainty for quantifying and communicating expert opinion and for use as Bayesian prior distributions. Methods for elicitation and construction of subjective probabilities. De Finetti coherence, predictive elicitation, fitting subjective-probability models, computer-aided elicitation, and use of experts.

STAT 8151. Statistical Decision Theory. (3 cr; S–N or Aud. Prereq.—8112, Math 6856)
Comparison of inferential methods in statistics (including risk comparison, minimax, and admissibility) using Wald’s formulation of decision. Formal and proper Bayes rules compared with frequentist inferences. Topics may vary depending on instructor.

STAT 8171. Sequential Analysis. (3 cr; Stdt Opt. Prereq.—8112)
Wald’s sequential probability ratio test and modifications. Sequential decision theory. Martingales. Sequential estimation, design, and hypothesis testing. Recent developments.

STAT 8201. Topics in Sampling. (3 cr; S–N or Aud. Prereq.—8112, Math 6856)
Sampling theory; stratified sampling, ratio estimators, cluster sampling, double sampling, superpopulation theory, Bayesian methods, multiple imputation, nonresponse.

STAT 8311. Linear Models. (4 cr; Stdt Opt. Prereq.—Linear algebra, 5102 or 8102 or #)
General linear model theory from a coordinate-free geometric approach. Distribution theory, ANOVA tables, testing, confidence statements, mixed models, covariance structures, variance components estimation.

STAT 8312. Linear and Nonlinear Regression. (3 cr; Stdt Opt. Prereq.—8311)
Nonlinear regression: asymptotic theory, Bates-Watts curvatures, super leverage, parameter plots, projected residuals, transform-both-sides methodology, Wald versus likelihood inference. Topics in linear and
generalized linear models as they relate to nonlinearity issues, including diagnostics, semi-parametric models, and model assessment.

STAT 8313. Topics in Experimental Design. (3 cr; S/Not Opt. Prereq—8311)
Optimal, Bayes, and nonlinear designs; algorithms for computing designs; sample size; recent developments.

STAT 8321. Regression Graphics. (3 cr; S/Not Opt. Prereq—8311)

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

STAT 8401. Topics in Multivariate Methods. (3 cr; S/Not Opt. Prereq—8311)

STAT 8411. Multivariate Analysis. (3 cr; S/Not Opt. Prereq—8152)
Multivariate normal distribution. Inference on the mean, covariance, and correlation and regression coefficients; related sampling distributions such as Hotelling’s T-squared and Wishart distributions. Multivariate analysis of variance. Principal components and canonical correlation. Discriminant analysis.

STAT 8421. Theory of Categorical Data Analysis. (3 cr; S/Not Opt. Prereq—8062 or #)

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

STAT 8501. Introduction to Stochastic Processes with Applications. (3 cr; S/Not Opt. Prereq—5101 or 8101)
Markov chains in discrete and continuous time, renewal processes, Poisson process, Brownian motion, and other stochastic model encoun tered in applications.

STAT 8511. Time Series Analysis. (3 cr; S/Not Opt. Prereq—5102 or 8111 or #)

STAT 8666. Doct Pr-Thesis Cr. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 2.4 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

STAT 8701. Computational Statistical Methods. (3 cr; S/Not Opt. Prereq—8311, programming exper)
Random variate generation, variance reduction techniques. Robustlocation estimation and regression, smoothing additive models, regression trees. Programming project: basic programming ability and familiarity with standard high-level language (preferably FORTRAN or C) are essential.

STAT 8711. Statistical Computing. (3 cr; S/Not Opt. Prereq—8701 or #)
Basic numerical analysis for statisticians. Numerical methods for linear algebra, eigen-analysis, integration, and optimization and their statistical applications.

Alternative programming paradigms to traditional procedural programming, including object-oriented programming and functional programming. Applications to development of dynamic statistical graphs and representation and use of functional data, such as mean function in nonlinear regression log likelihoods and prior densities in Bayesian analysis.

STAT 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])

STAT 8801. Statistical Consulting. (2-3 cr [max 3 cr]; S/N or Aud. Prereq—Grad stat major or #)
Principles of effective consulting/problem-solving, meeting skills, reporting. Aspects of professional practice behavior, ethics, continuing education.

STAT 8811. Statistical Consulting Practicum. (3 cr [max 12 cr]; S/N or Aud. Prereq—Statistics grad student or #)
Providing (under faculty supervision) statistical support to clients, primarily University researchers. Exercises in problem solving, ethics, listening/communication skills.

STAT 8821. Curricular Practical Training. (1 cr; S/N only. Prereq—Statistics grad student, %)
Industrial work assignment using advanced statistical techniques. Grade based on final report and presentation covering work assignment.

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

STAT 8900. Student Seminar. (1 cr [max 2 cr]; S/N or Aud. Prereq—Statistics graduate student)
Preparation or presentation of seminar on statistical topics.

STAT 8913. Literature Seminar. (1 cr [max 4 cr]; S/N only. Prereq—Statistics grad major or #)
Students will read, present, discuss, and critique current literature/research.

STAT 8931. Advanced Topics in Statistics. (3 cr [max 12 cr]; S/Not Opt)
Topics vary according to student needs and available staff.

STAT 8932. Advanced Topics in Statistics. (3 cr [max 12 cr]; S/Not Opt)
Topics vary according to student needs and available staff.

STAT 8933. Advanced Topics in Statistics. (3 cr [max 12 cr]; S/Not Opt)
Topics vary according to student needs and available staff.

STAT 8992. Directed Readings and Research. (1-6 cr [max 12 cr]; S/Not Opt. Prereq—#)
Directed study in areas not covered by regular offerings.

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

SST 8400. Seminar: Science, Technology, and Society. (3 cr; Stdnt Opt. Prereq—HSCI 8111 or [Phil 8601 or Phil 8602 or Phil 8605] or #) Students participate in ongoing research on interactions involving science, technology, and society from perspectives of philosophy, history, and social study of science, and prepare and present research papers.

SST 8420. Seminar: Social and Cultural Studies of Science. (3 cr [max 6 cr]; Stdnt Opt. =PHIL 8660) Recent work; theoretical and methodological differences among practitioners; selected responses from historians and philosophers of science.

Sumerian (SUM) Department of Classical and Near Eastern Studies College of Liberal Arts


SUM 5012. Elementary Sumerian II. (3 cr; Stdnt Opt. Prereq—5011) Reading from classical literary and historical texts.

Surgery (SURG) Department of Surgery Medical School

SURG 8200. Clinical Surgical Problems in Management. (3 cr; A-F or Aud. Prereq—Grad surg major) Diagnostic and management instruction in all phases of clinical surgery, inpatient and outpatient.

SURG 8201. Surgery Roentgenological Pathology Conference. (1 cr; A-F or Aud. Prereq—Grad surg major) Weekly review of surgical patients presenting interesting roentgen and pathological findings. Staff from the Departments of Surgery, Radiology, and Laboratory Medicine and Pathology. Basic science and management principles of the surgical patient.

SURG 8202. Surgical Research. (3 cr; A-F or Aud. Prereq—Grad surg major) Graduate students undertake original investigation of problems in either clinical or surgical surgery.

SURG 8203. Surgery Complications and Research Conference. (1 cr; A-F or Aud. Prereq—Grad surg major) Evaluation of surgical patients, including postoperative course. Discussion and critical evaluation of current research problems.

SURG 8207. Transplantation Conference. (1 cr; A-F or Aud. Prereq—Grad surg major) Interdepartmental discussion and evaluation of current clinical and research problems.

SURG 8293. Applied Statistics. (1 cr; S-N or Aud. Prereq—Grad student in [surgery or experimental surgery or health sciences] or) Interactive computer course. Concepts of applied statistics. Examples, problem sets based on surgical research. How to independently set up appropriate experiments and perform basic descriptive/inferential analysis.

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

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

SURG 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

SURG 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])

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

Sustainable Agricultural Systems (SAGR) Department of Agronomy and Plant Genetics College of Food, Agricultural and Natural Resource Sciences

SAGR 8010. Colloquium in Sustainable Agriculture. (2 cr; A-F or Aud. Prereq—Coursework in biological or social sciences that provides intro to ag practices or issues) Forum for University faculty and students, and representatives of the farming community, including farmers, grassroots organizations, agricultural businesses, and representatives of state agencies, to engage in discussions on topics related to sustainability of food production.

SAGR 8020. Field Experience in Sustainable Agriculture. (1-4 cr [max 3 cr]; S-N or Aud. Prereq—Coursework in biological or social sciences that provides intro to ag practices or issues) 3- to 14-week internship with growers or organizations working with sustainable agriculture issues. Students analyze issues in final written project, oral seminar.

