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

Course Numbers
0xxx......Courses that do not carry credit toward any University degree.
1xxx......Courses primarily for undergraduate students in their first year of study.
2xxx......Courses primarily for undergraduate students in their second year of study.
3xxx......Courses primarily for undergraduate students in their third year of study.
4xxx......Courses primarily for undergraduate students in their fourth year of study; graduate students may enroll in such courses for degree credit. 4xxx courses can be counted for a Graduate School degree if the course is taught by a member of the graduate faculty or an individual appointed to Limited Teaching Status (LTS).
5xxx......Courses primarily for graduate students; undergraduate students in their third or fourth year may enroll in such courses.

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

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

Abbreviations
The following abbreviations are used throughout the course prerequisites of most University catalogs to denote common and recurring items of information.

Prereq..........Course prerequisites.
cr ...............Credit.
div ..............Division.
DUS .............Director of undergraduate studies.
equiv ..........Equivalent.
fr, soph, jr, sr .Freshman, sophomore, junior, senior.
H ...............Honors. Courses with an H following the course number satisfy honors requirements.
V ...............Honors and Writing Intensive. Courses with a V following the course number satisfy both honors and liberal education writing intensive requirements.
W ...............Writing Intensive. Courses with a W following the course number satisfy the writing intensive requirement for liberal education.
A-F only ........A-F grade basis only; course may not be audited or take pass/fail
A-F or Aud ......A-F grade basis, or course may be audited for no grade
S-N only ........S-N grade basis only (pass/fail), course may not be audited or taken A-F
S-N or Aud .....S-N grade basis (pass/fail), or course may be audited for no grade
No Grade ......No grade will be given for the course; typically used for laboratory components of courses
OPT No Aud .Student selects the grading option; course may not be audited
Stdnt Opt ......Student selects the grading option; course may be audited

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. 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.
Prerequisite information
ACCT 5101. Intermediate Accounting I. (4.0 cr.; A-F or Audit; prereq Grade of at least B- in 2050, mgmt major or mgmt grad student, accounting certificate, select non mgmt students; fall, spring, every year) Valuation, measurement, reporting issues related to selected assets/liabilities of firm. Theory underlying accounting issues. Applying accounting principles.

ACCT 5102W. Intermediate Accounting II. (4.0 cr.; A-F or Audit; prereq 5101 [mgmt or grad mgmt student]; fall, spring, every year) Basic valuation problems encountered in financial reporting. Focuses on valuation of liabilities. Accounting for leases, pensions, and deferred taxes. Introduces consolidated financial statements.

ACCT 5237. Foreign National Tax Consulting. (2.0 cr.; S-N only; prereq 5135, accounting major; spring, every year) Tax return preparation/consulting experience. Partnership between U, IRS, Minnesota 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 5320. Current Topics in Accounting. (2.0 cr.; S-N only; fall, spring, every year) Topics vary.
ACCT 8331. Theory of Contracts I: Moral Hazard and Adverse Selection. (2.0 cr.; fall, spring, every year)

Foundational models of moral hazard, models with adverse selection, from theoretical economics literature. How models have been applied to fundamental issues in accounting research.

ACCT 8332. Theory of Contracts II: Renegotiation and Incomplete Contracting. (2.0 cr.; fall, spring, every year)

How theoretical economics literature has introduced contraction frictions such as incompleteness/renegotiation. How these frictions have been applied to issues in accounting research.

ACCT 8892. Readings in Accounting. (1.0-8.0 cr. [max 16.0 cr.]; prereq Business admin PhD student or #; fall, spring, summer, every year)

Readings appropriate to an individual student's program or objectives that are not available in regular courses.

ACCT 8894. Research in Accounting. (1.0-8.0 cr. [max 16.0 cr.]; prereq Business admin PhD student or #; fall, spring, summer, every year)

Individual research on an approved topic appropriate to student's program and objectives.

Addiction Studies (ADDS)

College of Continuing Education

ADDS 5011. Foundations in Addiction Studies. (2.0 cr.; A-F only; fall, spring, summer, every year)

Theoretical perspectives/concepts related to etiology of alcohol/drug dependency/abuse.

ADDS 5021. Introduction to Evidence Based Practices and the Helping Relationship. (3.0 cr.; A-F or Audit; fall, spring, summer, every year)


ADDS 5031. Applied Psychopharmacology. (2.0 cr.; A-F or Audit; fall, spring, every year)

Categories of psychoactive drugs. Medicines to treat mental disorders. Substances such as alcohol, nicotine, cocaine, and marijuana. What occurs physiologically when someone takes a psychoactive drug.

ADDS 5041. Methods and Models I: Motivational Counseling. (2.0 cr.; A-F or Audit; prereq 5021; fall, spring, summer, every year)


ADDS 5051. Methods and Models II: Cognitive Behavioral Therapy. (2.0 cr.; A-F or Audit; prereq 5021; fall, spring, summer, every year)

Components of cognitive model. Assessment, case formulation, automatic thoughts, core beliefs, cognitive restructuring, behavior change elements, therapeutic relationship. Learn, practice, master key concepts.

ADDS 5061. Foundations of Group Work. (3.0 cr.; A-F or Audit; prereq ADDS 5021; fall, spring, every year)

Designing/facilitating therapy groups. Intra-/inter-personal dynamics, leadership skills, developmental issues.

ADDS 5071. Foundations of Co-occurring Disorders. (2.0 cr.; A-F or Audit; fall, spring, summer, every year)

Understanding mentally ill/chemically abusive or dependent client. Intervention, advocacy, education, support for client/those part of his/her environment. Social, environmental, multicultural factors that contribute resources for these clients.

ADDS 5081. Multicultural Foundations of Behavioral Health. (3.0 cr.; A-F or Audit; fall, spring, every year)

What is culture? How might culture, cultural practices, and history be significant in the use/abuse of substances? How is culture relevant to the attitudes/practices in the prevention/treatment of substance use/abuse? Multicultural counseling and cultural competence in addiction counseling. People as individuals. Clinician's own cultural worldview/other cultural worldviews.

ADDS 5091. Assessment and Treatment Planning I. (3.0 cr.; A-F or Audit; prereq [5001 or 5011], 5021, [5003 or 5031]; fall, spring, summer, every year)

Core addictions counseling. Clinical assessment, case management, documentation treatment planning, ethical issues. Students begin process of securing internship.

ADDS 5224. Integrating Spirituality in Counseling Practice. (2.0 cr.; A-F only; fall, spring, summer, every year)

Knowledge/skills of counseling students/practitioners in professional competencies for addressing spiritual/religious issues. Lecture, discussion, experiential exercises/readings to advance cognitive, interpersonal/practical skills. Treatment of persons with co-occurring disorders.

ADDS 5950. Special Topics. (1.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)

Special topics in addiction studies.

ADDS 5993. Directed Study. (1.0-3.0 cr. [max 9.0 cr.]; prereq %; fall, spring, summer, every year)

Directed study.

ADDS 5994. Directed Research. (1.0-3.0 cr. [max 9.0 cr.]; A-F only; prereq %; fall, spring, summer, every year)

Directed research.

ADDS 5996. Internship in Substance Abuse Counseling. (1.0-8.0 cr.; S-N or Audit; prereq [5001 or 5011], [5021, 5003 or 5031], [5002 or 5041], [4001 or 5091]; %; fall, spring, summer, every year)

Supervised field work experience. Practical application of substance abuse counseling. Assessment, treatment planning, case management.

ADPY 5515. Neuropsychology: University Hospitals. (3.0-9.0 cr.; O-N or Audit; fall, every year)

ADPY 8205. Special Assignments. (1.0-16.0 cr.; )

ADPY 8206. Research. (1.0-16.0 cr.; spring, summer, every year)

ADPY 8249. Clinical Neuropsychopharmacology. (1.0-15.0 cr.; prereq Resident status or 3rd- or 4th-yr med student or 8248 for grad students; )

The course is designed for a two-day presentation, 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 anti-anxiety agents; clinical picture of depression, use of antidepressants, and principles of drug combinations; schizophrenia diagnosis, use of antipsychotic drugs, antiparkinson medication, parkinson side effects of neuroleptics, and tardive dyskinesia; clinical evaluation of epilepsy and use of anticonvulsants; neuropsychopharmacology of sleep, prescription of hypnotics and sedatives, and significance of over-the-counter sleep aids; use of anorexients, over-the-counter appetite suppressants, and opiate analogics; geriatric psychopharmacology; classification of drug side effects and principles of drug interaction; abused drugs; and ethnopsychopharmacology.

ADPY 8970. Directed Studies. (1.0-24.0 cr.; )

spring, summer, every year)

Aerospace Engineering and Mechanics (AEM)

College of Science and Engineering

AEM 5245. Hypersonic Aerodynamics. (3.0 cr.; A-F or Audit; prereq 4202, [grad student or upper div CSE]; spring, offered periodically)


AEM 5251. Computational Fluid Mechanics. (3.0 cr.; A-F or Audit; prereq [4201 or equiv],

Directed research.
AEM 5321. Modern Feedback Control. (3.0 cr.; cr prereq 4321 or EE 4231 or ME 5281 or equiv; fall, every year) State space theory for multiple-input-multiple-output aerospace systems. Singular value decomposition technique, applications to performance/robustness. Linear quadratic gaussian and eigenstructure assignment design methods. Topics in $\infty$-infinity. Applications.


AEM 5401. Intermediate Dynamics. (3.0 cr.; A-F or Audit; cr prereq CSE upper div or grad, 2012, Math 2243; fall, every year) Three-dimensional Newtonian mechanics, kinematics of rigid bodies, dynamics of rigid bodies, generalized coordinates, holonomic constraints, Lagrange equations, applications.


AEM 5451. Optimal Estimation. (3.0 cr.; A-F or Audit; cr prereq 4321 or EE 4231 or ME 5281 or equiv; fall, spring, offered periodically) Basic probability theory. Batch/recurrsive least squares estimation. Filtering of linear/nonlinear systems using Kalman and extended Kalman filters. Applications to sensor fusion, fault detection, and system identification.

AEM 5495. Topics in Aerospace Systems. (1.0-4.0 cr.; A-F or Audit; cr prereq #; fall, spring, summer, every year) Topics of current interest. Individual projects with faculty sponsor.

AEM 5501. Continuum Mechanics. (3.0 cr.; cr prereq CSE upper div or grad, 3031, Math 2243 or equiv or #; fall, every year) Concepts common to all continuous media; elements of tangent 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. (3.0 cr.; A-F or Audit; cr prereq 4501 or equiv, Math 2263 or equiv or #; spring, every year) 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. (3.0 cr.; A-F or Audit; cr prereq 4202, 4301, [grad student or CSE upper div]; fall, every year) Static aeroelastic phenomena, torsional divergence of a lifting surface, control surface reversal. Aeroelastic flutter, unstable aerodynamics. Problems of gust response, buffetting. Design project.

AEM 8000. Seminar: Aerospace Engineering and Mechanics. (1.0 cr. [max 4.0 cr.]; S-N or Audit; cr prereq DGS consent; fall, spring, every year) To be determined

AEM 8201. Fluid Mechanics I. (3.0 cr.; cr prereq 4201 or equiv, Math 2263 or equiv; fall, every year) 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. (3.0 cr.; cr prereq 8201; spring, every year) Analysis of incompressible viscous flow; creeping flows; boundary layer flow.

AEM 8203. Fluid Mechanics III. (3.0 cr.; cr prereq 8202; fall, every year) Analysis of compressible flow and shock waves; method of characteristics for one-dimensional unsteady flow and for two-dimensional steady flow.


AEM 8211. Theory of Turbulence I. (3.0 cr.; cr prereq 8202; ) Reynolds equations, methods of averaging, elements of stability theory and vortex dynamics; description of large vortical structures in mixing layers and boundary layers; horseshoe vortices; flow visualization.

AEM 8212. Theory of Turbulence II. (3.0 cr.; cr 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. (3.0 cr.; cr 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. (3.0 cr.; cr [ME 8361]; cr prereq [4201 or equiv]; cr [4203 or equiv]; [ME 3324 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. (3.0 cr.; cr prereq 8202 or #) Method of matched asymptotic expansions presented through simple examples and applied to viscous flows at high and low Reynolds numbers and other problems in fluid mechanics and applied mathematics.

AEM 8251. Finite-Volume Methods in Computational Fluid Dynamics. (3.0 cr.; cr prereq 4201 or 8201 or equiv, CSci 1107 or equiv; spring, offered periodically) 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 8261. Nonlinear Waves in Mechanics. (3.0 cr.; cr prereq 5501 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. (3.0 cr.; cr prereq 4201; #) 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. Signal processing and uncertainty; computer control of experiments.
AEM 8295. Selected Topics in Fluid Mechanics. (1.0-4.0 cr. [max 8.0 cr.]; prereq %; fall, spring, summer, offered periodically) Includes individual student projects completed under guidance of a faculty sponsor.

AEM 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

AEM 8400. Seminar: Aerospace Systems. (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq Aerosp Eng grad student; fall, spring, every year) Developing program of research in aerospace systems. Discussions of current research/topics of interest.


AEM 8412. Robust Multivariable Control Design. (3.0 cr.; prereq 5321 or equiv; spring, offered periodically) Application of robust control theory to aerospace systems. Role of model uncertainty/modeling errors in design process. Control analysis and synthesis, including H[sub2] and H[infinity symbol] optimal control design and structural singular value [Greek letter mu] techniques.

AEM 8423. Convex Optimization Methods in Control. (3.0 cr.; A-F or Audit; prereq 5321 or EE 5231 or equiv; fall, offered periodically) Practical aspects of convex optimization methods applied to solve design/analyzer problems in control theory.

AEM 8426. Optimization and System Sciences. (3.0 cr.; A-F or Audit; prereq 5321 or 5431, CSE grad student; fall, offered periodically) Review of probability concepts and random variables, nonlinear stochastic differential equations and their numerical solutions, Monte-Carlo simulations, Gauss-Markov process, stochastic dynamic programming, and optimal control of practical uncertain dynamic systems.


AEM 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

AEM 8451. System Identification: Theory and Applications. (3.0 cr.; A-F or Aud; prereq 4321 or equiv; spring, offered periodically) Modeling methods for dynamic systems using measurement data, or in combination with first principles, based on theory of systems/signals. Primary emphasis on linear systems for control system design/simulation applications. Examples from aerospace applications.

AEM 8495. Advanced Topics in Aerospace Systems. (1.0-4.0 cr. [max 9.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year) Individual student projects completed under guidance of a faculty sponsor.

AEM 8500. Research Seminar in Mechanics of Materials. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Seminars given by students, faculty, and visitors on topics drawn from current research.

AEM 8511. Advanced Topics in Continuum Mechanics. (3.0 cr. [max 6.0 cr.]; A-F or Audit; 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. (3.0 cr.; A-F or Audit; prereq 5503; ) Contact stresses, finite deformations, and other topics.