Teaching English as a Second Language (TESL) Institute of Linguistics, ESL, and Slavic Languages and Literatures

College of Liberal Arts

TESL 5101. Academic Writing in TESOL. (1 cr; S-N or Aud. Prereq—[5721, grad ESL student] or #) Research writing conventions in the profession. University rules on ethical use of human subjects, research paper rhetorical structure, literature sources/searches, literature review coherence, hedging markers, basic research methods, research result reporting, APA-formatted bibliographies, writing strategies.

TESL 5401. Language Analysis for Teachers of English as a Second Language. (4 cr; Stdnt Opt. Prereq—LING 5001 or Ling 5001 or #) Overview of the structure of the English language geared to the needs of teachers of English to speakers of other languages. Study the structures of English from the point of view of second-language speakers as well as native speakers. Phonetics, phonology, morphology, and some aspects of the syntax of the English language. Part of a two-course sequence.

TESL 5402. Language Analysis for Teachers of English as a Second Language. (4 cr; Stdnt Opt. Prereq—5401, Ling 5001) Overview of the structure of the English language geared to the needs of teachers of English to speakers of other languages. Study the structures of English from the point of view of second-language speakers as well as native speakers. More complex structures of English syntax, as well as English semantics, pragmatics, and discourse structures. Second in a two-course sequence.


TESL 5721. Methods in Teaching English as a Second Language. (3 cr; Stdnt Opt. Prereq—LING 3001 or 5001 or #) Introduction to methods for teaching English as a second language to adults.

TESL 5722. Practicum in Teaching English as a Second Language. (6 cr [max 12 cr]; S-N or Aud. Prereq—[5401 or 85401, 5402 or 85402, 5721, ESL major or ESL minor] or #) Observation of, and practice in, teaching English as a second language to adults at college or university level.

TESL 5723. Materials for Teaching English as a Second Language. (3 cr; Stdnt Opt. Prereq—[5721, 5722] or #) Principles for evaluating/preparing materials for teaching second languages as applied especially to English as a second language.

TESL 5724. Intro to Language Assessment. (3 cr; A-F or Aud) How to engage in meaningful, appropriate, and fair second-language assessment practices; interpret test results; and construct new forms of assessment.


TESL 5900. Topics in Second Language Learning and Teaching. (3 cr [max 12 cr]; Stdnt Opt) Topics vary. See Class Schedule.


TESL 5993. Directed Studies. (1-4 cr [max 9 cr]; Stdnt Opt. Prereq—#, @) Directed study for teaching English as a second language.

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

TESL 8751. Genre Analysis for Second Language Learning. (3 cr; Stdnt Opt. Prereq—5401 or 5402 or 5721 or #) Critical review of literature on genre analysis. Languages for specific purposes. Focuses on English. Registers used in fields such as engineering, nursing, and business. Students gather data, write research reports.

TESL 8777. Thesis Credits: Master’s. (1-16 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

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Theatre Arts (TH)
Department of Theatre Arts and Dance
College of Liberal Arts

TH 5100. Theatre Practicum. (1-4 cr [max 20 cr]; Stdnt Opt. Prereq—#; 4 cr of 3100 for undergrads)
Individual creative projects in production of approved plays as an actor, director, dramaturg, or playwright.
(See 5500 for design practicums.)

TH 5105. The Theatre Dramaturg. (3 cr; Stdnt Opt. Prereq—[4177 or 4178], [jr or sr], #)

TH 5117. Performance and Social Change. (3 cr; A-F or Aud. Prereq—Jr or sr or grad student)
Reading, writing, research, presentations and workshops explore activist performance projects. Theories of social formation and ideology provide framework to discuss/animate theater’s potential for social change.

TH 5118. History and Theory of Performance Conventions. (3 cr; A-F or Aud. Prereq—[3222, 3511, 3711 or 3712] or grad student)
Draws on visual materials, practical exercises, and theories of spatial representation in context of political/social function. Historical/cross-cultural overview of performance conventions and theatrical space from City of Dionysia to site-specific happenings of 20th century.

TH 5119. Text and Performance. (3 cr; A-F or Aud. Prereq—[3222, 3511, 3711 or 3712] or grad student)
How to read texts toward performance in various dramatic/ nondramatic material. Method of unlocking metaphoric energy of texts. Vocabulary/techniques of analysis that transform text from page to stage.

TH 5181. Blacks in American Theatre. (3 cr; Stdnt Opt. =AFRO 5181)
Historical survey of significant events in the development of American Black theatrical tradition; essays, plays, playwrights, and theaters from early colonial references to Black Arts Movement.

TH 5182. Contemporary Black Theatre: 1960-Present. (3 cr; Stdnt Opt. =AFRO 5182)
Essay, plays, playwrights, and theaters that have contributed to contemporary Black theatre. From the beginning of the Black Arts Movement to the present.

TH 5330. Comedy: Advanced Physical Performance Studio. (3 cr; A-F only. Prereq—3331, #)
Mechanics of creating physical comedy. Focuses on process using clown, Comedia dell’arte, Bouffons, or improvisational comedy. Exercises on how comedy is born from tragedy and state of conflict within one’s self.

TH 5340. Tragedy/Poetry: Advanced Physical Performance Studio. (3 cr [max 6 cr]; A-F only. Prereq—[3322, 3331, grad student] or #)
Specific tragic/poetic training paradigms in physical theater employed by Stanislavski, Grotowski, Brecht, Lecoq, etc. Psychological, emotional, technical, and physical work. Tragic action in Greek tragedy, Shakespeare, Melodrama, operatic characterization, Brecht. Original tragic/poetic work.

TH 5355. Puppetry: Techniques and Practice in Contemporary Theatre. (3 cr; Stdnt Opt. Prereq—[3513 or 3831], #; or grad student)
Fundamentals of puppetry and object/puppet theater/performance are introduced through traditional/contemporary puppetry forms. Focuses on object theater, toy theater, hand puppets, and shadow/Bunraku-style puppets. Readings, in-class screenings of videos/slides. Students build/create series of short works for in-class performance.

TH 5500. Theatre Design Practicum. (1-3 cr [max 20 cr]; Stdnt Opt. Prereq—3515, #, %)
Individual projects in production of approved plays as a designer of scenery/properties, costumes, lighting, or sound. (See 5100 for other creative practicums.)

TH 5510. Drawing, Rendering, and Painting for the Theatre Designer I. (3 cr; Stdnt Opt. Prereq—3515 or grad or #)
Development of skills necessary for presentation of theatre scene/costume designs. Materials, layout, and techniques in scene painting. Basic drawing/graphic skills.

TH 5515. Design Composition and Collaboration. (3 cr; Stdnt Opt. Prereq—grad or 3515, 3711, #)
Classical composition of art and its application to stage design and directing through the collaborative process.

TH 5520. Scene Design. (3 cr [max 9 cr]; Stdnt Opt. Prereq—3515 or grad or #)
Conceiving/communicating design ideas in both two-dimensional sketches and three-dimensional models for theatre and allied venues. Drafting.

TH 5530. Costume Design. (3 cr [max 9 cr]; Stdnt Opt. Prereq—3515 or grad or #)
Theory and process of costume design for theatrical productions (e.g., dance, opera, film) through hypothetical productions.

TH 5540. Lighting Design for the Theatre. (3 cr [max 9 cr]; Stdnt Opt. Prereq—3515 or grad or #)
Design aesthetics and exploration of design for various stage forms and venues. Development of the lighting plot and paperwork; use of the computer in lighting design.

TH 5545. Stage Lighting Technology. (3 cr; Stdnt Opt. Prereq—3515 or grad or #)
The lighting technician’s skills and crafts: equipment, techniques, control operation, wiring, and maintenance.

TH 5550. Video Project. (3 cr [max 6 cr]; Stdnt Opt. Prereq—4550 or 4560 [preferred], #)
Students participate in a video-shoot project serving in various positions, including camera operator, gaffer, grip, audio engineer, etc., and possibly director and director of photography.

TH 5551. Editing and Post Production for Video and Film. (3 cr; Stdnt Opt. Prereq—#)
Students manipulate software and other technologies used in post production. Editing, audio, image manipulation.

TH 5553. Video Production Design and Aesthetics. (3 cr; Stdnt Opt. Prereq—4553 or #)
Use of technologies in video/film in making a statement or communicating an idea/emotion. Creativity, sensitivity to an audience. Students explore different creative uses of technologies/media.

TH 5554. Multimedia Production for Live Performance. (3 cr; Stdnt Opt. Prereq—5553 or #)
Use of multimedia production technologies in actual production. Students apply knowledge/skill in conjunction with an artistic team on a production and are an integral part of the development/realization of that production.

TH 5556. Audio Engineering. (3 cr; Stdnt Opt. Prereq—4555, #)
Miking/recording techniques specific to music/dramatic dialogue. Use of different styles of music. Hands-on recording of bands, doing final mixes to demo CD. Field trips to professional studios and club/concert recordings.

TH 5558. Audio Systems Analysis and Installation. (3 cr; Stdnt Opt. Prereq—4555 or #)
Analyzing, designing, developing specifications, and installing sound systems. Students work from client program lists, with given resources and given spaces, to arrive at best possible audio system. Hands-on experience.

TH 5559. Sound Design for Performance. (3 cr; Stdnt Opt. Prereq—4555 or #)
Audio technology/psychology, their impact on audience in a performance. Communication, design process, psychoacoustics, script analysis.

TH 5560. Drawing, Rendering, and Painting for the Theatre Designer II. (3 cr; Stdnt Opt. Prereq—5510)
Development of skills necessary for presentation of theatre scene/costume designs. Materials, layout, and techniques in scene painting. Rendering and scene painting skills.

TH 5570. Properties/Scenery Technology. (1-3 cr [max 15 cr]; Stdnt Opt. Prereq—3515 or grad or #)
Management, structures, upholstery, mask-making, furniture construction, stage mechanics, soft properties, faux finishes. Topics specified in Class Schedule.

TH 5580. Costume Technology. (3 cr [max 15 cr]; Stdnt Opt. Prereq—3515 or grad or #)
Fabric enhancement techniques, masks, wig-making, millinery, makeup prosthetics, pattern drafting, and draping. Topics specified in Class Schedule.

TH 5590. Theatre Technology Practicum. (1-3 cr [max 15 cr]; Stdnt Opt. Prereq—3515, #, %; 4 cr max for undergrads)
Individual creative project in technology/craft area of theatre. Practical work in costume, lighting, makeup, props, scenery, sound, or technical management.

TH 5711. Advanced Stage Direction. (3 cr; Stdnt Opt. Prereq—[4711, #]; or grad student)

TH 5713. Theory and Practice of Performance. (3 cr; A-F or Aud. Prereq—[3171, 3172, 4177 or 4178], 5711 or grad student)
Traditions of thinking about theatre, from ancient Greece to present, in practical applications. Focuses on epistemological significance of performance in current critical practices of postmodernism, psychoanalysis, and phenomenology.

TH 5714. The Drama of Myth. (3 cr; Stdnt Opt. Prereq—[3222, 3711, 3712] or #)
Role of myth in performance. Students choose a myth and study its iconography, tracing its journey in painting, sculpture, music, and other texts that accumulated around it throughout history. Course culminates in creation of a non-traditional performance score that embodies/reveals energies of contemporary culture within ancient metaphor of a chosen myth.

TH 5715. Actor-Director Collaboration. (3 cr; Stdnt Opt. Prereq—[3222, 3711, 3712] or #)
Applying advanced acting and directing technique to an artistic, collaborative process that promotes flexibility and creativity. Actors and directors are exposed to a challenging range of roles, styles, and scenes.

TH 5716. Stage Management for the Theatre. (4 cr; Stdnt Opt. Prereq—[1101, 1321, soph] or grad)
Theories, practicalities, and techniques for rehearsal/ performance. Organizing/managing various types of performance venues.

TH 5718. Principles of Arts Management. (3 cr; Stdnt Opt. Prereq—#)
Nonprofit arts organization structure: concept, mission, organization. Financial, marketing, fund-raising, and grant-writing strategies. Discussion/guest professionals from Twin Cities arts/funding communities.
Course Descriptions

TH 5725. The Alchemy of an Object. (3 cr; Stdnt Opt. Prereq–[[3][22, 3717, 3712] or #; grad student]) Stage object as vehicle for investigating role of drama in culture from Middle Ages to present. Object as first connection that dramatic text makes with material world. Object as culturally inscribed link between language of drama and world of action in a historically given moment. Object as metaphor of cultural praxis.


TH 5760. Advanced Stage Management. (2-3 cr [max 3 cr]; Stdnt Opt. Prereq–5716 or &5716, #; 4 cr max for undergrads) Practical experience in stage management for specific productions of the University Theatre with emphasis on rehearsal and performance.

TH 5780. Advanced Topics in Arts Management. (2-4 cr [max 8 cr]; Stdnt Opt. Prereq–5718) Students apply non-profit arts management theories/techniques learned in 5718. Marketing/audience development, fundraising and grant writing strategies, and financial management of a non-profit arts organization.


TH 5993. Directed Study. (1-5 cr [max 20 cr]; Stdnt Opt. Prereq–6 Th cr, #, %, @) Guided individual reading or study.

TH 6100. Theatre Practicum. (1-1 cr [max 20 cr]; Stdnt Opt. Prereq–#, %) Individual creative projects in production of approved plays as an actor, director, dramaturg, or playwright (see 8100 for design practicums).

TH 6102. Theatre Historiography. (3 cr; Stdnt Opt) Current trends in historiography; research strategies and methods.

TH 6111. History and Theory of Western Theatre: Ancient World and Early Medieval. (5 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 6112. History and Theory of Western Theatre: Medieval Through Renaissance. (3 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 6113. History and Theory of Western Theatre: National Theatres to the French Revolution. (3 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 6114. History and Theory of Western Theatre: Enlightenment Through Naturalism. (5 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 6115. History and Theory of Western Theatre: 20th Century Through World War II. (5 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 6116. History and Theory of Western Theatre: 20th Century From 1945 to the Present. (3 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 8120. Seminar. (3 cr [max 12 cr]; Stdnt Opt) Selected research in various theatre fields and periods. Sample topics: Border Crossings--Theatre History and Representation; The Theatre and Drama of the Third Reich, 1927-1944.

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

TH 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

TH 8500. Theatre Design Practicum. (1-3 cr [max 20 cr]; Stdnt Opt. Prereq–#, %) Individual creative projects in production of approved plays as a designer for scenery/properties, costumes, lighting, or sound (see 8100 for other creative practicums).

TH 8590. Theatre Technology Practicum. (1-3 cr [max 20 cr]; Stdnt Opt. Prereq–#, %) Individual creative projects in the technology or craft of costume, lighting, makeup, props, scenery, sound, or theatre management.

TH 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

TH 8711. Theory and Practice of the Modern Stage Director. (3 cr; Stdnt Opt) Survey of principal stage directors (e.g., Saxe-Meiningen, Meyerhold, Brecht, Strehler, Mnouchkine, Brook) and their theories and practices from 1871 to today using books, journals, firsthand accounts, and videos.

TH 8750. MFA Directing Practicum. (2-3 cr [max 10 cr]; A-F or Aud. Prereq–MFA directing specialization) Rehearsed and performed production of published or original one-act (2 cr) or full-length play (3 cr) with budgeted design and technical support.

TH 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])

TH 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

TH 8950. Topics in Theatre. (1-1 cr [max 8 cr]; Stdnt Opt) Topics specified in Class Schedule.

TH 8990. Internship. (1-5 cr [max 10 cr]; Stdnt Opt. Prereq–#, %)

TH 8990. MFA Creative Thesis. (3-4 cr [max 4 cr]; Stdnt Opt. Prereq–#, %)

TH 8994. Directed Research. (1-5 cr [max 5 cr]; Stdnt Opt. Prereq–#, %)

Therapeutic Radiology (TRAD)

Department of Therapeutic Radiology

Medical School

TRAD 8204. Tumor Clinic Conference. (0 cr; Stdnt Opt)

TRAD 8240. Radiation Therapy Conference. (0 cr; Stdnt Opt)

TRAD 8310. Fundamentals of Radiation Therapy. (1 cr; Stdnt Opt)

TRAD 8315. Radiation Therapy Pathology. (1 cr; Stdnt Opt)

TRAD 8320. Radiation Therapy Treatment Planning Problems. (1 cr; Stdnt Opt)

TRAD 8325. Radiation Therapy Pediatrics Oncology. (1 cr; Stdnt Opt)

TRAD 8350. Research: Radiation Therapy. (1-15 cr [max 15 cr]; Stdnt Opt)

TRAD 8450. Research: Radiation Biology. (1-15 cr [max 15 cr]; Stdnt Opt)

TRAD 8550. Research: Radiological Physics. (1-15 cr [max 15 cr]; Stdnt Opt)

Toxicology (TXCL)

College of Veterinary Medicine

TXCL 5000. Directed Research in Toxicology. (1-4 cr [max 16 cr]; A-F or Aud. Prereq–#)

Special project that addresses specific issue in toxicology. Under guidance of faculty member.