AEM 8523. Elastodynamics. (3.0 cr.; A-F or Audit; 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. (3.0 cr.; A-F or Audit; prereq 5503 or #; fall, spring, offered periodically) Theories of mechanical breakdown. Kinetic rate theories and instability considerations; formation of equilibrium cracks and circular crack propagation under pulses; statistical aspects of strength and fracture of micromolecular systems; time and temperature dependency in fracture problems and instability of compressed material systems.

AEM 8533. Theory of Plasticity. (3.0 cr.; prereq 5203 or #; ) Theory of permanent deformation of ductile metals; bi-linear material models, Drucker’s three bar truss, and other examples; 3-D continuum formulation, yield surfaces, hardening rules, and material stability; slip line theory. Prandtl punch solution; single crystal plasticity.

AEM 8541. Mechanics of Crystalline Solids. (3.0 cr.; prereq 5501 or #; ) Atomic theory of crystals and origins of stress in crystals. Relation between atomic and continuum description; phase transformations and analysis of microstructure; effects of shear stress, pressure, temperature, electromagnetic fields, and composition on transformation temperatures and microstructure; interfacial energy in solids.

AEM 8551. Multiscale Methods for Bridging Length and Time Scales. (3.0 cr.; A-F or Audit; prereq Basic knowledge of [continuum mechanics, atomic forces], familiarity with partial differential equations, grad student in [engineering or mathematics or physics]; ) Classical/emerging techniques for bridging length/time scales. Nonlinear thermoelasticity, viscous fluids, and micromagnetics from macro/atomic viewpoints. Statistical mechanics, kinetic theory of gases, weak convergence methods, quasicontinuum, effective Hamiltonians, MD, new methods for bridging time scales.

AEM 8555. Selected Topics in Mechanics and Materials. (1.0-4.0 cr. [max 8.0 cr.]; prereq %; fall, spring, summer, every year) Includes individual student projects completed under guidance of a faculty sponsor.

AEM 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) To be determined

AEM 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr required total [Plan A only]; fall, spring, summer, every year) (No description)

AEM 8880. Plan B Project. (1.0-3.0 cr.; prereq Grad aerospace engineering or mechanics major, %; fall, spring, summer, every year) (No description)
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AFRO 5103. World History and Africa. (3.0 cr.; A-F or Audit; =AFRO 3103; prereq Grad student or #; fall, every year) Contributions of African American thinkers to making of African history/strategies to rework theoretical/analytical foundations of world history. Writings/intellectual networks of major thinkers whose historical/ethnographic works on Africa spanning nineteenth to twentieth century.


AFRO 5181W. Blacks in American Theatre. (3.0 cr.; =TH 5181W; spring, offered periodically) Historical survey of significant events in development of American black theater traditions. Essays, plays, playwrights, and theaters from early colonial references to the Black Arts Movement.

AFRO 5182. Contemporary Black Theatre: 1960-Present. (3.0 cr.; =TH 5182; fall, every year) Essays, plays, playwrights, and theaters that have contributed significantly to contemporary black theater. From the beginning of the Black Arts movement to the present.

AFRO 5191. Seminar: The African American Experience in South Africa. (3.0 cr.; =HIST 5438; fall, spring, offered periodically) Ideological, political, religious, and cultural ties that have informed African American and Black South African relations from late 18th century to present.

AFRO 5406. Black Feminist Thought. (3.0 cr.; =AFRO 4406; spring, offered periodically) Critically examine spatiality of African descendant women in Americas/larger black diaspora. Writings from black feminist/queer geographies, history, contemporary cultural criticism. Recent black feminist theorizing.

AFRO 5551. Methods: Use of Oral Traditions as Resources for History. (3.0 cr.; ) Use of spoken information through time as a source for writing history. Use of canons of history to analyze and critique oral traditions and integrate them into written history.


AFRO 5627. Seminar: Harlem Renaissance. (3.0 cr.; =AFRO 3627, ARTH 3627, ENGL 5597; prereq Grad student or #; fall, every year) Review Harlem Renaissance from variety of perspectives. Literary, historical, cultural, political, international. Complex patterns of permutation/interdependency between worlds inside/outside of what W.E.B. Du Bois called "the Veil of Color."

AFRO 5664. Proseminar: African-American History. (3.0-4.0 cr.; prereq #; fall, spring, offered periodically) 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, region, sexuality, and religion.

AFRO 5665. Proseminar: African-American History. (3.0-4.0 cr.; prereq #; fall, spring, offered periodically) Construction of a detailed research agenda, locating appropriate depositories of primary materials and secondary sources, and developing appropriate methodologies and frameworks.


AFRO 5876. Proseminar: Approaches to African Development. (3.0 cr.; fall, spring, offered periodically) Study, critical analysis, and comparison of primary documents relevant to African development.

AFRO 5910. Topics in African American and African Studies. (3.0 cr. [max 9.0 cr.]; fall, spring, summer, every year) Topics vary by instructor.

AFRO 5932. The Production of Knowledge, Negotiating the Past, and the Writing of African Histories. (3.0 cr.; A-F or Audit; =HIST 5932; prereq Grad student or #; fall, spring, offered periodically) Recent scholarship on social history of Africa. Focuses on new literature on daily lives of ordinary people in their workplaces, communities, households.

AFRO 5993. Directed Study. (1.0-3.0 cr.; prereq #; fall, spring, summer, every year) Guided individual reading/study for qualified seniors and graduate students.

AFRO 8202. Seminar: Intellectual History of Race. (3.0 cr.; fall, spring, every year) Shifting and contested meanings of "race" from the "Age of Conquest" 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.

AFRO 8554. Seminar: Gender, Race, Nation, and Policy--Perspectives from Within the African Diaspora. (3.0 cr.; prereq #; fall, spring, every year) Interdisciplinary analysis of U.S. domestic and foreign policies as they affect Africans and peoples of African descent in the diaspora. Intersections of gender, race, nation, and class.

AFRO 8590. Figures in Contemporary Black Fiction. (3.0 cr. [max 9.0 cr.]; spring, every year) Each term focuses on works of an individual writer, such as Toni Morrison, Paule Marshall, and Jamaica Kincaid. Critical studies.

AFRO 8802. Seminar: Orientalism. (3.0 cr.; fall, spring, offered periodically) 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. (3.0 cr. [max 9.0 cr.]; fall, spring, every year) Topics specified in [Class Schedule].

Agricultural, Food, and Environmental Education (AFEE)

College of Food, Agricultural and Natural Resource Sciences

AFEE 5111W. Agricultural Education: Methods of Teaching. (4.0 cr.; fall, every year) 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. (3.0 cr.; spring, every year) Development of community school program in agriculture, agribusiness, and environmental science. Program to meet graduation outcomes and determine student needs.

AFEE 5114. Agricultural Education Teaching Seminar. (1.0 cr.; spring, every year)

AFEE 5118. Strategies for Managing and Advising the FFA Organization. (2.0 cr.; A-F or Audit; prereq Agricultural education major or #; spring, offered periodically) Strategies/techniques for advising an FFA chapter. Historical/philosophical basis of FFA, organization/structure. Integration with classroom instruction, public relations, recruitment, and administration of FFA chapters.

AFEE 5220. Special Topics in Agriculture Education and Extension. (1.0-3.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Content varies by offering.

AFEE 5231. Agricultural Education Curriculum K-12. (2.0 cr.; A-F or Audit; ) 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. (2.0 cr.; A-F or Audit; ) New developments in methodology; assessment of innovations and procedures; consideration of various levels of instruction.

AFEE 5235. Advanced Supervised Agricultural Experience Programs. (2.0 cr.; ) The organization and administration of agricultural experience programs for middle and secondary level students: career exploration, improvement projects, experiments, placement in production/business/community settings, entrepreneurship, Current state and national programs and resource material.

AFEE 5280. Current Issues for the Beginning Agricultural Education Teacher. (1.0-3.0 cr. ; spring, every year) 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 5290. Seminar: Current Issues in Agricultural Education and Extension. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Exploration of current issues in agricultural education and extension, strategies of response, implications of response actions, and related leadership roles.

AFEE 5361. World Development Problems. (3.0 cr.; =AFEE 3361; prereq Grad students only; fall, every year) Development in Third World countries. Examples of First World development problems. Population, health and disease, agriculture, industry, finance, politics, and human rights.

AFEE 5415. Seminar: Teaching Commodity Marketing Strategies. (1.0 cr. [max 4.0 cr.; ] A-F or Audit; ) 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 5697. Teaching Internship: School and Classroom Setting. (2.0 cr.; prereq WHRE 5696 for initial licensure program; fall, every year) 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.

AFEE 5698. Teaching Internship. (3.0-8.0 cr. ; prereq Admission to initial licensure program; spring, every year) Teaching experience in a school system that provides programs to grades 5-12.

AFEE 5993. Directed Study in Agricultural Education and Extension. (1.0-9.0 cr.; fall, spring, summer, every year) Topics may be chosen to permit study of areas within education or to supplement areas of inquiry not provided in the regular course structure.

AFEE 5995. Integrating Paper—Master of Education: Agricultural and Extension Education. (1.0-4.0 cr.; A-F or Audit; fall, spring, summer, every year) Students prepare paper dealing with issues in agricultural education applied to professional responsibilities.

AFEE 8090. Seminar: Agricultural Education and Extension. (1.0-3.0 cr. [max 6.0 cr.]; prereq AgEd grad student; fall, spring, offered periodically) Topics on various aspects of agricultural education. Prepare, present, and critique a report.

AFEE 8094. Research in Agricultural Education and Extension. (1.0-6.0 cr.; A-F or Audit; prereq AgEd student doing Plan B research; fall, spring, summer, every year) Select problems, prepare bibliographies, analyze and interpret data, and prepare manuscripts on studies.

Agronomy and Plant Genetics (AGRO)

College of Food, Agricultural and Natural Resource Sciences

AGRO 5121. Applied Experimental Design. (4.0 cr.; =ENT 5121; prereq Stat 5021 or equiv or #; spring, every year) 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. Research Methods in Crop Improvement and Production. (1.0 cr.; S-N or Audit; prereq applied plants sciences grad; fall, summer, every year) 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. (3.0 cr.; A-F or Audit; =ENT 5321; prereq [3xxx or above] course in [Agro or AnSc or Ent or Hort or PIPa or Soil] or #; fall, every year) Ecological approach to problems in agricultural systems. Formal methodologies of systems inquiry are developed/applied.

AGRO 5431. Applied Plant Genomics and Bioinformatics. (3.0 cr.; prereq Grad student or [genetics course, ]; fall, every year) Analysis, interpretation, visualization of large plant genomic datasets. Basic computer programming, applying large-scale genomics to answer basic/applied biological questions, understanding limitations of each application, presenting concise visual findings from large-scale datasets.

AGRO 5980. Publishing in Plant Science Journals. (2.0 cr.; S-N only; prereq #; fall, every year) Organizational/writing skills for reporting research results in a peer-reviewed journal manuscript. Publication process; choosing your journal; characteristics of good scientific writing; ethics, plagiarism, and authorship; stating your objectives; writing the different components of a manuscript; citing literature; use of tables and figures; proofreading. Written manuscript ready for submission to a plant science journal.

AGRO 5999. Special Topics: Workshop in Agronomy. (1.0-6.0 cr.; prereq Jr or sr or grad student; fall, spring, summer, every year) Workshops on various topics in agronomy and plant genetics. Presenters/faculty may include guest lecturers/experts. Topics specified in Class Schedule.

AGRO 8005. Supervised Classroom or Extension Teaching Experience. (2.0 cr.; S-N or Audit; =BBE 8005, SOIL 8005, PLPA 8005, LAAS 8005, HORT 8005; prereq Grad SENG major; #; fall, spring, every year) Classroom or extension teaching experience in one of the following departments: Agronomy and Plant Genetics; Biosystems and Agricultural Engineering; Horticultural Science; Plant Pathology; or Soil, Water, and Climate. Participation in discussions about effective teaching to strengthen skills and develop personal teaching philosophy.
AGRO 8023. Evolution of Crop Plants. (3.0 cr.; A-F or Audit; prereq 9 grad cr in ag or bio science; spring, odd years) Origin, distribution, and evolution of cultivated plants; implication of the effects of evolutionary processes on crop breeding for needs of people today.

AGRO 8201. Advanced Plant Breeding. (3.0 cr.; A-F or Audit; =HORT 8201; prereq STAT 5301 or equiv; fall, odd years) Principles/current methods involved in breeding agronomic and horticultural crops. Use of genotype/environment data to increase genetic gain, population improvement, parent building, alternative selection strategies, breeding for special traits, and new approaches.

AGRO 8202. Breeding for Quantitative Traits in Plants. (3.0 cr.; prereq [5201, STAT 5021] or #; spring, even years) Principles and concepts of population and quantitative genetics/application in designing and implementing a plant breeding program/theory, experimental approaches, and evidence that form the basis for these concepts and breeding strategies.

AGRO 8241. Chromosomal and Molecular Genetics of Plant Improvement. (3.0 cr.; prereq Introductory Genetics course; spring, odd years) Mixture of classic/current info in molecular plant genetics, biotech, and genomics. Students devise experiments in breeding, genetics, genomics, physiology, cellular/molecular biology, and other areas.

AGRO 8270. Graduate Seminar. (1.0 cr.; A-F or Audit; =HORT 8270; prereq Grad major in [applied pnt sci or agro or ent or hort or plnt brdg or plnt path or soil or #]; fall, spring, every year) Reports/discussions of problems and investigational work.

AGRO 8280. Current Topics in Applied Plant Sciences. (1.0 cr.; S-N or Audit; prereq Grad major in agro or applied plant sciences or ent or hort or plant brdg or plant path or soil or #; spring, every year) Topics presented by faculty or visiting scientists.

AGRO 8505. Advanced Perspectives in Weed Science. (2.0 cr.; A-F or Audit; prereq Grad major in agro or applied plant sciences or ent or hort or plant brdg or plant path or soil or #; spring, every year) Topics concerning the biochemistry and sustainability of chemical and biological weed control methods. Lecture and student-directed discussion.

AGRO 8900. Advanced Discussions. (1.0-3.0 cr. [max 12.0 cr.]; S-N or Audit; =HORT 8900; prereq #; fall, spring, every year) Special workshops or courses in applied plant sciences.

AKKA 5011. Elementary Akkadian I. (3.0 cr.; prereq Adv undergrads with # or grads; ) Introduction to cuneiform script. Basics of Old Babylonian morphology and syntax. Written drills, readings from Hammurabi laws, foundation inscriptions, annals, religious and epic literature.

AMIA 5012. Elementary Akkadian II. (3.0 cr.; prereq 5011; ) Continuation of 5011. Readings include The Gilgamesh Epic, The Descent of Ishtar, Mari Letters, Annals of Sennacherib and Assuraddnon, Sargon II.

AKKA 5300. Readings in Akkadian. (3.0 cr. [max 18.0 cr.]; prereq 5011, 5022; ) Survey of Akkadian literature, including literary, legal, historiographical, and sacred texts. Topics specified in Class Schedule.

American Indian Studies (AMIN) College of Liberal Arts

AMIN 5107. The Structure of Anishinaabemowin, the Ojibwe Language. (3.0 cr.; A-F or Audit; =AMIN 3107; prereq 3104; ) Analysis of grammatical structures of Anishinaabemowin.

AMIN 5108. History of Anishinaabemowin, the Ojibwe Language. (3.0 cr.; A-F or Audit; =AMIN 3108; prereq 3107 or #; ) Historical development of Anishinaabemowin.

AMIN 5109. Anishinaabe Literature. (3.0 cr.; A-F or Audit; =AMIN 3109; prereq 3107 or 5107 or #; ) Readings in Anishinaabe oral literature.

AMIN 5141. American Indian Language Planning. (3.0 cr.; A-F or Audit; =AMIN 3141; prereq 3103 or 3123 or #; ) Planning for maintenance/revitalization of North American indigenous languages. Condition/status of languages. Documentation, cultivation, literacy, education.

AMIN 5303. American Indians and Photography. (3.0 cr.; =AMIN 3303; fall, odd years) 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 agencies of those who stand behind their making.

AMIN 5402. American Indians and the Cinema. (3.0 cr.; A-F or Audit; spring, summer, every year) 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. (3.0 cr.; A-F only; fall, odd years) 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. (3.0 cr.; =AMIN 3409; fall, even years) Comparative survey of ethnographic/ethnohistorical writings by/about American Indian women.


AMIN 5590. Problems in American Indian History. (3.0 cr.; =HIST 5890; prereq #; fall, spring, offered periodically) 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. (1.0-6.0 cr. [max 9.0 cr.]; A-F or Audit; fall, spring, every year) Various topics in American Indian studies, depending upon instructor/semester.

AMIN 5991. Graduate Level Directed Studies. (1.0-6.0 cr. [max 9.0 cr.]; A-F or Audit; prereq #; spring, every year) Contact department for further information.

American Studies (AMST) College of Liberal Arts

AMST 5402. American Indians in the Cinema. (3.0 cr.; spring, every year) 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. (1.0-4.0 cr. [max 9.0 cr.]; fall, spring, offered periodically) Topics specified in Class Schedule.

AMST 8201. Historical Foundations of American Studies. (3.0 cr.; prereq grad AmSt major; fall, every year) 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. (3.0 cr.; prereq grad AmSt major or # or %; spring, every year) Analysis of central theoretical work in the field and survey of key methodologies.

AMST 8231. Cultural Fallout: The Cold War and Its Legacy, Readings. (3.0 cr.; fall, spring, every year)
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

AMST 8232. Cultural Fallout: The Cold War and Its Legacy, Research. (3.0 cr.; prereq 8231; fall, spring, every year)
Student produce 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. (3.0 cr.; fall, every year)
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. (3.0 cr. [max 9.0 cr.]; prereq #; spring, every year)
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. (3.0 cr.; fall, offered periodically)
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. (3.0 cr.; prereq 8239 or #; fall, offered periodically)
Popular arts in their political/social context. Focuses on issues of race, gender, class, and nationalism.

AMST 8259. Literature, History, and Culture: Research Strategies. (3.0 cr.; prereq #; fall, spring, offered periodically)
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. (3.0 cr.; prereq #; fall, spring, offered periodically)
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. (3.0 cr.; fall, offered periodically)
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. (3.0 cr.; prereq 8228 or #; spring, offered periodically)
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. Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

AMST 8401. Practicum in American Studies. (3.0 cr.; S-N or Audit; prereq #; fall, spring, offered periodically)
Training in teaching undergraduate courses in American studies.

AMST 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

AMST 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)

AMST 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Master’s 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; fall, spring, summer, every year)

AMST 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

AMST 8920. Topics in American Studies. (3.0-4.0 cr. [max 12.0 cr.]; fall, spring, every year)
Topics specified in Class Schedule.

AMST 8970. Independent Study in American Studies. (1.0-9.0 cr. ; prereq #; fall, spring, summer, every year)
Independent study of interdisciplinary aspects of American civilization under guidance of faculty members of various departments.

ANAT 5095. Advanced Problems in Anatomy. (1.0-6.0 cr. [max 12.0 cr.]; A-F only; prereq one or more ANAT classes; #; fall, spring, summer, every year)
Exceptional projects that do not easily fit within confines of other ANAT offerings. Examples include but not limited to individual teaching or research projects.

ANAT 5150. Human Gross Anatomy. (5.0 cr.; A-F only; prereq #; fall, every year)
Human cadaveric dissection based on traditional preparation, lab dissection, review sections, radiographic analysis, clinical correlations. Taught by residents. Extremities. Torso, head/neck. Assessment by mid-semester/final written/practical examinations.

ANAT 5525. Anatomy and Physiology of the Pelvis and Urinary System. (1.0-2.0 cr.; A-F only; = [PHSL 5525]; prereq One undergraduate anatomy course, one undergraduate physiology course, #; spring, every year)
Two-day intensive course. Pelvis, perineum, and urinary system with cadaveric dissection. Structure/function of pelvic and urinary organs, including common dysfunction and pathophysiology. Laboratory dissections, including kidneys, ureters, urinary bladder, pelvic viscera and perineum (male or female), pelvic floor, vascular and nervous structures. Grand rounds section.

ANAT 5999. Head and Neck Anatomy. (3.0 cr.; A-F or Audit; prereq #; summer, every year)

Anesthesiology (ANES) Medical School

ANES 5578. Adv Clinical Physiology I for Nurse Anesthetists. (3.0 cr.; A-F or Audit; fall, every year)
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. (3.0 cr.; A-F or Audit; prereq Advanced Clinical Physiology I for Nurse Anesthetists; spring, every year)
Respiratory physiology, acid-base physiology, gastrointestinal physiology, metabolism, endocrinology, reproductive physiology, physiology of pregnancy/labor.

ANES 5686. Chemistry and Physics for Nurse Anesthetists. (3.0 cr.; A-F or Audit; prereq General chemistry or #; summer, every year)
Chemical equilibrium, organic chemistry, physics of fluids/gases, anesthetic applications.

ANES 8269. Research in Anesthesia. (1.0 cr.; fall, spring, every year)

Animal Science (ANSC) College of Food, Agricultural and Natural Resource Sciences

ANSC 5099. Special Workshop in Animal Science. (1.0-6.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; spring, every year)
Topics vary. See Class Schedule or department. Topics may use guest lectures/experts.

**ANSC 5200. Statistical Genetics and Genomics.** (4.0 cr.; prereq [Stat 3021 or equiv]; [Bio 4003 or equiv]; fall, even years)
Data analysis. Phenotypes/DNA markers.
Parametric/non parametric linkage analysis.
Mapping quantitative trait loci (QTL). Parentage testing.

**ANSC 5305. Companion & Wild Species Reproduction.** (2.0 cr.; A-F only; prereq #; spring, every year)
Principles of reproductive physiology specific to domesticated companion canine and feline species as well as avian species. These principles discussed in the context of the management of breeding and reproductive diseases in companion species as well as conservation management in wild species.

**ANSC 5625. Nutritional Biochemistry.** (3.0 cr.; prereq BIOC 3021 or #; fall, every year)
Overview of biochemical molecules and pathways important in nutritional events.

**ANSC 5626. Nutritional Physiology.** (3.0 cr.; A-F only; spring, every year)
Whole body macronutrient metabolism as it relates to etiology of metabolic diseases. Signaling between tissues to control homeostasis. How dysregulation of crosstalk can lead to metabolic diseases. How diet, exercise, or starvation impact metabolism. Regulation of food intake and energy expenditure. Designing/analyzing/interpreting research data.

**ANSC 5700. Cell Physiology.** (4.0 cr.; A-F only; prereq [Two semesters of physics/chemistry, calculus, one semester of systems-level physiology] or #; fall, every year)
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.** (3.0 cr.; prereq #;)
Application of population genetics to livestock breeding; selection index theory and practice; basis of relationships and covariances among relatives; and selection based on multiple sources of information.

**ANSC 8121. Linear Model Methods.** (3.0 cr.; 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.

**ANSC 8134. Ethical Conduct of Animal Research.** (3.0 cr.; A-F or Audit; fVMED 8134, CMB 8134; prereq Grad student or prof school student or #; fall, every year)
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 8141. Mixed Model Methods for Genetic Analysis.** (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq 5200 or CMB 5200 or equiv; spring, odd years)
Theoretical foundation of genetic prediction, selection index theory, best linear unbiased prediction, multivariate mixed models, estimation of variance components using maximum/restricted maximum likelihood methods, genomic prediction/variance component estimation.

**ANSC 8194. Research in Animal Genetics.** (1.0-3.0 cr.; prereq #; fall, spring, summer, every year)
Research in quantitative genetics, cytogenetics, molecular genetics, and other areas related to animal breeding.

**ANSC 8211. Animal Growth and Development.** (3.0 cr.; prereq #; spring, every year)
Whole body growth of animals, bone, and adipose tissue; structure, function, differentiation, and development of tissues; mode of action of hormones, growth factors, and growth promoters.

**ANSC 8294. Research in Muscle Chemistry and Physiology.** (1.0-3.0 cr.; prereq #; fall, spring, summer, every year)
Research in selected areas.

**ANSC 8311. Animal Bioenergetics.** (3.0 cr.; A-F or Audit; prereq #; BIOC 4331 recommended; fall, spring, every year)
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.

**ANSC 8312. Protein Metabolism.** (3.0 cr.; A-F or Audit; prereq BioC 4331;)
Basic and applied concepts of protein metabolism in farm animals.

**ANSC 8320. Concepts and Developments in Nutritional Physiology.** (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq #; spring, every year)
Review and critical evaluation of pertinent scientific literature.

**ANSC 8330. Concepts and Developments in Animal Nutrition.** (1.0-2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, every year)
Review, critical evaluation of recent research reports.

**ANSC 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**ANSC 8340. Concepts and Developments in Swine Nutrition.** (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq #; fall, spring, every year)
Review and critical evaluation of scientific literature.

**ANSC 8344. Mechanisms of Hormone Action.** (2.0 cr.; prereq Course in biochemistry or cell biology or #; fall, even years)
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.** (1.0-3.0 cr.; prereq #; fall, spring, summer, every year)
Research in selected areas: topics and animal species determined by consultation.

**ANSC 8411. Physiology of Reproduction.** (3.0 cr.; A-F or Audit; prereq 3305 or equiv;)
Emphasis is on gametogenesis, conception, and implantation.

**ANSC 8421. Physiology of Fertilization and Gestation.** (3.0 cr.; prereq 3305 or #;)
Physiological events occurring during gametogenesis; capacitation and fertilization; period of the embryo; period of the fetus; and parturition.

**ANSC 8431. Immunoreproduction.** (3.0 cr.; prereq 3305 or #;)
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.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**ANSC 8451. Reproductive Endocrinology.** (2.0 cr.; A-F or Audit; prereq 3305 or 3327 or equiv, BioC 3021;)
Hormonal regulation of mammalian reproductive cycles and seasonal patterns; nutritional and stress effects on reproductive endocrinology; mechanism of hormone action.

**ANSC 8494. Research in Animal Physiology.** (1.0-3.0 cr.; prereq #; fall, spring, summer, every year)
Individual research under faculty direction. Topic determined by consultation: a specialized aspect of a thesis problem or an independent problem of mutual interest to graduate student and adviser.

**ANSC 8510. Graduate Seminar.** (1.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year)
Students attend seminars and lead a seminar, giving oral presentation of scientific data. Public speaking skills. Preparing visuals for scientific presentations. Audience critiques of presentations.

**ANSC 8594. Research in Animal Science.** (1.0-3.0 cr.; prereq #; fall, spring, summer, every year)
Research including experimental studies in disciplines associated with animal production and research, with emphasis on interdisciplinary studies.
ANTH 5031W. Ethnographies of Science. (3.0 cr.; A-F only; prereq 5030 or grad student or #; spring, odd years)

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. (3.0 cr.; prereq 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 as a whole; current debates concerning the reading and writing of ethnography.

ANTH 5041. Ecological Anthropology. (3.0 cr.; =ANTH 3041, ANTH 8213; prereq grad or #; fall, offered periodically)

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 5112. Reconstructing Hominin Behavior. (3.0 cr.; A-F or Audit; =ANTH 8112; prereq Previous coursework in Biological Anthropology or Archaeology; spring, odd years)

Major hypotheses regarding evolution of human behavior. Combine evidence from realm of biological anthropology as we consider link between bone biology/behavior. Archaeological record. Hypotheses about biocultural evolution regarding tool-use, hunting, scavenging, food sharing, grandmothers, cooking, long distance running.

ANTH 5113. Primate Evolution. (3.0 cr.; A-F only; =ANTH 8113; prereq Anthropology major, junior or senior; fall, odd years)

Evolutionary history of primates. Particular focus on origin/diversification of apes/Old World monkeys.

ANTH 5121. Business Anthropology. (2.0 cr.; =ANTH 4121; prereq MBA student; spring, every year)

Anthropological/ethnographic understandings/research techniques.

ANTH 5224. Interpreting Ancient Bone. (4.0 cr.; A-F or Audit; =ANTH 8244; prereq 1001; fall, every year)


ANTH 5255. Archaeology of Religion. (3.0 cr.; fall, odd years)

Archaeological evidence for origins of religion and its diverse roles in human societies over millennia. What constitutes religion, why it is constantly present in human history. How archaeologists reconstruct beliefs/practices of past peoples.

ANTH 5269. Analysis of Stone Tool Technology. (4.0 cr.; A-F or Audit; 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 5325. The Art of the Aztec Empire. (3.0 cr.; =ARTH 5325, RELS 5325; spring, every year)

Art/architecture of Nahua-speaking Aztecs of Central Mexico, from their first appearance in archaeological record until Spanish invasion of Central Mexico in 1521. Theoretical/methodological approaches. Critical analysis of scholarly writing and what constitutes "evidence."

ANTH 5401. The Human Fossil Record. (3.0 cr.; A-F only; =ANTH 3401; prereq 1001 or #; fall, even years)

Fossil evidence 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 5402. Zooarchaeology Laboratory. (3.0 cr.; A-F only; fall, every year)

How archaeologists reconstruct the past through the study of animal bones associated with artifacts at archaeological sites. Skeletal element (e.g., humerus, femur,ibia), and taxon (e.g., horse, antelope, sheep, bison, hyena) when confronted with bone. Comparative collection of bones from known taxa.

ANTH 5403. Quantitative Methods in Biological Anthropology. (4.0 cr.; A-F or Audit; prereq Basic univariate statistics course or #; fall, spring, even years)

Quantitative methods used by biological anthropologists. Applying these methods to real anthropometric data. Lectures, complementary sessions in computer lab.

ANTH 5405. Human Skeletal Analysis. (3.0 cr.; A-F only; =ANTH 3405; prereq 1001 or #; spring, every year)

Structure, design, and variability of modern human skeleton. Anatomy, functional
morality development evolutionary history. Bone histology/biology excavation preservation taphonomy pathology forensic analyses. Differentiating between males females adults subadults and humans nonhumans. Quizzes exams research paper project.