TXCL 5011. Principles of Toxicology. (2 cr; A-F or Aud. Prereq–Grad txcl major or #)

Introduction to fundamentals of poisoning in individuals and the environment, assessment of potential health hazards, and application of toxicology in various professional careers.

TXCL 5195. Veterinary Toxicology. (3 cr; A-F or Aud. Prereq–CVM 6195; Prereq–Grad student or #)

Explanation of products requiring 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 or BioC 4331, PubH 5104 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, BioC 4333, PubH 5062 or Phil 6101 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–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined 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])
Urban Studies (URBS)
Department of Geography
URBS 5101. The City and the Metropolis: An Exploration. (3 cr; A-F only, Prereq–Grad student or [adv URBs undergrad, *])
The City and the Metropolis as places that result from important acts of human creativity. Interdisciplinary/exploratory perspectives. Building/developing (North American) cities, Construction of “urban culture.”
URBS 5861. Financing Cities. (3 cr; A-F only)
Services/projects cities provide/finance. Ways in which developers/consumers participate in urban development through policies and financial tools. Challenges cities face in determining budgets.

Veterinary and Biomedical Sciences (VBS)
College of Veterinary Medicine
VBS 8700. Seminar: Veterinary Pathobiology. (1 cr [max 5 cr]; Stdnt Opt)

Veterinary Medicine, Graduate (VMED)
College of Veterinary Medicine
VMED 5080. Problems in Veterinary Epidemiology and Public Health. (1-3 cr [max 3 cr]; A-F or Aud)
Individual study on problem of interest to epidemiology or public health student.
VMED 5082. Diagnostic Epidemiology of Infectious Diseases. (2 cr; A-F only, Prereq–Statistics course or *)
VMED 5090. Seminar: Veterinary Epidemiology. (1 cr [max 3 cr]; S-N or Aud. Prereq–Veterinary Medicine grad student)
Each student leads at least one seminar. Reviews of current research, literature reviews, and technique development. Students and participating faculty participate in presentation, discussion, and administration of the seminars.
VMED 5093. Directed Studies in Population Medicine. (1-4 cr [max 8 cr]; A-F or Aud. Prereq–Grad student, *)
Directed studies arranged between student and instructor.
VMED 5165. Surveillance of Foodborne Diseases and Food Safety Hazards. (2 cr; Stdnt Opt + PUBH 5101. Prereq–PUBH 5330, professional school or grad student[1] or *1)
VMED 5190. Seminar and Presentation Development. (2 cr; S-N only, Prereq–Grad student)
Skills needed to research, organize, develop, and deliver an oral scientific presentation or to assist in finding, compiling, and organizing information for presentations, theses, or papers suitable for publication.
VMED 5193. Dairy Decision Making in a Financial Context. (2 cr; A-F or Aud. Prereq–Earned DVM, *)
Economic/decision making principles applied to commercial dairy farms in North America. Economic techniques, decision making under financially constrained conditions. Financial evaluation of a dairy operation. Modules assignments, written work submitted via the Internet, discussions at online course site.
VMED 5210. Advanced Large Animal Physiology I. (1-3 cr [max 6 cr]; Stdnt Opt)
Review of large animal physiology at level needed for specialty board certification or beginning research. Students present topics in physiology and supplement reading with clinical case material or journal articles.
VMED 5211. Advanced Large Animal Physiology II. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–#; 5210 recommended)
Large animal physiology for specialty board certification or beginning research. Students present topics in physiology and supplement reading with clinical case material or journal articles.
VMED 5212. Large Animal Diagnostic Ultrasonography. (1 cr; A-F or Aud. Prereq–#)
VMED 5232. Comparative Clinical Veterinary Dermatologic Pathology. (1 cr [max 2 cr]; S-N only, Prereq–DVM degree or foreign equiv)
Microscopic pathology of basic dermatologic reactions and of variable disease states.
VMED 5240. Advanced Small Animal Pathobiology I. (1 cr; A-F only. Prereq–CVM grad student. [DVM or foreign equiv] degree)
Biology, physiology, pathophysiology, and medicine of diseases of companion animals. Pathogenesis/treatment of diseases. Developing hypotheses that can be translated into clinical research.
VMED 5241. Advanced Small Animal Pathobiology II. (1 cr; A-F only. Prereq–CVM grad student. [DVM or foreign equiv] degree)
Biology, physiology, pathophysiology, and medicine of diseases of companion animals. Developing hypotheses that can be translated into clinical research.
VMED 5242. Advanced Small Animal Pathobiology III. (1 cr; A-F only. Prereq–CVM grad student. [DVM or foreign equiv] degree)
Overview of biology, physiology, pathophysiology, and medicine. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research.
VMED 5243. Advanced Small Animal Pathobiology IV. (1 cr; A-F only. Prereq–CVM grad student. [DVM or foreign equiv] degree)
Overview of biology, physiology, pathophysiology, and medicine. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research.
VMED 5274. Diseases of the Urinary System. (1 cr; A-F or Aud. Prereq–*)
Expands on disorders of small animal urinary system. Introduction to core and to additional disorders.
VMED 5291. Independent Study in Veterinary Medicine. (2 cr; Stdnt Opt. Prereq–DVM, *)
Arranged independent study in a clinical area of veterinary medicine.
VMED 5293. Directed Studies in Comparative Medicine and Pathology. (1-4 cr [max 8 cr]; A-F or Aud. Prereq–Grad student, *)
Directed studies arranged between student and instructor.
VMED 5295. Problems in Large Animal Clinical Medicine/Surgery and Theriogenology. (1 cr [max 3 cr]; A-F or Aud. Prereq–VMED grad student, possess DVM)
Hospital cases using standardized format, audiovisual aids. Review literature pertinent to case. One or two cases presented by enrolled participants per month.
VMED 5310. Topics in Veterinary Clinical Pathology. (1 cr [max 2 cr]; S-N only, Prereq–Grad student in CVM)
Modified rounds format. Cases from VMC used to explore cytology with associated chemistry/hematology data. Attendees/clinicians can request lab topics for discussion. Past topics have included lab measurement of chemical analytes, test sensitivity or specificity (e.g., ethylene glycol test, FELV test), lab testing for infectious agents.
VMED 5319. Veterinary Gross Pathology. (1 cr [max 3 cr]; S-N only, Prereq–Grad student in CMB or [VMED, [DVM degree or foreign equiv], @])
Diagnosing gross lesions of tissues. Evaluating images from wide variety of animals submitted to lab. Mock exams. Students prepare two in-depth reviews on topics covered during in course.
VMED 5320. Advanced Veterinary Systemic Pathology I. (3 cr; A-F only. Prereq–Grad student in VMED or [CMB, [DVM degree or foreign equiv] or *)
Students review/summarize topics in systemic pathology using veterinary pathology textbooks and relevant updates from pathology and veterinary medical journals. Diagnostic cases in alimentary, respiratory, urinary, cardiovascular, and hematopoietic system pathology. Students give 10-15 presentations with handouts for other students.
VMED 5321. Advanced Veterinary Systemic Pathology II. (3 cr; A-F only. Prereq–Grad student in VMED or [CMB, [DVM degree or foreign equiv] or *)
Students review/summarize topics in systemic pathology using veterinary pathology textbooks and relevant updates from pathology and veterinary medical journals. Diagnostic cases in alimentary, respiratory, urinary, cardiovascular, and hematopoietic system pathology. Students give 10-15 presentations with handouts for other students.
VMED 5330. Veterinary Descriptive Histopathology. (1 cr [max 2 cr]; Stdnt Opt. Prereq–Grad student in VMED or [CMB, [DVM degree or foreign equiv] or *)
Weekly, one-hour microscopic slide presentations, reviews on wide variety of diseases in domestic/non-domestic animals. Students present microscopic slide cases and prepare discussions about disease entities, differential diagnoses, and ancillary tests.
VMED 5380. Veterinary Diagnostic and Comparative Pathology. (2 cr; max 4 cr; A-F only. Prereq-[VMED/VMD or equiv degree] from a foreign institution, [resident or grad student] in [veterinary anatomic or clinical pathology], #) Diagnostic skills in gross/microscopic pathology. Students participate in necropsy services of veterinary diagnostic lab, examine carcasses from variety of animals. Case write-ups, interpretation of gross/microscopic lesions done under supervision of faculty pathologist. Students assist in supervision of veterinary students on senior necropsy rotation.