ANTH 5422. Anthropologies of Citizenship and Nationalism. (3.0 cr.; A-F only; prereq 3xxx course in anthropolgy or related discipline; spring odd years) Why/how citizenship and nationalism have been constructed over time as a force of cultural identity/belonging. Key theories recent developments in citizenship theory. Defining an anthropological approach to citizenship.


ANTH 5444. Archaeological Ceramics. (4.0 cr.; A-F only; prereq 3001 or #; spring, every year) Ceramics as material technology and cultural/ social trace. Methods of assessing technology use. Research design and interpretation of ceramic analyses. Students work with collections and propose answer research question about a ceramic assemblage. Readings discussion.

ANTH 5446. Archaeology of Representation as Communication. (3.0 cr.; A-F only; spring, every year) Seminar. Uses of paintings sculptures drawings and photographs as means of communication from earliest representations 30,000 years ago to present day.

ANTH 5448. Applied Heritage Management. (3.0 cr.; A-F only; spring, every year) Contexts of cultural heritage applicable to federal state protection. Approaches to planning management. Issues of heritage stakeholder conflict.

ANTH 5601. Archaeology and Native Americans. (3.0 cr.; =ANTH 3601 AMIN 3602; fall, even years) Pre-European contact/contact period archaeology of American Indians north Mexico.


ANTH 5980. Topics in Anthropology (3.0 cr. [max 6.0 cr.]; fall, spring, every year) Topics specified in Class Schedule.

ANTH 5990. Topics in Archaeology. (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq #; fall, spring, summer every year) Topics specified in Class Schedule.

ANTH 8001. Ethnography Theory History. (3.0 cr.; A-F or Audit; fall, every year) 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 8004. Foundations of Anthropological Archaeology. (3.0 cr.; prereq 8001 8002; spring, every year) Theoretical foundations of anthropological archaeology in historical and contemporary perspective.

ANTH 8005. Linguistic Anthropology. (3.0 cr.; fall, even years) Introduction to literature of anthropological linguistics.


ANTH 8112. Reconstructing Hominin Behavior. (3.0 cr.; A-F or Audit; =ANTH 5112; spring, odd years) Consider major hypotheses regarding evolution of human behavior. Evidence arguments used to support or reject hypotheses. Consider link between bone biology behavior. Archaeological record for more holistic understanding of evidence.

ANTH 8113. Primate Evolution. (3.0 cr.; A-F only; =ANTH 5113; prereq Anthropology doctoral student; fall, odd years) Evolutionary history of primates, with particular focus on origin diversification of apes/Old World monkeys.

ANTH 8120. Problems in Culture Change and Applied Anthropology. (3.0-6.0 cr.; fall, spring, offered periodically) Comparative studies of change in cultural systems impact of global processes on local cultures. Roles of anthropology anthropologists in policy planning implementation and evaluation.

ANTH 8121. Business Anthropology. (3.0 cr.; spring, every year) Ways in which anthropological understandings and research techniques, particularly ethnographic techniques, can be used to enhance study/practice of business.

ANTH 8201. Humans and Nonhumans: Hybrids and Collectives. (3.0 cr.; spring, offered periodically) 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. (3.0 cr.; prereq Grad anth major or #; fall, every year) 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. (3.0 cr.; =ANTH 4053; fall, spring, offered periodically) 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. (3.0 cr.; fall, spring, offered periodically) 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 8213. Ecological Anthropology. (3.0 cr.; =ANTH 3041, ANTH 5041; fall, spring, offered periodically) Seminar on method, theory, and key problems in ecological anthropology and human ecology. Examines 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. (3.0 cr.; prereq Grad anth major or #; fall, spring, offered periodically) 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. (2.0 cr.; prereq Grad anth majors preparing to submit research grant proposals next academic yr; fall, spring, offered periodically) Students draft a research proposal in their area of interest. Seminar involves reading evaluating proposals, learning about funding and process of submitting proposals, nuts of bolts of composing a proposal, and ethics of research in anthropology.

ANTH 8220. Archaeology Field School. (6.0 cr.; prereq Grad anth major; summer, every year) Advanced archaeological field excavation, survey, and research. Intensive training in
ANTH 8230. Anthropological Research Design. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Anth grad student or #; fall, spring, offered periodically)
Training seminar on research development, coordination, grant management, field/ laboratory research management, fundraising.

ANTH 8244. Interpreting Ancient Bone. (4.0 cr.; A-F or Audit; ANTH 5244; prereq #; fall, spring, offered periodically)
How anthropologists use fossil bones to answer questions of past human diet, behavior, and environments. Skeletal element and species identification (of humans, large mammals). Students analyze small assemblage of bones for class project. Scientific method, data analysis using computers.

ANTH 8333. FTE: Masters. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ANTH 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ANTH 8510. Topics in Archaeology. (3.0-9.0 cr.; fall, spring, every year)
Seminar examines particular aspects of archaeological methods and/or theory. Topics vary according to student and faculty interests.

ANTH 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
(No description)

ANTH 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

ANTH 8810. Topics in Sociocultural Anthropology. (3.0-9.0 cr.; fall, spring, every year)
Seminar examines particular aspects of method and/or theory. Topics vary according to student and faculty interests.

ANTH 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year)
(No description)

ANTH 8991. Independent Study. (1.0-18.0 cr.; prereq #; fall, spring, summer, every year)
Under special circumstances and with instructor approval, qualified students may register for a listed course on a tutorial basis.

ANTH 8992. Directed Reading. (1.0-18.0 cr. [max 54.0 cr.]; prereq #; fall, spring, summer, every year)
tbd

ANTH 8993. Directed Study. (1.0-18.0 cr.; prereq #; fall, spring, summer, every year)
Directed Study

ANTH 8994. Directed Research. (1.0-18.0 cr.; prereq #; fall, spring, summer, every year)

APST 5117. Retail Environments and Human Behavior. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year)
Theory/research related to designed environment across retail channels.

APST 5121. History of Costume. (4.0 cr.; A-F only; spring, every year)
Analysis/interpretation of primary data about 19th/20th centuries based on historical methods. Critique of cultural, social, economic, technological, political, and artistic data presented through lens of dress in film/literature.

APST 5123. Living in a Consumer Society. (3.0 cr.; A-F only; prereq Sr or grad student; fall, odd years)

APST 5124. Consumers of Design. (3.0 cr.; A-F only; prereq 5123 or DHA 5123 or equiv or #; fall, odd years)
Contemporary approaches to consumer behavior.

APST 5170. Topics in Apparel Studies. (1.0-4.0 cr. [max 32.0 cr.]; A-F or Audit; prereq Jr or sr or grad student; fall, spring, summer, every year)
In-depth investigation of specific topic, announced in advance.

APST 5193. Directed Study in Apparel Studies. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)
Independent study in apparel studies under tutorial guidance.

APST 5196. Field Study: National/International. (1.0-10.0 cr.; A-F or Audit; DES 5196; HSG 5196, DES 5196, IDES 5196; prereq #; fall, spring, summer, every year)
Faculty-directed field study in national or international setting.

APST 5218. Fashion, Design, and the Global Industry. (3.0 cr.; A-F only; fall, every year)
Relationship of fashion, dress, and culture to time, place, and design. Focuses on fashion centers, fashion industry, and globalization. Chinese fashion industry as case study.

APST 8170. Topics in Apparel Studies. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Varies with topic; fall, spring, every year)
In-depth investigation of a topic announced in advance.

APST 8180. Professional Seminar. (1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; fall, spring, every year)
Professional development issues/trends.

APST 8192. Readings in Apparel Studies. (1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)
Independent study/review of books/periodicals under tutorial guidance.

APST 8193. Directed Study. (1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)
Directed study in apparel studies.

APST 8222. Plan B Master's Project. (3.0 cr.; S-N or Audit; prereq DHA master's student; #; fall, spring, every year)
Plan B master's project.

APST 8267. Dress and Culture. (3.0 cr.; A-F or Audit; prereq 4212 or #; fall, even years)
Cultural factors of identity expressed through dress. Focuses on issues of cultural diversity through analysis of dress and textiles within a specific world region.

APST 8268. Behavioral Aspects of Dress. (3.0 cr.; A-F or Audit; fall, odd years)
Research and social science theories as applied to appearance/dress as manifestations of human behavior.

APST 8271. Retailing: Strategic Perspectives. (3.0 cr.; A-F or Audit; fall, even years)
Selected topics in the field of retailing. Students extend their thinking regarding consumer behavior to strategic retail management.

APST 8272. Multichannel Consumers: Theories in Retail and Consumer Studies. (3.0 cr.; A-F or Audit; prereq DES 8102 or equivalent quantitative methods class; spring, even years)
Reviews range of critical theories in retail/consumer studies to explore issues in multi-channel retailing environments. Exposure to breadth of topics in multi-channel retailing. Practical research experience.

APST 8192. Readings in Apparel Studies. (1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)
Independent study/review of books/periodicals under tutorial guidance.

APST 5218. Fashion, Design, and the Global Industry. (3.0 cr.; A-F only; fall, every year)
Relationship of fashion, dress, and culture to time, place, and design. Focuses on fashion centers, fashion industry, and globalization. Chinese fashion industry as case study.

APST 8170. Topics in Apparel Studies. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Varies with topic; fall, spring, every year)
In-depth investigation of a topic announced in advance.

APST 8180. Professional Seminar. (1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; fall, spring, every year)
Professional development issues/trends.

APST 8192. Readings in Apparel Studies. (1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)
Independent study/review of books/periodicals under tutorial guidance.

APST 8193. Directed Study. (1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)
Directed study in apparel studies.

APST 8222. Plan B Master's Project. (3.0 cr.; S-N or Audit; prereq DHA master's student; #; fall, spring, every year)
Plan B master's project.

APST 8267. Dress and Culture. (3.0 cr.; A-F or Audit; prereq 4212 or #; fall, even years)
Cultural factors of identity expressed through dress. Focuses on issues of cultural diversity through analysis of dress and textiles within a specific world region.

APST 8268. Behavioral Aspects of Dress. (3.0 cr.; A-F or Audit; fall, odd years)
Research and social science theories as applied to appearance/dress as manifestations of human behavior.

APST 8271. Retailing: Strategic Perspectives. (3.0 cr.; A-F or Audit; fall, even years)
Selected topics in the field of retailing. Students extend their thinking regarding consumer behavior to strategic retail management.

APST 8272. Multichannel Consumers: Theories in Retail and Consumer Studies. (3.0 cr.; A-F or Audit; prereq DES 8102 or equivalent quantitative methods class; spring, even years)
Reviews range of critical theories in retail/consumer studies to explore issues in multi-channel retailing environments. Exposure to breadth of topics in multi-channel retailing. Practical research experience.

Applied Economics (APEC)
College of Food, Agricultural and Natural Resource Sciences

APEC 5031. Methods of Economic Data Analysis. (3.0 cr.; prereq Math 1271, Stat 5021, knowledge of matrix algebra; fall, every year)
Statistical and econometrics techniques for applied economists. Theory and application of multivariate regression model using data sets from published economic studies. Emphasis on use of statistical technique to understand market behavior.
APEC 5032. Economic Data Analysis for Managerial and Policy Decisions. (3.0 cr.; prereq 5031 or #; spring, every year) Statistical/econometric methods for the analysis of large data sets to support managerial/policy decisions. Methods for organizing, accessing, and ensuring the quality of data. Estimation techniques include panel data methods, limited dependent variable models, and time series analysis. Clarity of reporting and design of procedures for maintaining/updating data estimates.

APEC 5151. Applied Microeconomics: Firm and Household. (3.0 cr.; prereq 3001 or Math 1271 or Math 2243 or equiv or grad student or #; fall, every year) Quantitative techniques for analysis of economic problems of firms and households. Links between quantitative tools and economic analysis. Regression analysis, mathematical programming, and present value analysis.

APEC 5152. Applied Macroeconomics: Income and Employment. (3.0 cr.; prereq 3001 or Math 1271 or Math 2243 or equiv or grad student or #; spring, every year) 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 5321. Regional Economic Analysis. (3.0 cr.; prereq 3006 or Econ 3102 or #; fall, offered periodically) Development patterns. Role of resources, transportation, and institutional constraints. Migration, investments in growth/change. Economic information in investment and location decisions. Economic development policies/tools. Economic impact analysis.

APEC 5341. Public Finance. (3.0 cr.; A-F or Audit; prereq 3001 or Econ 3101 or PA 5021; spring, every year) 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 5481. Futures and Options Markets. (3.0 cr.; =APEC 4481; prereq grad student; spring, every year) Economic concepts related to futures/options trading. Hedging, speculation.

APEC 5511. Labor Economics. (3.0 cr.; prereq [3001 or Econ 3101 or PA 5021], [PA 5032 or equiv], grad student)] or #; fall, every year) Theoretical foundations of labor markets. Intertemporal/household labor supply. Demand for labor, efficiency wages. Human capital theory, unemployment, migration decisions. Analysis of econometric research applied to labor policy issues such as minimum wage, tax policy, social insurance, education.

APEC 5611. Economic Aspects of Environmental Management. (3.0 cr.; A-F or Audit; prereq [Sr or grad student] in [biological science or conservation biology or ecology or fisheries or forestry or public affairs or water resources or wildlife conservation] or CLA or #; spring, offered periodically) Economist approach to environmental problems such as water/air pollution. Application of supply/demand concepts to evaluation of environmental resources. Methods of evaluation. Analysis of pollution control policies from economic point of view.

APEC 5651. Economics of Natural Resource and Environmental Policy. (3.0 cr.; =[PA 5722]; prereq [[3001 or Econ 3101]. [3611 or Econ 3611 or ESPM 3261]] or #; fall, every year) Economic analyses, including project evaluation of current natural resource/ environmental issues. Intertemporal use of natural resources, 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. (3.0 cr.; prereq 3001 or Econ 3101; spring, offered periodically) 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. (3.0 cr.; prereq 3001 or Econ 3101 or #; fall, every year) Economics of innovation, technical change, and research/development. Productivity measurement. Knowledge stocks, research lags/spillovers. Econometric/welfare surplus methods for evaluating economic consequences of R&D. Economics of intellectual property rights.

APEC 5731. Economic Growth and International Development. (3.0 cr.; prereq 3002 or [Econ 3101, Stat 3022]; Econ 4211 recommended; spring, offered periodically) Economics of research/development. Technical change, productivity growth. Impact of technology on institutions. Science/technology policy.

APEC 5751. Global Trade and Policy. (3.0 cr.; prereq 3001 or Econ 3101 or PA 5021; fall, every year) Trade policies of import/export nations, gains from trade, trade negotiations/agreements. Free trade and common market areas. Exchange rate impacts. Primary commodities and market instability. Current trade issues.

APEC 5811. Cooperative Organization. (3.0 cr.; =APEC 3840; prereq Grad student or #; spring, every year) Introduction to cooperative form of business. Extensive applications to agricultural/food cooperatives. Active-student learning process with group activities/written exercises.