VMED 5395. Problems in Veterinary and Comparative Pathology. (3 cr; A-F only. Prereq-Grad student in CVM, [VMD degree or foreign equiv]) Case material in Veterinary Diagnostic Lab. Students investigate pathogenesis/epidemiology of selected disease condition or case-related problem agreed upon with faculty pathologist.


VMED 5420. Molecular Epidemiology of Infectious Disease. (3 cr; A-F only. Prereq-Basic course in microbiology) Impact, application, and interpretation of molecular techniques in understanding etiology, transmission, and control of infectious diseases important to animal and public health. Theoretical/practical aspects of molecular biology methods in context of epidemiological studies of infectious diseases, including bacterial/viral infections of veterinary/zoonsotic significance. Population and evolutionary genetics of pathogenic microorganisms. Data analysis/interpretation. Design of descriptive/hypothesis-driven epidemiological studies involving molecular techniques.

VMED 5493. Directed Studies in Infectious Disease. (1-4 cr; max 8 cr; A-F or Aud. Prereq-Grad student, #) Directed studies arranged between student and instructor.

VMED 5496. Training in Swine Production and Management. (4 cr; S-N only. Prereq-VMED grad student or #) Production module introduces techniques/protocols for swine production system operation. Research module covers applied research trials for viral/bacterial pathogens in pigs.

VMED 5596. Swine Diseases and Diagnostics. (2-3 cr; Stdnt Opt) Review of recent advances in swine diseases; farm visits for on-farm disease diagnostics and control programs.


VMED 5621. Principles of Veterinary Anesthesiology. (2 cr; A-F only. Prereq-VMed grad student, [VMD degree or foreign equiv], instr consent) In-depth training in principles of veterinary anesthesiology. Lectures, anesthesia labs, presentations by students.

VMED 5670. Bovine Surgery Practicum. (2 cr; S-N only. Prereq-[VMed grad student, [VMD or equiv foreign degree]] or #) Intensive training in ruminant surgery. Evaluation of food animal surgery principles, hands-on laboratory components.

VMED 5691. Independent Research in Veterinary Anesthesiology. (1-6 cr; max 6 cr; A-F or Aud. Prereq-[Biologic major or prevet or vet grad student], #) Independent research supervised by faculty member.

VMED 5693. Directed Studies in Surgery/Radiology/Anesthesiology. (1-4 cr; max 8 cr; A-F or Aud. Prereq-Grad student, #) Directed studies arranged between student and instructor.

VMED 5698. Directed Studies in Theriogenology. (1-4 cr; max 8 cr; A-F or Aud. Prereq-Grad student, #) Directed studies arranged between student and instructor.

VMED 5910. Grant Writing: What Makes a Winning Proposal?. (1 cr; S-N or Aud. or CMB 5910) Components of a strong proposal. Grant submission process. What reviewers look for. How to locate grant announcements that match research interests.

VMED 8090. Epidemiology of Zoonoses and Diseases Common to Animals and Humans. (3 cr; A-F or Aud. Prereq-Epidemiology and Infectious disease course or #) Major human zoonotic diseases, methods of transmission, diagnosis, control, and prevention.

VMED 8134. Ethical Conduct of Animal Research. (3 cr; A-F or Aud. Prereq. or ASC 8134, CMB 8134. Prereq-[Grad or professional school] student or #) Ethical considerations in use of animal subjects in agricultural, veterinary, and biomedical research. Federal, state, and University guidelines relating to proper conduct for acquisition/use of animals for laboratory, observational, epidemiological, and clinical research. Regulatory bases for proper conduct. Societal impact on scientific investigations utilizing animal subjects.

VMED 8195. Pre-Harvest Food Safety and Public Health Aspects of Food Animal Production. (1-3 cr; max 3 cr; Stdnt Opt) Includes presentations and discussions on on-farm HACCP principles and prudent use of antibiotics.

VMED 8201. Advanced Small Animal Veterinary Medicine. (1-5 cr; max 5 cr; A-F or Aud. Prereq.-#) Discussions of diseases of organs or systems in animals, including degenerative, psychological, anorexic, nutritional, neoplastic, immune, inflammatory, toxic, and traumatic disorders.

VMED 8202. Internal Medicine in Small Companion Animals. (1-3 cr; max 3 cr; A-F or Aud. Prereq.-#) Lectures, assigned readings, and discussions on internal medical problems of dogs and cats.

VMED 8203. Advanced Diagnosis and Therapeutics of Animal Medicine. (1-2 cr; max 2 cr; A-F or Aud. Prereq.-#) Detailed examination, treatment, and discussion of naturally occurring disease in patients admitted to Veterinary Medical Center.

VMED 8210. Seminar: Veterinary Medicine. (1 cr; Stdnt Opt. Prereq.-#) Participation and presentations of regularly scheduled seminars about internal medicine.

VMED 8220. Advanced Nephrology/Urology Clinics. (1-3 cr; max 3 cr; Stdnt Opt. Prereq.-#) Clinical investigation of naturally occurring urinary diseases in patients admitted to Veterinary Medical Center.

VMED 8230. Medical Conference. (1-3 cr; max 3 cr; Stdnt Opt. Prereq.-#) Participation in weekly conference about internal medical disorders.

VMED 8250. Problems in Acid-base, Electrolyte, and Fluid Metabolism. (2-4 cr; max 4 cr; A-F or Aud. Prereq.-#) Clinical problems and physiology of acid-base, electrolyte, and fluid disorders of dogs and cats.

VMED 8292. Journal Club: Large Animal Internal Medicine. (1 cr; max 3 cr; A-F or Aud. Prereq.-#) Students/faculty keep abreast of current literature in large animal internal medicine. Students critically evaluate the literature.

VMED 8293. Advanced Studies in Nephrology and Urology. (1-3 cr; max 3 cr; A-F or Aud. Prereq.-#) Studies of urinary tract diseases with goal of generating new knowledge.

VMED 8294. Research Studies in Nephrology and Urology. (1-3 cr; max 3 cr; Stdnt Opt. Prereq.-#) Individual research on selected problems

VMED 8296. Advanced Large Animal Veterinary Medicine. (1-3 cr; max 6 cr; A-F or Aud. Prereq.-DVM student, vet med grad student, #) Discussions of diseases of organs or systems in animals in a clinical setting.

VMED 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent) Use of medicine literature in clinical problem solving.


VMED 8393. Medical Conference. (1-3 cr; max 6 cr; A-F or Aud.) Medical, surgical, or obstetrical cases supported by anatomic, bacteriologic, pathologic, physiologic, pharmacologic, and radiologic evaluations whenever applicable.

VMED 8394. Research in Veterinary Medicine. (1-3 cr; max 5 cr; Stdnt Opt. Prereq.-#) Research problems relating to any aspect of internal medicine or to the various systems in animals.

VMED 8396. Diagnostic and Therapeutic Techniques of Animal Diseases. (1-3 cr; max 6 cr; Stdnt Opt. Prereq-DVM student, vet med grad student, #) Detailed examination, discussions, and treatments of cases of animal diseases in a clinical setting.

VMED 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

VMED 8492. Seminar: Infectious Diseases and Swine Medicine. (1 cr; max 2 cr; Stdnt Opt) Students, faculty, and guest speakers present seminars on current research in diagnosis, control, and treatment of infectious diseases.

VMED 8494. Research in Infectious Diseases. (1-3 cr; max 5 cr; Stdnt Opt) Directed research.

VMED 8495. Problems in Infectious Diseases. (1-5 cr; max 5 cr; Stdnt Opt) In-depth discussion on specific problems for various infectious diseases of farm animals.

VMED 8520. Advanced Immunology. (2 cr; Stdnt Opt) Lectures and case presentations.

VMED 8530. Advanced Swine Diseases. (2 cr; Stdnt Opt) Lectures and discussion on advances.

VMED 8592. Infectious Disease Journals: Critical Thinking. (1 cr; Stdnt Opt) Reading and critical discussion of journal articles.
VMED 8593. Advanced Veterinary Virology and Serology. (1-3 cr [max 3 cr]; Stdnt Opt) Discussion and laboratory practice.

VMED 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

VMED 8681. Advanced Small Animal Surgery. (1-3 cr [max 3 cr]; Stdnt Opt) Advanced techniques and procedures.

VMED 8682. Advanced Large Animal Surgery. (1-3 cr [max 6 cr]; A-F or Aud. Prereq–DVM or equiv degree, #) Surgery of various systems in large animals, with preoperative and postoperative evaluation and management.

VMED 8685. Surgery of the Gastrointestinal System. (2-4 cr [max 4 cr]; A-F or Aud) Advanced techniques and problems.