APEC 5891. Independent Study: Advanced Topics in Farm and Agribusiness Management. (1.0-4.0 cr.; #; fall, spring, every year) Special topics or individual work suited to the needs of particular groups of students.

APEC 5991. Special Topics and Independent Study in Applied Economics. (1.0-4.0 cr. [max 12.0 cr.]; #; fall, spring, summer, every year) Special classes, independent study, and supervised reading/research on subjects/problems not covered in regularly offered courses.

APEC 8001. Applied Microeconomic Analysis of Consumer Choice and Consumer Demand. (2.0 cr.; A-F or Audit; prereq [5151 or Econ 5101 or Econ 5151 or intermediate microeconomics class]. [MATH 2243, MATH 2263] or equiv)] or #; fall, every year) Consumer behavior/demand. Introduction to welfare analysis. General equilibrium analysis in pure exchange economy. Part of four-course sequence (APEC 8001-8004).

APEC 8002. Applied Microeconomic Analysis of Production and Choice Under Uncertainty. (2.0 cr.; A-F or Audit; prereq [8001 or Econ 8001 or Econ 8101], [MATH 2243, MATH 2263] or equiv)] or #; fall, every year) Production, competitive markets, and choice under uncertainty. Technology and production, cost minimization and profit maximization, production duality, efficiency and technical change, general equilibrium of production. Part of four-course sequence (APEC 8001-8004).

APEC 8003. Applied Microeconomic Analysis of Game Theory and Information. (2.0 cr.; A-F or Audit; prereq [8002 or Econ 8002 or Econ 8102], [MATH 2243, MATH 2263] or equiv)] or #; spring, every year) Strategic competition, game theory, and information. Non-cooperative games, static games of complete and imperfect information, dynamic games of complete/incomplete information, application of incomplete information. Part of four-course sequence (APEC 8001-8004).

APEC 8004. Applied Microeconomic Analysis of Social Choice and Welfare. (2.0 cr.; A-F or Audit; prereq [8003 or Econ 8003 or Econ 8103], [MATH 2243, MATH 2263] or equiv)] or #; spring, every year) Welfare economics/measurement, externalities and social choice. Welfare theorems in general equilibrium, externalities and public goods, social choice, social welfare, and welfare
APEC 8202. Mathematical Optimization in Applied Economics. (3.0 cr.; prereq [5151, Econ 5151] or equiv or #; fall, every year) Economic foundations and applications of mathematical and dynamic programming and optimal control. Mathematical optimization concepts; structures and economic interpretations of various models of the firm, consumer, household, sector, and economy. Model building and solution techniques.

APEC 8203. Applied Welfare Economics and Public Policy. (3.0 cr.; prereq calculus, intermediate econ theory; spring, every year) Basic concepts underlying measurement of welfare change, problems of market failure and externalities, social welfare functions, and distribution within and across generations. Application of concepts, based on case studies of the environment, returns to research, technical change, and agricultural policy.


APEC 8205. Applied Game Theory. (3.0 cr.; prereq [8101, 8102, 8103, 8104] or [Econ 8001, Econ 8002, Econ 8003, 8004] or #; fall, every year) Topics in game theory, application to economic problems. For each topic, important theory/ equilibrium concepts are followed by extensive applications. Focuses on static/dynamic games of complete/incomplete information, evolutionary games.

APEC 8206. Dynamic Optimization: Applications in Economics and Management. (3.0 cr.; prereq 5151 or equiv or #; spring, every year) Formulation/solution of dynamic optimization problems using optimal control theory and dynamic programming. Analytical/numerical solution methods to solve deterministic/ stochastic problems for various economic applications.

APEC 8211. Econometric Analysis I. (4.0 cr.; prereq [Stat 4102 or Stat 5102], Ph.D. student] or #; fall, every year) Classical multiple linear regression, stochastic regressors, heteroscedasticity, autocorrelated disturbances, panel data, discrete dependent variables.

APEC 8212. Econometric Analysis II. (4.0 cr.; prereq 8211 or equiv or #; spring, every year) Second semester of econometrics for Ph.D. students. Specification tests, instrumental variables, heteroscedasticity, panel data, simultaneous equations, bootstrap methods, limited dependent variable models, semiparametric estimation, econometrics of program evaluation, general method of moments, time series, hazard models.

APEC 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

APEC 8341. Applied Public Finance. (3.0 cr.; A-F only; prereq 8001-8004 or ECON 8001-8004 or spring, offered periodically) Current economic research on government tax and expenditure policy. Apply tools of applied economics to public finance issues. Tax policy, taxation and household decisions (including labor supply and saving), taxation and the firm (including the cost of capital), and fundamental tax reform. Alternative demand models for public goods, public choice theory, and fiscal federalism.

APEC 8401. Consumer Behavior and Household Economics. (2.0 cr.; A-F or Audit; prereq Econ 8001 or concurrent registration in 8001), [8002 or concurrent registration in 8002], [8003 or concurrent registration in 8003], [8004 or concurrent registration in 8004] or [ECON 8001 or concurrent registration in ECON 8001], [ECON 8002 or concurrent registration in ECON 8002], [ECON 8003 or concurrent registration in ECON 8003], [ECON 8004 or concurrent registration in ECON 8004] or [ECON 8101 or concurrent registration in ECON 8101], [ECON 8102 or concurrent registration in ECON 8102], [ECON 8103 or concurrent registration in ECON 8103], [ECON 8104 or concurrent registration in ECON 8104]; [8211 or concurrent registration in 8211], [8212 or concurrent registration in 8212]; fall, offered periodically)

APEC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

APEC 8501. Labor Economics I. (2.0 cr.; A-F or Audit; prereq 8003 or equiv or 88003, 8211, 5032 or equiv; spring, offered periodically) Theoretical and empirical studies of compensating differentials, discrimination, personnel economics, and gross flows.

APEC 8502. Labor Economics II. (2.0 cr.; A-F or Audit; prereq [8211, 8001, 8002] or [ECON 8001, ECON 8002] or [ECON 8101, Econ 8102] or #; ) Topics in applied microeconomics related to labor supply and human capital. Focuses on household decisions and resulting outcomes in labor market. Household labor supply. Estimation of labor supply/earnings functions. Theory of human capital, wage structure/ determination, and impacts of tax/transfer policies.

APEC 8601. Natural Resource Economics. (3.0 cr.; prereq [5151, 8202, 8206 [ECON 5151 or equiv]] or #; fall, spring, offered periodically) Economic analysis of resource use/ management. Capital theory, dynamic resource allocation. Applications to renewable/ nonrenewable resources. Empirical studies, policy issues.

APEC 8602. Economics of the Environment. (3.0 cr.; prereq 8004 or ECON 8004 or Econ 8104 or equiv or #; fall, every year)
Economic analysis of environmental management, emphasizing environmental policy. Application of microeconomic theory to problems of market failure, market-based pollution control policies, contingent valuation, hedonic models, option value, and other topics.

APEC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) Doctoral Pre-Thesis Credits

APEC 8701. International Economic Development, Growth, and Trade. (3.0 cr.; prereq Econ 8002 or Econ 8102 or #; fall, every year) Development, growth, and trade of developing nations and emerging market economies. Course links stylized characteristics of economic development, economic policy, and political economy using modern economic theory and empirical methods of analysis.

APEC 8702. Economic and Trade Policy: Sectoral and Institutional Issues. (3.0 cr.; prereq ECON 8002 or ECON 8102 or #; spring, every year) International trade across developed/developing countries. National policies, regional agreements/treaties, multilateral arrangements such as World Trade Organization. Applying international trade and multinational theory and econometric methods.

APEC 8703. Microeconomic Analysis of Economic Development. (3.0 cr.; A-F or Audit; prereq Econ 8001-804 or Econ 8101-804, and APEc 8211-8212 or #). Concurrent registration is ok.; Topics concerning microeconomics of economic development in low-income countries. Focuses on behavior of agricultural households, poverty, inequality, education, health/nutrition, and evaluation of development programs.

APEC 8777. Thesis Credits: Master’s. (1.0-18.0 cr.; [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

APEC 8793. Master’s Paper: Plan B Project. (1.0-6.0 cr.; S-N or Audit; prereq Agri/ApEc MS student or ApEc MS student; fall, spring, summer, every year) Students work under guidance of adviser to complete their Plan B Paper project.


APEC 8804. Managerial Economics. (3.0 cr.; prereq [8001, 8002, 8003, 8004] or [Econ 8101, Econ 8102, Econ 8103, Econ 8104] or #; majors must register on A-F basis.; fall, spring, offered periodically) Analysis of managerial decisions by organizations/individual entrepreneurs. Application of dynamic programming to investment/resource allocation decisions. Economics of business organization, including boundaries of the firm, mechanisms for vertical coordination. Economic implications of alternative ownership structures.

APEC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq ApEc PhD student; max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) Doctoral thesis credit.

APEC 8901. Graduate Seminar: MS & PhD. (1.0 cr.; S-N or Audit; prereq ApEc MS student or ApEc PhD student; spring, every year) Attendance/active participation in applied economics research seminars. Effective research methods. Research topics/observe professional methods of research presentations.

APEC 8902. Graduate Research Development Seminar. (1.0 cr.; S-N or Audit; prereq ApEc MS student or ApEc PhD student; fall, spring, every year) Faculty, students, outside speakers present research ideas/results, which participants critique. Topics vary according to interests of speakers.

APEC 8903. PhD Qualifying Paper Seminar I. (1.0 cr.; S-N only; prereq 8001-8004 or Econ 8001-8004 or Econ 8101-8104; fall, every year) Support for writing second year Qualifying Paper. Purpose of paper is to provide guided opportunity for doctoral students to complete substantial research paper.

APEC 8904. PhD Qualifying Paper Seminar II. (1.0 cr.; S-N only; prereq APEC 8903; spring, every year) Provides support to doctoral students writing second year Qualifying Paper. Purpose of paper is to provide guided opportunity for students to complete substantial research paper.

APEC 8991. Advanced Topics in Applied Economics. (1.0-6.0 cr.; prereq #; fall, spring, summer, every year) Special seminars or individual work on subjects suited to needs of students.

APEC 8844. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

APEC 8866. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

APSC 8777. Thesis Credits: Master’s. (1.0-18.0 cr.; [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

APSC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

APSC 8123. Research Ethics in the Plant and Environmental Sciences. (0.5 cr.; S-N or Audit; =SOIL 8123, PLPA 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 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

APSC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

Applied Plant Sciences (APSC)

College of Food, Agricultural and Natural Resource Sciences

APSC 8123. Research Ethics in the Plant and Environmental Sciences. (0.5 cr.; S-N or Audit; =SOIL 8123, PLPA 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 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

APSC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

APSC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

APSC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

Applied Professional Studies (APS)

College of Continuing Education

APS 5100. Topics in Applied Professional Studies. (1.0-4.0 cr.; [max 24.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year) Topics in Applied Professional Studies.

APS 5101. Polyculture Design. (3.0 cr.; A-F or Audit; prereq SOIL 5125, HORT 1001, %; summer, offered periodically) Design/systems thinking with plant mechanisms.
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

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APS 5201. Career and Job Search Preparation for Graduate Students. (1.0 cr.; S-N only; prereq %; fall, spring, every year) Job search and career development tools. Goals, networking, job search, resume/CV, interviewing. Assignments include resume/CV, informational interview, career development plan.

APS 8001. Introduction to Research in the Biological Sciences. (1.0 cr.; S-N only; prereq Admitted MBS student; fall, spring, summer, every year) Resources available at U of M/College of Continuing Education that will help complete Master of Biological Sciences degree. Required of all MBS students.

APS 8002. Final Project Course for Plan B MBS Students. (2.0 cr.; S-N only; prereq %; fall, spring, summer, every year) Synthesize/complete Plan B graduate final project.

APS 8003. Capstone Course for Plan C MBS Students. (2.0 cr.; S-N only; prereq %; fall, spring, summer, every year) MBS students synthesize/complete Plan C graduate final project.

APS 8110. Graduate Seminar Series. (1.0 cr. [max 3.0 cr.]; S-N only; prereq %; fall, spring, summer, every year) Recent developments in student's field of interest presented in research seminars by scientific experts.

Arabic (ARAB)

College of Liberal Arts

ARAB 5101. Advanced Arabic I. (3.0 cr. [max 4.0 cr.]; prereq [3102, successful completion of the Arabic language proficiency exam] or %; fall, every year) Advanced readings in classical/modern Arabic. Compositions based on texts.

ARAB 5102. Advanced Arabic II. (3.0 cr. [max 4.0 cr.]; prereq 5101 or %; spring, every year) Readings of Arabic texts. Writing compositions based on texts. Continuation of 5101.

Architecture (ARCH)

College of Design

ARCH 5101. Architectural Design Studios. (7.0 cr.; S-N only; prereq 3+ track for MArch; summer, every year) Principles/methods architecture design. Theories, history, technologies, media, and processes as foundation for critical thinking. Analytic modeling, visual thinking.

ARCH 5110. Architecture as Catalyst. (1.0 cr. [max 3.0 cr.]; S-N only; prereq MArch; spring, every year) Topical workshops on design methods, theories, or emerging practices.

ARCH 5212. Undergraduate Architecture Studio 05: Advanced Design. (6.0 cr.; A-F only; prereq Passing grade in 3281, 3282, 4283, 4284; spring, every year) Advanced design studio to engage students in range of critical subjects to be determined by respective instructors. Intended to challenge students with independent/experimental approach to design that builds on prior knowledge, develop working methodologies/design ethics.


ARCH 5301. Conceptual Drawing. (3.0 cr.; A-F only; prereq MArch major or %; spring, every year) Drawing as way of analyzing, exploring, and generating design ideas. Projection systems, diagramming, mapping. Different modes of visual perception. Nonverbal structures.

ARCH 5311. Theory of Architectural Representation. (3.0 cr.; A-F or Audit; [ARCH 4311]; prereq [5371, 5372, MArch] or instr consent; fall, every year) 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. (3.0 cr.; A-F or Audit; [ARCH 4313]; prereq MArch major or %; spring, every year) Delineation, presentation, and design techniques. Various visual media and methods of investigation.

ARCH 5321. Architecture in Watercolor. (3.0 cr.; A-F or Audit; [ARCH 4321]; prereq MArch grad student or %; fall, spring, summer, every year) Watercolor as a tool in design process. Foundation principles, techniques, medium, tools, materials. Color relationships, mixing, composition, applications to design.

ARCH 5361. 3-D Computer Architectural Modeling and Design. (3.0 cr.; A-F or Audit; [ARCH 4361]; prereq MArch major; fall, spring, summer, every year) 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 5372. Computer Methods II. (1.0 cr.; S-N or Audit; [LA 5375, LA 5372, LA 5377]; prereq 5371, & 8252 and MArch major or %; spring, every year) Current techniques, computer programs, and their application to architectural computing and design.

ARCH 5381. Introduction to Computer Aided Architectural Design. (3.0 cr.; A-F or Audit; prereq Arch or BED or MArch or grad student in LA or %; fall, every year) 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. (3.0 cr.; A-F or Audit; prereq 5381 or arch grad major or %; spring, every year) 2-D/3-D CAD, image manipulation. Advanced multimedia visualization techniques for design, including solid modeling, photo-realistic imaging, animation, video-editing/recording.

ARCH 5410. Topics in Architectural History. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq MS Arch or MArch major or %; fall, spring, every year) Advanced study in architectural history. Readings, research, seminar reports.

ARCH 5411. Principles of Design Theory. (3.0 cr.; A-F or Audit; prereq MArch major or %; fall, every year) 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. (3.0 cr.; A-F only; [ARCH 4421W]; prereq [3411, 3412] or %; fall, odd years) Historical/hermeneutical investigation of iconography of grotto. Intertwined themes of descent into earth and ascent to light, from earliest strata of human culture to present day.

ARCH 5423. Gothic Architecture. (3.0 cr.; A-F or Audit; [ARCH 4423]; prereq MS Arch or MArch major or %; spring, even years) History of architecture and urban design in Western Europe, from 1150 to 1400.

ARCH 5424. Renaissance Architecture. (3.0 cr.; A-F or Audit; [ARCH 4424]; prereq MS Arch or MArch major or %; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; [ARCH 4425]; prereq MS Arch or MArch major or %; fall, odd years) Architecture and urban design in Italy, from 1600 to 1750. Emphasizes major figures (Borromini, Bernini, Guarini) and evolution of major cities (Rome, Turin).

ARCH 5431. Eighteenth-Century Architecture and the Enlightenment. (3.0 cr.; A-F or Audit; [ARCH 4431W]; prereq MArch grad student or %; fall, spring, every year) Architecture, urban planning, and garden design in Europe and America from 1650 to 1850.

ARCH 5432. Modern Architecture. (3.0 cr.; A-F or Audit; [ARCH 4432]; prereq MS Arch or MArch major or %; fall, offered periodically)
Architectural and urban design in Europe and the United States, from early 19th century to World War II.

ARCH 5434. Contemporary Architecture. (3.0 cr.; A-F or Audit; =ARCH 4434; prereq MS Arch or M Arch major or #; fall, every year)
Developments, theories, movements, and trends in architecture and urban design, from World War II to present.

ARCH 5441. Minnesota: Architecture and Landscapes. (3.0 cr.; A-F only; =ARCH 4441); prereq [3411, 3412] recommended; spring, every year)
History of major architectural monuments, urban phenomena, and landscape forms of Minnesota. Interrelationships between architecture, geography, and people.

ARCH 5445. Suburbia. (3.0 cr.; A-F only; =ARCH 4445W); fall, every year)
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 sites/designs. Representations in film, television, popular literature, and music.

ARCH 5446. Architecture Since World War II: Postwar Experimentation: Aesthetics and Politics of Architecture. (3.0 cr.; A-F only; prereq M Arch major; fall, every year)
Eight-week seminar. Avant-garde architectural responses to postwar consciousness of social issues/meaning. How tenets of western avant-gardism were transformed by regional constraints when introduced to post-independent agendas of non-western world.

ARCH 5450. Topics in Architectural Theory. (1.0-3.0 cr.; max 9.0 cr.; A-F or Audit; prereq Arch major or M Arch major or #; fall, spring, summer, every year)
Selected topics in architectural theory and criticism.

ARCH 5451. Architecture: Defining the Discipline. (4.0 cr.; A-F only; prereq M Arch major; fall, spring, offered periodically)
Paradigms through which architecture has defined itself. Implications for its practice, product, and architecture in general. Lecture, discussion, design exercises.

ARCH 5452. Architecture: Design, Form, Order, and Meaning. (4.0 cr.; A-F or Audit; prereq M Arch major or #; fall, spring, every year)
Architecture and the issue of meaning.
Explores fundamental and constituent elements of architectural form and order; their inherent tectonic, phenomenal, experiential, and symbolic characteristics; their potential and implications for the creation and structure of meaningful human places.

ARCH 5461. North American Indian Architecture. (3.0 cr.; =ARCH 4461; prereq M Arch major or instr consent; spring, every year)
Historic/contemporary principles/theories of North American Indian architecture. Culture, technology, environment, art, and craft of North American Indians in their settlements/architecture.

ARCH 5465. LeCorbusier's Search for Theory and Identity in His Formative Years. (3.0 cr.; A-F only; prereq M Arch major; spring, every year)

ARCH 5513. Environmental Technology I: Thermal Design in Architecture. (3.0 cr.; A-F or Audit; prereq M Arch major or #; fall, every year)
Thermal and climatic issues in the design of small and mid-size buildings. Investigations in built and mechanical methods to modify climate. Evaluation of the impact of design techniques on energy use, the environment, and architectural meaning.

ARCH 5514. Environmental Technology II: Lighting and Acoustic Design. (3.0 cr.; A-F or Audit; prereq M Arch major or #; fall, every year)
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 5515. Technology One: Building Materials and Construction Systems. (3.0 cr.; A-F only; prereq M Arch student; fall, every year)

ARCH 5516. Technology Two: Luminous and Thermal Design. (6.0 cr.; A-F only; prereq M Arch; spring, every year)
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 5517. Technology Three: Structural Systems. (3.0 cr.; A-F only; prereq M Arch student; fall, every year)
Structural behavior in withstand gravity and lateral forces. Evolution, range, and applications of structural systems. Structural analysis. Graphical methods, site visits, analog/digital modeling. Case studies, problems.

ARCH 5521. Material Investigation: Concrete. (4.0 cr.; A-F only; prereq M Arch or MS; spring, every year)
Design projects identify common problems/improvements, investigate alternatives, and develop solutions where concrete is primary building material.

ARCH 5523. Material Investigation: Steel and Glass. (4.0 cr.; A-F only; prereq Grad student; spring, every year)
Design projects identify common problems and improvements, investigate alternatives and develop solutions where steel and glass are the primary building materials.

ARCH 5527. Material Investigations: Stone and Water. (4.0 cr.; A-F only; prereq M.Arch or M.S.; spring, every year)
Design projects identify common problems/improvements, investigate alternatives, and develop solutions where wood is primary building material.

ARCH 5539. Daylighting and Architecture Design. (4.0 cr.; A-F only; prereq M Arch major; spring, every year)
Ecological design approaches that combine ecological, physiological, and experiential aspects to enhance relationship to place. How formal, aesthetic, and experiential aspects of daylighting support/foster sustainable architectural design.

ARCH 5541. Material Strategies. (3.0 cr.; A-F only; prereq M Arch or Arch MS major; fall, every year)
Emergent materials in advanced building design; strategies for material approaches relevant to global resource flows, technological trajectories, and sociocultural effects. Research projects based on evaluative tools and case studies.

ARCH 5550. Topics in Technology. (1.0-4.0 cr.; max 12.0 cr.; A-F only; prereq M Arch major; fall, spring, summer, every year)
Selected topics in architecture technology, e.g., construction, environmental management, energy performance, lighting, materials.

ARCH 5561. Tech 1, Structures for Building. (2.0 cr.; A-F only; prereq M Arch major or #; fall, every year)
Role of structure in architectural design. Common systems found throughout history. Review systems to identify parameters that influence structural decisions.

ARCH 5562. Tech 2, Intro to Building Technology. (2.0 cr.; A-F only; prereq M Arch or #; fall, every year)
Origin/development of architectural idea. Designs as direct means of representing our underling intentions.

ARCH 5563. Tech 3: Advanced Building Technology Integrated Building Systems. (0.0-2.0 cr.; A-F only; prereq M Arch or #; fall, every year)
Logic of integrating building systems. Improving understanding of/thinking critically about integration principles, theories, practice, application. Identifying/working through problems project architect must address.

ARCH 5564. Tech 4: Building Structural Systems. (0.0-2.0 cr.; A-F only; prereq M Arch or #; fall, every year)
Main concepts related to building structures. Basic knowledge of flow of forces. Review of rules for sizing structures. Calculations to understand systems behavior. Knowledge/tools to design buildings considering structure within design process.

ARCH 5571. Architectural Structures I: Wood and Steel Design. (3.0 cr.; A-F or
ARCH 5609. Development and Implementation of Research. (3.0 cr.; A-F or Audit; prereq: ARCH 5621, Arch major or #; fall, spring, every year)

Bridge gaps among architectural research, design, practice, Forum for students to independently develop research topics/implement research methods related to architectural scholarship/practice, aided by classmates, instructor, guest lecturers.

ARCH 5611. Design in the Digital Age. (3.0 cr.; A-F or Audit; [ARCH 3611]; prereq Grad student or upper level undergrad student; spring, every year)

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. (3.0 cr.; A-F or Audit; prereq M Arch major or #; fall, spring, summer, every year)

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 5630. Practicum: Advanced Issues in Practice. (3.0 cr. [max 6.0 cr.]; S-N only; prereq M.S. Architecture or M.Arch; fall, spring, every year)

Advanced architectural practice topics not normally covered in curricula are examined/evaluated as foundation for licensure/ARE 4.0 testing processes.

ARCH 5650. Topics in Architectural Practice. (1.0-4.0 cr. [max 16.0 cr.]; prereq 5621, Arch major or 5621, M Arch major or #; fall, spring, summer, every year)

Topics in architectural practice, methods of design production, marketing, operation, and relationships among clients, architecture, and society.

ARCH 5651. Building Stories. (3.0 cr. [max 12.0 cr.]; A-F only; spring, every year)

Professional practice education by means of case study analysis.

ARCH 5670. Topics in Historic Preservation. (1.0-3.0 cr. [max 12.0 cr.]; prereq MS Arch or M Arch major or #; fall, offered periodically)

Selected topics in the theory, philosophy, research, and methods of architectural historic preservation.

ARCH 5671. Historic Preservation. (3.0 cr.; fall, every year)

Philosophy, theory, origins of historic preservation. Historic architecture/research, descriptive analysis, documentation of historic buildings. Government's role in historic preservation, preservation standards/guidelines, preservation/building codes, preservation advocacy.

ARCH 5672. Historic Building Conservation. (3.0 cr.; prereq 3412, 5671 or #; spring, every year)

Historic building materials, systems, and methods of conservation. Discussion of structural systems, building repair and pathology, introduction of new environmental systems in historic buildings, and conservation of historic interiors. Research on historic building materials and techniques using primary and secondary resources and on documentation of a specific historic site through large-format photography and measured drawings.

ARCH 5673. Historic Property Research and Documentation. (3.0 cr.; prereq [3412, 3641, 4671, 5671, 4672 or 5672] or #; spring, every year)

Philosophy, theory, methods of historic building research. Descriptive analysis of buildings, building documentation, historical archaeology, architectural taxonomy.

ARCH 5677. Preservation of the Vernacular Built Environment and Cultural Landscape. (3.0 cr.; A-F only; prereq Grad student, open to upper level (junior/senior) undergraduates with #. Honors student encouraged.; spring, offered periodically)

Theoretical, methodological, practical implications of preserving vernacular environment such as commercial blocks, strips/buildings, warehouses/sheds, warehouses/piers, abandoned streetcar tracks/railroad spurs.

ARCH 5711. Theory and Principles of Urban Design. (3.0 cr.; A-F or Audit; prereq M Arch major or LA grad major or grad student or #; spring, every year)

Seminar. Debate on dominant theories/paradigms informing city design from renaissance to 21st century. Critical issues central to current debates.

ARCH 5721. Case Studies in Urban Design. (3.0 cr.; A-F or Audit; prereq M Arch major or LA grad major or grad student or #; spring, every year)

Reading seminar. Evolution of contemporary city. Dynamics that created contemporary urban spatial patterns. Planning/design theories that have guided public interventions in built environment. Thematic texts, classroom discussions.

ARCH 5731. Territorial City. (3.0 cr.; A-F only; fall, every year)

Seminar. Students research, define, and test conditions within which the territory and contemporary city coexist. Site for research is Twin Cities metropolitan area. Readings, discussions, field trips, collaborative development of urban proposals.

ARCH 5750. Topics in Urban Design. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; prereq Arch major; fall, spring, summer, every year)

Special topics in theory/practice of urban design.

ARCH 5993. Directed Study. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, every year)

Guided individual reading or study.

ARCH 8101. Subjects and Methods in Architecture. (2.0 cr.; S-N or Audit; prereq Grad Arch major or #; fall, spring, offered periodically)

The discipline of architecture.

ARCH 8250. Advanced Topics in Design. (1.0-6.0 cr.; S-N or Audit; prereq Admitted to 3+ track for MArch prog or #; spring, summer, offered periodically)

Design studio.

ARCH 8251. Graduate Architectural Design I. (9.0 cr.; A-F or Audit; prereq MArch or #; fall, every year)

Design projects focus on fundamental issues of space/form/light/materiality in relation to human habitation. Design as a process of exploration/inquiry. Modes/media of representation, their critical impact.

ARCH 8252. Graduate Architectural Design II. (6.0 cr.; A-F or Audit; prereq 8251, grad Arch major or #; spring, every year)

Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort.

ARCH 8253. Graduate Architectural Design III. (9.0 cr.; A-F or Audit; prereq [8251, MArch] or #; fall, every year)

Issues of design process, representation, programming, technology, and urban relations.

ARCH 8254. Technical Applications in Design. (4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq [8253, MArch major or #]; fall, every year)


ARCH 8255. Graduate Architectural Design V. (6.0 cr. [max 12.0 cr.]; A-F or Audit; prereq [8254, grad Arch major or #]; fall, spring, every year)

Fundamental architectural problems involving design as a creative inquiry. Individual/collaborative effort.

ARCH 8295. Directed Graduate Architectural Design. (6.0 cr.; A-F or Audit; prereq 8251, grad Arch major or #; spring, every year)

ARCH 8299. Master's Final Project. (10.0 cr.; S-N only; prereq Plan C, MArch; spring, every year)

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. (1.0 cr.; No Grade Associated; prereq Master's student,
adviser and DGS consent; fall, spring, summer, every year)
(No description)

ARCH 8350. Advanced Topics in Representation. (1.0-3.0 cr.; A-F or Audit; prerequisite Grad Arch major or #; summer, every year)
Theory and practice of visual representation in architecture.

ARCH 8450. Topics in Theory. (1.0-3.0 cr.; A-F or Audit; prerequisite 5411, grad Arch major or #; fall, spring, every year)
Topics vary

ARCH 8494. Directed Research in Architectural History. (1.0-3.0 cr.; A-F or Audit; prerequisite Grad Arch major or #; spring, every year)
tbd

ARCH 8550. Topics in Technology. (1.0-3.0 cr.; A-F or Audit; prerequisite Grad Arch major or #; fall, spring, every year)
Special topics in theory/practice of architecture technologies.

ARCH 8561. Sustainable Design Theory and Practice. (3.0 cr.; A-F only; prerequisite [5512, grad MS or MArch] or #; fall, every year)

ARCH 8563. Energy and Indoor Environmental Quality Issues in Sustainable Design. (3.0 cr.; A-F or Audit; prerequisite [5513, grad MS or MArch] or #; spring, every year)
Energy/IEQ aspects of sustainable design related to global environmental issues. Energy/IEQ strategies, methods, and tools as applied to sustainable building design. Research projects, case studies.