VMED 8684. Surgical Physiology. (1-3 cr [max 3 cr]; Stdnt Opt) Discussions on pathophysiology of surgical diseases in dogs and cats.

VMED 8685. Neurosurgery. (2-3 cr [max 3 cr]; A-F or Aud) Advanced neurosurgical diseases of small animals amenable to surgical treatment.

VMED 8686. Thoracic and Cardiovascular Surgery. (2-4 cr [max 4 cr]; A-F or Aud) Advanced thoracic and cardiovascular diseases of small animals amenable to surgical treatment.

VMED 8688. New Techniques in Large Animal Surgery. (1-6 cr [max 6 cr]; A-F or Aud, Prereq–DVM or equiv degree, #) Independent research projects.

VMED 8691. Research in Large Animal Surgery. (1-6 cr [max 6 cr]; A-F or Aud, Prereq–DVM or equiv degree, #) Research into an application, development of an application, or prospective/retrospective study of any aspect of veterinary imaging or veterinary radiotherapy.

VMED 8794. Research in Veterinary Radiology. (1-3 cr [max 3 cr]; Stdnt Opt) Research into an application, development of an application, or prospective/retrospective study of any aspect of veterinary imaging or veterinary radiotherapy.

VMED 8795. Problems in Veterinary Radiology. (1-3 cr [max 6 cr]; Stdnt Opt) Discussion of problems associated with veterinary imaging or radiation therapy.

VMED 8796. Avian Anesthesia and Orthopedic Surgery. (1-3 cr [max 3 cr]; A-F or Aud, Prereq–courses in vet pathology, vet small animal orthopedics) New techniques and procedures in large animal orthopedic surgery.

Water Resources Science (WRS)

Department of Soil, Water, and Climate

College of Food, Agricultural and Natural Resource Sciences

WRS 5101. Water Resources: Individuals and Institutions. (3 cr; Stdnt Opt. Prereq–Grad student or #) Socio-cultural, legal, and economic forces that affect use of water resources by individuals/institutions. Historical trends in water policy, resulting water laws in the United States. Institutional structures whereby water resources are managed at federal, state, and local levels.


WRS 8050. Special Topics in Water Resources Science. (1-3 cr [max 6 cr]; A-F or Aud) Directed Studies in Water Resources Science

WRS 8095. Plan B Project. (3 cr; S-N or Aud) 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) Interdisciplinary Seminar in Water Resources

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 8581. Research and Professional Ethics in Water Resources and Environmental Science. (1.5 cr; S-N or Aud. =CE 8581. Prereq–Environmental engineering or water resources science) student and adviser. Written report required.

WRS 8581. Research and Professional Ethics in Water Resources and Environmental Science. (1.5 cr; S-N or Aud. =CE 8581. Prereq–Environmental engineering or water resources science) student and adviser. Written report required.

WRS 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

WRS 8887. 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])

WRS 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)
Work and Human Resource Education (WHRE)

WHRE 5001. Survey: Human Resource Development and Adult Education. (3 cr; Stdnt Opt)
Overview of fields of human resource development and adult education. Includes societal context, theories, processes, definitions, philosophies, goals, sponsoring agencies, professional roles, participants, and resources. Focus on the unique characteristics and ways the fields overlap and enhance one another.

WHRE 5002. Thinking, Learning, and Teaching in Work and Human Resource Education. (3 cr; A-F or Aud)
Nature of thinking/learning in everyday life contexts of work and human resource education. Theory/practice relevant to stimulating/supporting thinking/learning in these contexts.

WHRE 5011W. Technology and Public Ethics. (3 cr; A-F or Aud)

WHRE 5021. Learning Through Service. (3 cr; Stdnt Opt)
Service as philosophy and as method of learning. Theory/practice of service in school-based, work-based, and community-based organizations.

WHRE 5031. Information Resources in Education. (3 cr; S-N or Aud)
Sources of knowledge and search strategies for accessing library, electronic, institutional, and informal resources of interest to educators.

WHRE 5101. Introduction to Leadership and Administration of WHRE. (3 cr; Stdnt Opt)
Finance, public relations, communications, legal aspects, leadership, personnel policies/management, program planning/development, evaluation. Inter-institutional collaboration of work and human resource education programs in school-based settings.

WHRE 5102. Leadership in WHRE. (2 cr; Stdnt Opt)
Leadership, leadership roles/responsibilities. Application to work and human resource education.

WHRE 5121. Principles of Supervisory Management. (3 cr; Stdnt Opt)
Introduction to the principles of supervision in education, business, industry, government, and service organizations.

WHRE 5131. Planning WHRE. (3 cr; Stdnt Opt)

WHRE 5141. Evaluation of WHRE. (3 cr; Stdnt Opt)
Designing/conducting project, program, and systems evaluations in work and human resource education contexts/settings.

WHRE 5201. Family and Work Relationships. (3 cr; A-F or Aud)
Examination of the interactions of work and family to prepare professionals to improve work and family relationships.

WHRE 5301. Philosophy and Practice of Career and Technical Education. (2 cr; A-F or Aud)

WHRE 5331. Coordination Techniques for Work and Human Resource Education. (3 cr; Stdnt Opt)

WHRE 5341. Global Program Delivery Techniques and Technology of Extension. (2 cr; A-F or Aud. = AFEE 5341)
Special educational activities and teaching and communications methods and techniques for youth and adults, ranging from outreach to extension services, with an emphasis on youth and adult education programs in different global settings.

WHRE 5351. Methods for Change in Developing Countries. (3 cr; A-F or Aud. = AFEE 5351)
Sociological and cultural parameters as they pertain to promoting the adoption of improved practices in rural, community, and agricultural development, including formal and informal education institutions. Project planning, implementation, and evaluation related to actual change and development situations in developing countries.

WHRE 5401. Distance Learning in Adult Education and Training. (3 cr; A-F or Aud)
Distance learning concepts, theory, history, present practice, delivery systems, course design, major issues, future directions.

WHRE 5501. Organizational Learning. (3 cr; A-F or Aud)
Theoretical, empirical, and practical aspects of learning in organizations. Historical context, Definitions, theories, and applications of organizational learning. Learning organization, knowledge management, intellectual capital.

WHRE 5511. Education for Work. (3 cr; Stdnt Opt)
Examination of contextual bases underlying education for work; implications for practice.

WHRE 5521. Work-Based Learning Policies. (2 cr; Stdnt Opt)
Aims/purposes of federal, state, and local policies, related to work-based learning.

WHRE 5522. Work-Based Learning Practices. (3 cr; Stdnt Opt)

WHRE 5601. Student and Trainee Assessment. (2 cr; A-F or Aud. = HRD 5601. Prereq.-- BIE 5601)
Developing learning progress reporting systems and tests of knowledge, affect, and processes for programs focused on instruction of skills associated with business/industry. Evaluating instructional effectiveness. Applying tests and other evaluation instruments to assess/report learning in business/industry and career/technical education fields. Students develop each type of test and an overall evaluation plan for a course.

The theory of managing and consulting in human resource development and adult education. Includes a personal assessment of role requirements and experimentation with management and consultation processes and techniques.

WHRE 5628. Multimedia Presentations in Business. (3 cr; Stdnt Opt. Prereq--5011 or equiv)
Creating, designing, and presenting information using multimedia resources in business settings.

WHRE 5629. Course Development for Business and Industry. (2 cr; A-F or Aud. = HRD 5629)
Designing instructional programs/courses that help learners develop desired competence. Designing instruction for performance based training and vocational/technical education. Developing course syllabus components that clarify course expectations. Developing academic/community-based elements that complement course goals. Reflect on and compare performance-based instruction with other curriculum models for the field.

WHRE 5661. Instructional Methods for Business and Industry. (2 cr; Stdnt Opt. Prereq-- = HRD 5661 or BIE 5661)
Theory/practice in instructional methods for career/technical education (CTE) instructors and human resources/development (HRD) professionals. How to select various teaching methods and plan for their delivery. Preparing an instructional methods plan to clarify course content, teaching methods selected, rationale for their selection, and how a student organization might facilitate student learning.

WHRE 5696. Teaching Internship: School and Classroom Settings. (2 cr; Stdnt Opt. Prereq--5696 for initial licensure program)
Part-time supervised teaching experience in a school. Seminars on managing student’s learning in context of work and human resource education programs in contemporary schools and on becoming a reflective educator.

WHRE 5698. Teaching Internship. (3 cr; max 8 cr; Stdnt Opt. Prereq--Admission to initial licensure program)
Teaching experience in a school system that provides programs for grades 5-12.