ARCH 8565. Materials Performance in Sustainable Building. (3.0 cr.; A-F only; prerequisite [5512, grad MS or March] or #; fall, every year)
Building-material properties, resource conservation, fabrication/construction processes in production of high performance sustainable building designs. Application of assessment/evaluation tools (LCA, BEES, Athena or LEED) 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. (3.0 cr.; A-F only; prerequisite [5512, grad MS or MArch student] or #; spring, every year)
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 8650. Topics in Architectural Practice. (1.0-3.0 cr.; A-F or Audit; prerequisite Grad Arch major or #)

ARCH 8750. Topics in Urban Design. (1.0-3.0 cr.; A-F or Audit; prerequisite Grad Arch major or #)

ARCH 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prerequisite Max 18 cr per semester or summer; 10 cr total required [Plan A only; fall, spring, summer, every year])
(No description)

**Art (ARTS)**
College of Liberal Arts

ARTS 5105. Advanced Dimensional Painting. (4.0 cr.; prerequisite 3105 or #; spring, every year)
Illusionary space applied to sculptural forms. Practical applications of spatial/painterly concepts. Emphasizes critical/visual judgment. Development of cohesive body of work reflecting interaction of two/three dimensions.

ARTS 5106. Advanced Drawing: Interpreting the Site. (4.0 cr.; prerequisite 3106 or #; summer, every year)
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 5107. Advanced Drawing Using Digital Media. (4.0 cr.; prerequisite 3107 or #; fall, spring, every year)
Advanced, individual creative work using digital technology as tool/component in contemporary drawing practice.

ARTS 5110. Advanced Drawing. (4.0 cr. [max 16.0 cr.]; prerequisite 3101 or 3111 or #; fall, spring, every year)
Developing personal direction in form/content. Various media. Various aesthetic/conceptual approaches.

ARTS 5120. Advanced Painting. (4.0 cr. [max 16.0 cr.]; prerequisite 3102 or #; fall, spring, every year)
Developing personal vision/content through painting. Emphasizes critical thinking, self-evaluation, and independent pursuit of ideas.

ARTS 5130. Advanced Painting: Watercolor. (4.0 cr. [max 8.0 cr.]; prerequisite 3102 or #; fall, spring, every year)

ARTS 5300. Advanced Sculpture. (4.0 cr. [max 12.0 cr.]; prerequisite 3300; fall, spring, every year)

ARTS 5310. Advanced Sculpture: Direct Metal. (4.0 cr. [max 8.0 cr.]; prerequisite 3301 or #; fall, offered periodically)
Direct metal sculpture in steel, other metals. Studio practice, investigation of historical/contemporary methods/concepts. Development of personal sculpture imagery.

ARTS 5320. Advanced Sculpture: Spatial Problems. (4.0 cr. [max 8.0 cr.]; prerequisite 3302 or #; fall, spring, every year)
Sculptural practice outside traditional media/approaches. Installation, theater, public art, architecture as topics for individual investigations into spatial organization.

ARTS 5330. Advanced Sculpture: Metal Casting. (4.0 cr. [max 12.0 cr.]; prerequisite 3303 or #; fall, spring, every year)
Metal casting of sculpture in bronze, iron, aluminum, other metals. Studio practice, investigation of historical/contemporary methods/concepts. Development of personal sculptural imagery.

ARTS 5340. Advanced Sculpture: Carving and Construction. (4.0 cr. [max 8.0 cr.]; prerequisite 3304; fall, spring, every year)

ARTS 5350. Advanced Sculpture: Kinetics. (4.0 cr. [max 8.0 cr.]; prerequisite 3305 or #; spring, every year)

ARTS 5360. Advanced Performance Art and Installation. (4.0 cr. [max 8.0 cr.]; prerequisite 3306 or #; fall, spring, offered periodically)
Studio practice in performance art and installation; investigation of historical and contemporary methods and concepts of interdisciplinary expression. Development of personal imagery.

ARTS 5370. Contemporary and Traditional Approaches to Figurative Sculpture. (4.0 cr. [max 12.0 cr.]; prerequisite 3307 or #; spring, every year)

ARTS 5390. Advanced Sculpture Methods and Practice. (4.0 cr. [max 12.0 cr.]; prerequisite 5300; fall, spring, every year)
Work in selected sculptural processes with intense studio activity. Development of innovative methods/techniques.

ARTS 5400. Seminar: Concepts and Practices in Art. (3.0 cr. [max 6.0 cr.]; prerequisite BFA candidate or #; fall, spring, every year)
ARTS 5402. Artists’ Books. (4.0 cr.; prereq 3402 or #; fall, spring, every year)
Advanced projects in creation of unique, handmade books using various structures, media, techniques. Critical, historical, theoretical issues surrounding contemporary book arts.

ARTS 5403. Women's Images and Images of Women. (3.0 cr.; [ARTS 3403]; prereq 1001 or #; fall, spring, every year)
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. (3.0 cr.; A-F only; prereq Grad student or [Art BFA student: Art Major, Jr or Sr]; fall, spring, offered periodically)
Theoretical issues, business practices, professional skills required for career management/development in visual arts.

ARTS 5444. Bachelor of Fine Arts Exhibition. (1.0 cr.; S-N only; prereq 5400, BFA candidate, Sr; fall, spring, every year)
Final solo or small group exhibition and artist's statement developed in consultation with faculty advisor. Visual documentation of work and statement as appropriate to media.

ARTS 5490. Workshop in Art. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year)
Selected topics and intensive studio activity. Topics vary yearly.

ARTS 5510. Advanced Printmaking. (4.0 cr. [max 12.0 cr.; prereq 3510 or #; fall, spring, every year])
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 5550. Advanced Papermaking. (4.0 cr. [max 8.0 cr.; prereq 3505 or #; fall, spring, offered periodically])
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. (4.0 cr. [max 12.0 cr.; prereq 3601 or #; fall, spring, offered periodically])

ARTS 5620. Narrative Digital Video. (4.0 cr. [max 12.0 cr.; prereq 3602; fall, spring, every year])
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. (4.0 cr. [max 12.0 cr.; prereq 3603 or #; fall, spring, every year])

ARTS 5640. Advanced Animation. (4.0 cr. [max 12.0 cr.; prereq 3604 or #; fall, spring, every year])
Two/three-dimensional animation with digital technologies. Individual projects. Expansion of personal voice/visual clarity within framework of animated imagery and time-based artwork.

ARTS 5650. Advanced Sound Art. (4.0 cr. [max 12.0 cr.; prereq 3605; fall, spring, every year])
Sound art practice/theory. Emphasizes 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 5670. Interdisciplinary Media Collaborations. (3.0 cr. [max 9.0 cr.; prereq Upper-division undergraduate or graduate student in art, creative writing, dance, music or theater.; fall, spring, every year])
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. Emphasize integration of media arts with visual art, music, dance, and theater to produce interdisciplinary/collaborative art.

ARTS 5690. Art for the People/Art on Wheels: Advanced Projects. (4.0 cr. [max 12.0 cr.; prereq Arts 3609; spring, every year])
Advanced work in the Minneapolis Art on Wheels (MAW) project/participation in a student-run public art group. Use MAW’s hardware/software technologies for mobile projections and current urban projection techniques that rely on bicycles. Opportunities to develop/exhibit large scale works in public spaces.

ARTS 5701. Performed Photography: Documentation of Artistic Acts and Social Interventions. (4.0 cr. [prereq Two 3xxx [photography or video] courses; fall, spring, offered periodically]
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. (4.0 cr. [max 12.0 cr.; prereq Two semesters of 3xxx photography or #; fall, spring, every year])
Design/implementaton of individual advanced projects. Demonstrations, lectures, critique. Reading, writing, discussion of related articles/exhibitions.

ARTS 5810. Advanced Ceramics. (4.0 cr. [max 16.0 cr.; prereq 3801, 3802, 3810] or #; fall, spring, every year)
Critical discourse of aesthetics. History of, contemporary issues in clay and criticism. Independent, advanced projects.

ARTS 5821. Ceramic Materials Analysis. (4.0 cr.; prereq 3801 or 3802 or #; fall, spring, offered periodically)
Ceramic materials, their interrelationships. Advanced investigation of glazes, slip formulation, clay bodies in high/low temperature ranges. Individual interests related to students’ aesthetic needs.

ARTS 5990. Independent Study in Art. (1.0-4.0 cr. [max 12.0 cr.; prereq Major, completed regular course with instructor, #; fall, spring, every year])
Independent study project designed by student in consultation with instructor.

ARTS 8100. Practice and Critique: Drawing and Painting. (3.0 cr. [max 12.0 cr.; prereq Art MFA student; fall, spring, every year])
Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8300. Practice and Critique: Sculpture. (3.0 cr. [max 12.0 cr.; fall, spring, offered periodically])
Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ARTS 8400. Theoretical Constructions in Contemporary Art. (3.0 cr. [max 6.0 cr.; fall, spring, every year])

ARTS 8401. Studio and Pedagogy: Philosophy and Practice. (3.0 cr. [max 6.0 cr.; spring, every year])
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/Visiting Artists Seminar. (3.0 cr. [max 6.0 cr.; A-F or Audit; prereq 8440; fall, spring, every year])
Studio based critique to foster critical dialogue about art practice across media/disciplines. Colloquium for ideas/theories that migrate between artistic practice, influence studio work. Introduction to work/ideas of visiting artists/critics.

ARTS 8420. Seminar: Visiting Artists Program. (2.0 cr. [max 12.0 cr.; S-N only; prereq MFA student; fall, spring, every year])
Introduction to work/ideas of visiting artists/ critics. Individual studio critiques, group discussion. Students connect/extend topics to their thesis and supporting paper.

**ARTS 8490. Workshop in Art.** (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Selected topics/intensive studio activity. Topics vary yearly.

**ARTS 8500. Practice and Critique: Printmaking.** (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

**ARTS 8600. Practice and Critique: Experimental and Media Arts.** (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

**ARTS 8700. Practice and Critique:Photography.** (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

**ARTS 8800. Practice and Critique: Ceramics.** (3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, every year) Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

**ARTS 8990. M.F.A. Creative Thesis.** (1.0-9.0 cr. [max 18.0 cr.]; prereq Art MFA candidate, passed oral/ written prelim; #; fall, spring, every year) Research/studio work in preparation for thesis exhibition and supporting paper.

**Art History (ARTH)**

**College of Liberal Arts**

**ARTH 5108. Greek Architecture.** (3.0 cr.; [CNES 5108]; prereq Arth/Clas 3008, Jr or sr or grad, or #; spring, offered periodically) Geometric through classical examples of religious and secular architecture and their setting at archaeological sites in Greece, Asia Minor, and Italy.

**ARTH 5112. Archaic and Classical Greek Art.** (3.0 cr.; prereq Jr or sr or grad or #; fall, offered periodically) 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.

**ARTH 5112. Archaic and Classical Greek Art.** (3.0 cr.; prereq Jr, Clas/Arth 5111; fall, offered periodically) 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 Athens.

**ARTH 5113. Heritage After Iraq and Afghanistan: Debates in Art History, Museum Studies, and the Art Market.** (3.0 cr.; fall, spring, offered periodically) Pre- and postwar Iraq, looting of the Baghdad Museum, systematic looting of archaeological sites; destruction of Afghanistan's cultural heritage under the Taliban, looting/trade in antiquities since the overthrow; art/war in historical/contemporary perspective; nationalistic uses of archaeology, museology.

**ARTH 5115. Hellenistic and Iranian Asia: Art and Archaeology of Hellenistic, Scythian, Kushan, and Sogdian Asia.** (3.0 cr.; fall, spring, every year) Transformations of Greek architecture, sculpture, painting, mosaic, and decorative arts beginning of the eastern Mediterranean and Hellenistic Asia. Art and archaeology of the post-Hellenistic Iranian world. Religious, political and historical contexts of archaeological sites, monuments, and art objects.

**ARTH 5172. House, Villa, Tomb: Roman Art in the Private Sphere.** (3.0 cr.; [CNES 5172]; prereq one intro art history course or #; fall, spring, offered periodically) 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 5188. Art and Archaeology of Early Christianity and the Late Roman Empire.** (3.0 cr.; [REL 5252]; fall, spring, offered periodically) Emergence of Christian visual culture in Rome. Age of Tetrarchs andConstantine the Great. Age of Justinian. Development of liturgical environments such as Jewish synagogue and Christian church. Melding of imperial and Christian art, architecture, and ritual. Constantinople, from its founding through sixth century. Church architecture. Early icon/ manuscript painting.

**ARTH 5192. Persia and the Ancient Iranian World: Art and Archaeology of Achaemenid to Sasanian Persia.** (3.0 cr.; fall, spring, every year) Art, archaeology of ancient Persia and the wider ancient Iranian world from the rise of the Achaemenid empire in 650 BCE to the advent of Islam in the seventh century CE.

**ARTH 5301. Visual Culture of the Atlantic World.** (3.0 cr.; A-F or Audit; spring, offered periodically) 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.** (3.0 cr.; A-F or Audit; ) 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 5323. Art of the Italian Renaissance: 14th-16th Centuries.** (3.0 cr.; fall, every year) Chronological/thematic study of painting, sculpture, and architecture. Emphasizes major artists/commissions, but lesser schools/followers also considered.

**ARTH 5324. 15th-Century Painting.** (3.0 cr.; prereq Jr or sr or grad or #; fall, spring, offered periodically) The origin, character, and development of painting in Northern and Southern Europe.

**ARTH 5325. Art of the Aztec Empire.** (3.0 cr.; [ANTH 5325, RELS 5325]; spring, every year) Art/architecture of Nahua-speaking Aztecs of Central Mexico, from first appearance in archaeological record until Spanish invasion in 1521. Major scholarly problems, theoretical/methodological approaches. Analysis of scholarly writing.

**ARTH 5335. Baroque Rome: Art and Politics in the Papal Capital.** (3.0 cr.; [HIST 3706, ARTH 3335, RELS 5612, RELS 3612]; fall, even years) Center of baroque culture—Rome—as city of spectacular and pageantry. Urban development. Major works in painting, sculpture, and architecture. Emphasizes ecclesiastical/private patrons who transformed the Eternal City into one of the world's great capitals.

**ARTH 5411. Gender and Sexuality in Art Since 1863.** (3.0 cr.; fall, spring, offered periodically) 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 5413. Alternative Media: Video, Performance, Digital Art.** (3.0 cr.; A-F or Audit; prereq 3464 or #; ) In-depth examination of development of alternative media in 20th/21st century art. Video technologies. Performance, time based art. Digital art.

**ARTH 5417. Twentieth Century Theory and Criticism.** (3.0 cr.; prereq 3464 or #; fall, offered periodically) Trends in 20th-century art theory, historical methodology, criticism. Key philosophical ideas of modernism/postmodernism: formalism, semiotics, poststructuralism, feminism, Marxism, psychoanalysis, deconstruction.