WHRE 5699. Teaching Internship: Extended. (1 cr; Stdnt Opt. = CI 5924. Prereq--5698)
Extended student teaching experience in a school system that provides programs for grades 5-12.

WHRE 5711. Teaching Entrepreneurship: Small Business Management. (3 cr; Stdnt Opt)
Methods, organization, curriculum development and modification, and implementation of educational programs for entrepreneurs.

WHRE 5801. Educating Special Populations in Work and Human Resource Education Settings. (3 cr; Stdnt Opt)
Identifying/accommodating in work and human resource education settings educational needs of students with disabilities and disadvantaged populations.

Interagency planning issues/practices relating to special populations for educational, business, and human service organization personnel, family members, and advocates.

WHRE 5803. Developmental Writing and the College Student: Theory and Practice. (3 cr; Stdnt Opt. Prereq--Bachelors degree)
WHRE 5804. Research in Postsecondary Developmental Education. (3 cr; Stdnt Opt. Prereq–Bachelor's degree, courses in [intro psych, basic stats])  Strategies for conducting three types of research that are central to developmental education: placement test validation, program evaluation, and classroom research. Students read examples and learn what constitutes best practices in each type.


WHRE 5823. Program Planning and Improvement for Special Populations in Work and Human Resource Education. (2 cr; Stdnt Opt)  Concepts, issues, and practices related to the design, implementation, and evaluation of efforts focused on developing new programs or modifying existing programs, in work and human resource education settings, for individuals with special learning needs.


WHRE 5990. Special Topics in Work and Human Resource Education. (1-4 cr [max 4 cr]; Stdnt Opt)  Topics vary.

WHRE 5993. Directed Study in WHRE. (1-4 cr [max 4 cr]; Stdnt Opt)  Self-directed study, with faculty advice, in areas not covered by regular courses.

WHRE 8001. Advanced Theory in Human Resource Development and Adult Education. (3 cr; A-F or Aud. Prereq–5001 or AdEd 5001)  Theoretical understanding of individuals and organizations as adaptive entities; roles of human resource development and adult education in mediating complex demands.

WHRE 8100. Work and Human Resource Education Colloquium. (1-3 cr [max 12 cr]; Stdnt Opt)  Selected topics of significance to work and human resource education professionals. Topics based on interest and demand.


WHRE 8143. Contemporary Workforce and Workplace Issues. (3 cr; A-F or Aud)  Workforce preparation/retraining. Impact of cultural, political, and economic changes.

WHRE 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser consent, DGS consent)

WHRE 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

WHRE 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required credit for 1st/2nd registrations, up to 12 combined cr; 4% for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

WHRE 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade)

WHRE 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

WHRE 8896. Internship. (1-10 cr [max 10 cr]; S-N or Aud)  Student applies for position in professional practice; individual arrangements describe specific responsibilities during internship. Ed.D. program requirement.


WHRE 8915. Ethics and Responsible Research. (1 cr; A-F or Aud)  Introduction to ethical/legal issues involved in practicing responsible educational research. Key issues, formal/informal codes of conduct, ethical reasoning.

WHRE 8990. Research Seminar. (1 cr [max 6 cr]; S-N or Aud. Prereq–8911, 8912 or 8913 or 8914)  Developing, reporting, and evaluating research. Participants make and react to presentations. (Two credits counted in doctoral program.)

Writing Studies (WRIT)


WRIT 5052. Graduate Research Presentations and Conference Writing for Non-Native Speakers of English. (3 cr; Stdnt Opt. Prereq–Grad student, non-native speaker of English or #)  Practice in writing/presenting graduate-level research for conferences or professional seminars. Delivery of professional academic presentations to U.S. audiences. Conference abstract, paper, and poster presentation. Communication in research process. Students select topics from their own research/studies. Format, style, transitions, topic narrowing, non-verbal presentation skills.

WRIT 5111. Information Design: Theory and Practice I. (3 cr; A-F or Aud. Prereq–Grad student or #)  Audience analysis, media selection, message design through various theoretical perspectives, including cognitive/schema, social construction, feminist, intercultural theories. Usability testing, contextual inquiry as means to study effectiveness of messages.

WRIT 5112. Information Design: Theory and Practice II. (3 cr; A-F or Aud. Prereq–Grad student or #)  Political, economic, social, and technical aspects of media selection and message design. Media analyses, scripts, budgets, treatments, project-design plans, interactive screens. Online design project.

WRIT 5196. Internship in Scientific and Technical Communication. (3-6 cr [max 6 cr]; S-N or Aud. Prereq–STC grad or #)  Internship sites may include the University, industry, or government agencies. An internship proposal, progress report, internship journal (optional), and final report with a letter from the internship supervisor are required.

WRIT 5270. Special Topics. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–([STC or RSTC] [major or grad student]), #)  Topics specified in Class Schedule.

WRIT 5291. Independent Study. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq–#)  Supervised reading/research on advanced projects not covered in regularly scheduled offerings.


WRIT 5531. Introduction to Writing Instruction: Composition Pedagogy. (3 cr; A-F or Aud. Prereq–Grad student)  Pedagogical philosophy/methodology in composition, primarily first-year writing. Introduction to theories underlying teaching/tutoring with technology.

WRIT 5532. Scientific and Technical Communication Course Development and Pedagogy II. (1 cr; A-F or Aud. Prereq–5531 or #)  Mentor with faculty, usually concurrently with student’s first teaching assignment. Student shares observations, solves teaching problems in seminar setting. Issues facing new teachers. Developing a philosophy of teaching. Focuses on evaluating work in classroom.

WRIT 5534. Designing Technical Training for Intercultural Audiences. (3 cr; A-F or Aud)  Select and research a training topic, write learning objectives and outcomes, set the conditions for learning, complete a comprehensive course outline, and one training module.

For definitions of course numbers, symbols, and abbreviations, see page 214. 397
WRIT 5561. Editing and Style for Technical Communicators. (3 cr; A-F only. Prereq.—Grad student, knowledge of grammar/punctuation rules or #) 
Proofreading, copyediting. Students use primarily electronic editing methods in assignments. Editor's responsibilities, relationship to writer, and roles within an organization. Style guides, technical editing, ethical choices, editing in a global setting. Editing/style for visual design and online documents.

WRIT 5570. Minnesota Writing Project Directed Studies. (1-3 cr [max 9 cr]; A-F or Aud) 
Guided individual research into current theories/practices of writing and writing pedagogy.

WRIT 5664. Science Writing for Popular Audiences. (3 cr; A-F or Aud. Prereq.—Rhet 3562 or #) 
How science is “translated” for popular audiences. Rhetorical theory used to critique popularized articles. Developing a heuristic for writing articles. Controversial issues surrounding movement from science as “science” to science as “popular.”

WRIT 5671. Visual Rhetoric. (3 cr; A-F only. Prereq.—Jr or Sr grad student) 
Range/development of visuals, especially those in science/technology. Vocabulary for commenting on, criticizing, and creating visuals.

WRIT 5775. Major Figures in Rhetorical Tradition: Classical Period. (3 cr; A-F only) 
Classical theories of rhetoric. Epistemological status of rhetoric. Ethical implications of persuasion. Emphasizes “Aristotle’s Rhetoric” as founding document. Other figures (e.g., Plato, Isocrates, Cicero, Quintilian).

WRIT 5776. Major Figures in Rhetorical Tradition: Modern Era. (3 cr; A-F or Aud) 

WRIT 5777. Rhetoric of Science. (3 cr; A-F only) 
Relationship between rhetorical theory/science. Readings typically include works by rhetoricians, sociologists, historians, and philosophers on role that rhetoric/language play in establishing scientific claims.

WRIT 8011. Research Methods in Rhetoric and Scientific and Technical Communication. (3 cr; A-F or Aud. Prereq.—STC/STSC grad or #) 
Quantitative/qualitative research methods. Theoretical perspectives that demonstrate/test analytical approaches to scientific/technological rhetoric.

Introduction to one or two quantitative or qualitative research methods in scientific/technical communication or rhetoric (e.g., ethnography, case studies, discourse analysis).

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

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

WRIT 8505. Professional Practice. (3 cr; A-F or Aud. Prereq.—STC/STSC grad student, %, #) 
Extended problem involving situation in business, government, or industry. Student acts as consultant to explore problem, identify possible solutions, introduce solution, apply it.

WRIT 8510. Topics in Rhetorical Theory, History, and Criticism. (3 cr [max 12 cr]; A-F or Aud. Prereq.—Rhet 5775 or equiv) 
Rhetorical theory in context of culture influenced by science/technology. Topics vary. See Class Schedule.

WRIT 8520. Topics in Science and Rhetoric. (3 cr [max 12 cr]; A-F or Aud) 
Doctoral seminar concerning relationship between rhetoric and science. Topics vary. See Class Schedule.

WRIT 8530. Topics in Feminist Theory in Science, Technology, and Communication. (3 cr [max 12 cr]; A-F only) 
Doctoral seminar on interaction of gender with science/technology. Topics vary. See Class Schedule.

WRIT 8540. Topics in Scientific and Technical Communication Pedagogy. (3 cr [max 12 cr]; A-F or Aud) 
Doctoral seminar on theories of pedagogy/research studies that inform technical/scientific classroom/workplace. Topics vary. See Class Schedule.

WRIT 8550. Topics in Technology and Culture. (3 cr [max 12 cr]; A-F or Aud) 
Doctoral seminar on computer-mediated communication, democracy/technology, controversies over digital communication, privacy/ethical issues. Topics vary. See Class Schedule.

WRIT 8560. Topics in Writing Studies. (3 cr [max 12 cr]; A-F only. Prereq.—Grad student) 
Doctoral seminar in writing studies theories/practices. Topics vary. See Class Schedule.

WRIT 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq.—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)

WRIT 8775. Classical Rhetorical Theory. (3 cr [max 12 cr]; A-F or Aud) 
Aristotle’s “Rhetoric” in context of its times and of Aristotle’s other works, especially “The Ethics” and “The Politics.”

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

WRIT 8792. Directed Readings. (1-4 cr [max 12 cr]; S-N only. Prereq.— #)
Weekly discussion seminar taken concurrently with 5101 to integrate theory and praxis with youth work experience. Written and experimental assignments to increase knowledge, competency, and skills related to working with youth.

WRIT 5034. Adolescent and Youth Development for Youthworkers. (4 cr; Stdnt Opt. YOST 5032. Prereq.—[1001 or 2001 or 2002W or 2101, any Psych or CPsy course]) 
Application of theory/research about children/adolescents. How findings/theories facilitate understanding of behavior.

YOST 5101. Youth Work Practice I: Internship. (3 cr; Stdnt Opt. Prereq.—5101, 5032 or equiv, & 5111, #) 
First course of a sequential internship that includes 15 hours per week working with youth in a community youth-serving organization. Opportunity to enhance competence and identity as a youth worker, and reflect on and integrate knowledge about youth with on-going experience in youth work.

YOST 5102. Youth Work Practice II: Internship. (3 cr; Stdnt Opt. Prereq.—5101, 5111, 5102, #) 
Second course of a sequential internship that includes 15 hours per week of work with youth in a community youth-serving organization. Develop and enhance competence and identity as a youth worker, and reflect on and integrate knowledge about youth with ongoing experience in youth work.

YOST 5111. Community Building, Civic Engagement, and Youth Service System. (3 cr; Stdnt Opt. Prereq.—[1001 or 2001 or 2002W or 2101], any Psych or CPsy course, #) 
Weekly discussion seminar taken concurrently with 5101 to integrate theory and praxis with youth work experience. Written and experimental assignments to increase knowledge, competency, and skills related to working with youth.

YOST 5234. Youth Agencies, Organizations, and Youth Service System. (3 cr; Stdnt Opt. YOST 5235. Prereq.—2001, one basic course in Pol, one basic course in Soc) or # 
Reciprocities between youth development and community development brought about by young people’s civic engagement. Individual, social, and political change by/for young people and their community.

YOST 5235. Community Building, Civic Engagement, and Civic Youthwork. (4 cr; Stdnt Opt. YOST 5235. Prereq.—2001, one basic course in Pol, one basic course in Soc) or # 
Reciprocities between youth development and community development brought about by young people’s civic engagement. Individual, social, and political change by/for young people and their community.

YOST 5240. Special Topics in Youth Studies. (2 cr [max 10 cr]; Stdnt Opt. YOST 3240. Prereq.—Two soc/anth courses, work experience in [youth agency or org] or #) 
Comunities/governmental responses to young people as potential problems through agencies/programs and other organizational forms. Purpose, structure, activities of such forms. How forms are/are not integrated into youth service systems.

YOST 5255. Community Building, Civic Engagement, and Civic Youthwork. (4 cr; Stdnt Opt. YOST 5255. Prereq.—2001, one basic course in Pol, one basic course in Soc) or # 
Reciprocities between youth development and community development brought about by young people’s civic engagement. Individual, social, and political change by/for young people and their community.

YOST 5241. Experiential Learning. (4 cr; Stdnt Opt. YOST 5241. Prereq.—[1001, 2001 or 2002W or 2101]) 
In-depth investigation of one area of youth studies. Teaching procedure and approach determined by specific topic and student needs. Topic announced in advance.

YOST 5245. Youth Work Practice II: Internship. (3 cr; Stdnt Opt. YOST 5245. Prereq.—[1001 or 2001 or 2002W or 2101]) 
First course of a sequential internship that includes 15 hours per week working with youth in a community youth-serving organization. Opportunity to enhance competence and identity as a youth worker, and reflect on and integrate knowledge about youth with on-going experience in youth work.
YOST 5301. Communicating With Adolescents About Sexuality. (3 cr; Stdnt Opt. Prereq–Upper div AdPy course, exper working with youth or #)
How to communicate sensitively/effectively with adolescents and their concerned persons about sexuality in everyday life. Healthy sexual development (physical, emotional, ethical), sexual diversities. Gender/body image, disease, sexual violence, intimacy, sex in cyberspace.

YOST 5313. Direct Work with Adolescents. (2 cr; Stdnt Opt. Prereq–Two social sci courses, exper working with youth or #)
Designed to give an understanding of direct work with troubled and at-risk adolescents in a wide range of settings where youth workers or social workers are typically involved. Emphasis on young people in groups in the “lifespace” in everyday life, rather than in one-to-one office-based interactions.

YOST 5314. Theatre Activities in Youthwork and Education. (2 cr; Stdnt Opt. =YOST 4314. Prereq–1001 or 2101)

YOST 5315. Youthwork in Schools. (4 cr; Stdnt Opt. =YOST 4315. Prereq–Introductory course in education or #)
Craft of youthwork as a framework to understand life-worlds of young people and a practice to enhance healthy development. How young people often make artificially/harmfully divide their lives into school and not school.

YOST 5319. Understanding Youth Subcultures. (3 cr; Stdnt Opt. =YOST 4319. Prereq–2001 or one course each in [Anth, Soc] or #)
Young people’s participation in and understanding of subcultures, life-styles, and event cultures. Place of these in young people’s identity, friendship, and life chances.

YOST 5321. Work With Youth: Individual. (2 cr; Stdnt Opt. =YOST 4321. Prereq–1001 or 2002W or #)
Basic assumptions underlying individual work with youth. Special issues/concerns of adolescents and of persons who work with them, especially those who work with youth in one-to-one interactions.

YOST 5322. Work With Youth: Families. (2 cr; Stdnt Opt. =YOST 4322. Prereq–1001 or 2002W or #)
Theories/techniques of working with youth and their families. Practical methods of structural change. Developing effective communication. Decision-making/problem-solving systems. Winning the family’s cooperation. Role of professional in influencing healthy family development.

YOST 5323. Work with Youth--Groups. (2 cr; Stdnt Opt. =YOST 4323. Prereq–1001 or 2002W or #)
Social group work. Adolescent group needs/associations. Group process. Working with diverse groups of youth in community, in group living situations, and in group therapy.

YOST 5401. Young People’s Spirituality and Youthwork: an Introduction. (4 cr; A-F or Aud. =YOST 4401W. Prereq–[2001, one course each in [Anth, Soc, CPsy]] or #)
Adolescent spirituality, its relation to working with young people. Faith/spirituality as actual/necessary aspects of healthy youth development. Research, active community-based programs. Knowledge, attitudes, and skills to meet adolescent needs/wants.

Youth policy as formulated in response to youth issues, problems, and community/public concerns. Policy as political response to youth panics, as indirect youthwork, and as a community’s moral compact with its young people. Perspectives are explored specific to student interests.
## Course Designators

The following is an alphabetical list of course designators and their referents under which courses are organized within the Courses section of this catalog. The list is provided to help students find the full description of prerequisite courses and identify the programs to which the courses apply. Directly following each designator and its referent is a “see” note in cases where the program name or names differ from the referent. For example, courses in physiology (PHSL) pertain to the cellular and integrative physiology program. Courses in fields that do not offer graduate programs, but which may be taken for graduate credit if related to a student’s program, also appear in the course section; their designators and referents below are followed by “related courses.”

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