**ARTH 5422. Off the Wall: History of Graphic Arts in Europe and America in the Modern Age.** (4.0 cr.; spring, offered periodically)
History/theory of creation of lithography, social caricature (e.g., Daumier, Gavarni), revival of etching (e.g., Goya, mid-century practitioners, Whistler), and color lithography (e.g., Toulouse-Lautrec, Vuillard, Bonnard). Media changes of 20th century. Revolutionary nature of new media.

ARTH 5454. Design Reform in the Era of Art Nouveau. (3.0 cr.; )
History of art nouveau in France, Belgium, England, Germany, Austria, Scotland, United States. Innovations in architecture, graphics, decorative arts; continental variants of the style. Major promoters and pioneers of modern design. Critical issues of design reform; texts integrated with principal monuments.

ARTH 5466. Contemporary Art. (3.0 cr.; prereq 3464 cr & #; spring, offered periodically) Survey of the art and important critical literature of the period after 1970. Origins and full development of postmodern and subsequent aesthetic philosophies.


ARTH 5494. East/West, West/East. (3.0 cr.; fall, spring, every year) Beginning in the early 18th century and culminating at the dawn of the First World War. Chinoiserie, Orientalism, Japonisme, and western influence in Japan during the Meiji Era. Historical and critical context of trade competition, the colonial race, and the shrinking geopolitical map as the period progresses. Paintings to prints, decorative arts to architecture, and world fair exhibitions to photography.

ARTH 5535. Style, Tradition, and Social Content in American Painting: Colonial Era to 1876. (3.0 cr.; ) America's colonial, Revolutionary era, and 19th-century painters' responses to the influence of European aesthetics. Key American painting types: portrait, rural genre, and landscape from Copley and Gilbert Stuart to the Hudson River School and the chroniclers of the Western frontier.

ARTH 5546. American Architecture: 1840 to 1914. (3.0 cr.; ) 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, technology, economics, urbanism, and social reform.

ARTH 5555. American Art in the Gilded Age. (3.0 cr.; fall, spring, offered periodically) Major artists, artistic movements, and aesthetic concerns that dominated American art history from the Civil War to the turn of the century. Nationalism and cosmopolitanism as well as masculinity and femininity, industrialization and the "incorporation of America," methods of art instruction and its social role. Place of art in civic life.

ARTH 5575. Boom to Bust: American Art from the Roaring Twenties to the Great Depression. (3.0 cr.; fall, spring, every year) American art/culture from 1917 to 1940. Boom of post-WWII affluence, bust of stock market crash, Midwestern Dust Bowl. How tumultuous times influenced painting, sculpture, photography, and industrial design.

ARTH 5577. Art of the Harlem Renaissance. (3.0 cr.; fall, every year) Visual side of Harlem Renaissance, as represented by painters, illustrators, sculptors, and photographers. How African-Americans in 1920s/30s tried to reclaim visual field for purpose of racial redefinition.

ARTH 5565. African American Cinema. (3.0 cr.; [ARTH 3655, AFRO 3655, AFRO 4655]; fall, offered periodically) African American cinematic achievements, from silent films of Oscar Micheaux through contemporary Hollywood and independent films. Class screenings, critical readings.

ARTH 5765. Early Chinese Art. (3.0 cr.; spring, every year) Art/material culture of early China from Neolithic age (ca. 10000-2000 BCE) to early imperial period (221 BCE-906 CE).

ARTH 5766. Chinese Painting. (3.0 cr.; fall, odd years) Major works from the late bronze age to the modern era that illustrate the development of Chinese landscape painting and associated literary traditions.

ARTH 5775. Formation of Indian Art: 2500 BCE to 300 CE. (3.0 cr.; ) Sculpture/architecture, from Indus Valley civilization through Kushana period.

ARTH 5776. Redefining Tradition: Indian Art, 400 to 1300. (3.0 cr.; ) India's art/architecture, from earliest free-standing temples through 13th century. Focusses on temples, associated sculpture. Mural painting, beginnings of Islamic architecture in India.

ARTH 5777. The Diversity of Traditions: Indian Art 1200 to Present. (3.0 cr.; fall, spring, summer, every year) 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. (3.0 cr.; ) 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. (3.0 cr.; ) 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.

ARTH 5786. Theorizing City and Space in the Mediterranean and Western Asia. (3.0 cr.; spring, even years) Development of greatest cities of Eastern Mediterranean/Western Asia from age of Alexander to rise of Islam. Methodological/theoretical approaches to study of cities where as much evidence exists in texts as archaeological form.

ARTH 5787. Visual Cultures in Contact: Cross-Cultural Interaction in the Ancient and Early Medieval Worlds. (3.0 cr.; fall, even years) Evaluate critical perspectives from variety of interdisciplinary conversations. Framework for studying cross-cultural interaction among ancient visual cultures that integrates practical, cognitive, object oriented approaches. Cross-continental movement/collective appropriation of objects/motifs.


ARTH 5926. The Cinema of Alfred Hitchcock. (3.0 cr.; [ARTH 3926]; fall, even years) Achievement/significance of Alfred Hitchcock. British/American periods of career, major films, television program. Biographical, historical, technological, industrial, aesthetic issues surrounding his achievement.

ARTH 5940. Topics: Art of the Film. (3.0 cr.; fall, spring, every year) Topics in film history including individual directors (e.g., Hitchcock, Welles), genres (e.g., westerns, musicals), and other topics (e.g., American independent filmmaking, film noir).

ARTH 5950. Topics: Art History. (3.0 cr.; max 9.0 cr; ) fall, spring, summer, every year) Topics specified in Class Schedule.

ARTH 5993. Directed Study. (1.0-4.0 cr.; max 12.0 cr.; ) A-F or Audit; prereq #; fall, spring, summer, every year) TBD

ARTH 5994. Directed Research. (1.0-4.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) TBD
ARTH 8001. Art Historiography: Theory and Methods. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Key texts, from Renaissance to present, from western/non-western fields, relating to history/criticism of both art and visual culture. Focuses on recent critical theory, its re-examination of assumptions underlying the discipline.

ARTH 8120. Computer Applications in Art History and Archaeology. (3.0 cr.; fall, spring, every year) Seminar. Potential of digital technology as applied to art history/archaeology. Computer technologies as affecting methodologies of art history/archaeology. Way in which art history/archaeology can contribute to emerging computer applications.

ARTH 8190. Seminar: Issues in Ancient Art and Archaeology. (3.0 cr. [max 12.0 cr.]; =CNES 8190); prereq #; fall, spring, every year) Selected topics, with special attention to current scholarly disputes. Topics specified in Class Schedule.

ARTH 8200. Seminar: Medieval Art. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Focus on a major art historical theme, artist, period, or genre.


ARTH 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ARTH 8340. Seminar: Baroque Art. (3.0 cr. [max 12.0 cr.]; prereq #; spring, every year) Topics vary.

ARTH 8400. Seminar: Issues in 19th-Century Art. (3.0 cr. [max 12.0 cr.]; prereq #; fall, spring, offered periodically) Typical seminars have included symbolism, role of the academy and the avant-garde, surrealism in art and theory, and Franco-American relationships at the turn of the 20th century.


ARTH 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ARTH 8500. Issues in Latin American Art. (3.0 cr. [max 12.0 cr.]; spring, every year) Topics vary.

ARTH 8520. Seminar: American Art and Material Culture. (3.0 cr. [max 12.0 cr.]; =AMST 8520); prereq #: fall, spring, offered periodically) Topics in American art, popular art, and material culture, emphasizing methods and techniques of inquiry; creation and use of archives, oral history, sources for pictorial evidence, and current approaches to interpreting traditional and non-traditional data.

ARTH 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

ARTH 8710. Seminar: Islamic Art. (3.0 cr. [max 12.0 cr.]; prereq #: fall, spring, offered periodically) Focus depends on current research interests of the professor and needs and interests of graduate students in Islamic and Asian art history.

ARTH 8720. Seminar: East Asian Art. (3.0 cr. [max 12.0 cr.]; prereq #: fall, spring, offered periodically) Research focuses on closely defined topic, such as a short period of Chinese art, a restricted subject, or role of a single artist. A substantive research paper is required and participation in the seminar dialogue is expected.

ARTH 8770. Seminar: Art of India. (3.0 cr. [max 12.0 cr.]; prereq 3 cr art history; #; fall, spring, summer, every year) Topics vary by offering.

ARTH 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

ARTH 8920. Seminar: Film History and Criticism. (3.0 cr. [max 12.0 cr.]; prereq #: fall, spring, every year) Selected topics in film history and theory, including specific directors, genres, movements, periods, and critical issues (e.g., violence).

ARTH 8950. Seminar: Issues in the History of Art. (3.0 cr. [max 12.0 cr.]; prereq 3 cr art history; #; fall, spring, every year) Theoretical or topical issues. Topics vary.

ARTH 8970. Directed Studies. (1.0-3.0 cr. [max 12.0 cr.]; prereq #: fall, spring, summer, every year) TBD

ACL 5950. Special Topics. (1.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #: fall, spring, summer, every year) Special topics.

ACL 5993. Directed Studies. (1.0-4.0 cr. [max 15.0 cr.]; A-F only; prereq Grad student; %; fall, spring, summer, every year) Guided individual reading or study for qualified graduate students.

ACL 8001. Introduction to Interdisciplinary Inquiry. (3.0 cr.; A-F or Audit; prereq ACL student or %; fall, spring, summer, every year) Emphasizes what students need to know to successfully complete their individually crafted program, including critical thinking, clear writing, interdisciplinary research.

ACL 8002. Final Project Seminar. (3.0 cr.; S-N only; prereq ACL student or %; spring, every year) Required final project seminar for graduate students in MPS in Arts/Cultural Leadership program.

ACL 8201. Leadership: Skills and Practice. (1.0 cr. [max 2.0 cr.]; A-F only; prereq ACL student, %; summer, every year) Opportunity to meet several arts/nonprofit leaders from Twin Cities community. How leaders effectively build relationships, work
with artists, board members, staff, community groups. Explore personal leadership strengths through Gallup’s Strengths Finder tool, personal reflection, readings, in-class discussion.

AAL 8202. Nonprofit Board Practicum. (1.0 cr. [max 2.0 cr.]; A-F only; prereq ACL student, %; summer, every year) Fiduciary, strategic, generative governance explored through lens of peer-learning/facilitation by seasoned board/non-profit professional. Role of executive leader to board. How executive leadership can foster healthy organization in concert with strong/highly functioning board.

Asian American Studies (AAS)
College of Liberal Arts

AAS 5920. Topics in Asian American Studies. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Topics specified in Class Schedule.

AAS 5993. Directed Readings. (1.0-4.0 cr. [max 8.0 cr.]; fall, offered periodically) Directed reading--must be set up with individual instructor.

AAS 5996. Graduate Proseminar. (1.0 cr. [max 4.0 cr.]; S-N only; fall, spring, every year) Discussions/presentations from various disciplinary perspectives on research, activism, and performance in Asian American/Diasporic Studies. Students engage in dialogue, observe models of scholarly engagement, and reflect on issues within Asian American/diasporic studies.

Asian Languages and Literatures (ALL)
College of Liberal Arts


ALL 5276. Liberalism and Its Critics: Global Perspectives. (3.0 cr.; A-F only; fall, odd years) 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 5436. Literature by 20th-Century Japanese Women in Translation. (3.0 cr.; fall, offered periodically) Literary/historical exploration of selected works by Japanese women writers in variety of genres. All literary texts read in English.

ALL 5671. Hinduisms. (3.0 cr.; [HIST 3492, ALL 3671, RELS 5671, RELS 3671]; fall, spring, offered periodically) 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 5836. Persian Fiction in Translation. (3.0 cr.; [ALL 3836, MELC 5601, MELC 3601]; fall, offered periodically) Impact of westernization on Iran, from 1920s to present. Materials produced by Iranian writers, filmmakers, and intellectuals. Internal/external forces that bind contemporary Iranian society to world civilization. Works of Hedayat (especially Blind Owl), Chubak, Aí Ahmad, Daneshvar, and Behrangi are analyzed/interpreted.

ALL 5900. Topics in Asian Literature. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Topics specified in Class Schedule.

ALL 5920. Topics in Asian Culture. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Topics specified in Class Schedule.

ALL 5990. Directed Study. (1.0-4.0 cr. [max 16.0 cr.]; fall, spring, summer, every year) Individual reading/study, with guidance of a faculty member, on topics not covered in regular courses. Prereq-instr consent, dept consent, college consent.

ALL 8001. Critical Approaches to Asian Literary and Cultural Studies. (3.0 cr.; fall, odd years) Constructions of national identity, its consolidation in current disciplinary/academic structures.


ALL 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, [adviser, DGS] consent; fall, spring, summer, every year) x

ALL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, [adviser, DGS] consent; fall, spring, summer, every year) x

ALL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) x

ALL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; fall, spring, summer, every year) x

ALL 8920. Topics in Asian culture. (1.0-3.0 cr. [max 9.0 cr.]; S-N only; fall, spring, every year) Topics specified in Class Schedule.

Astronomy (AST)
College of Science and Engineering


AST 5201. Methods of Experimental Astrophysics. (4.0 cr.; prereq Upper div CSE or grad or #; spring, odd years) Contemporary astronomical techniques and instrumentation. Emphasizes data reduction and analysis, including image processing. Students make astronomical observations at O’Brien Observatory and use department’s computing facilities for data analysis. Image processing packages include IRAF, AIPS, IDL, MIRA.

AST 8001. Radiative Processes in Astrophysics. (4.0 cr.; prereq #;) Introduction to classical/quantum physics of electromagnetic radiation as it applies to astrophysics. Emphasizes radiative processes (e.g., emission, absorption, scattering) in astrophysical contexts (e.g., ordinary stars, ISM, neutron stars, active galaxies).

AST 8011. High Energy Astrophysics. (4.0 cr.; 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.

AST 8021. Stellar Astrophysics. (4.0 cr.; prereq #;) Stellar structure, evolution, and star formation. Emphasizes contemporary research.

AST 8031. Astrophysical Fluid Dynamics. (4.0 cr.; fall, offered periodically) Introduction to physics of ideal/non-ideal fluids with application to problems of...

AST 8041. Comparative Planetology. (4.0 cr.; 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 epoch of planetary system formation: comets, asteroids, minor bodies.

AST 8051. Galactic Astronomy. (4.0 cr.; prereq #; )
Content, structure, evolution, and dynamics of Milky Way Galaxy. Emphasizes recent observations from space-/ground-based telescopes.

AST 8061. Radio Astronomy. (4.0 cr.; prereq #; )

AST 8071. Infrared Astronomy. (4.0 cr.; prereq #; )

AST 8081. Cosmology. (4.0 cr.; prereq #; )
Role of gravity in cosmology. Background, recent research advances.

AST 8110. Topics in Astrophysics. (2.0-4.0 cr.; prereq #; fall, spring, offered periodically)
Current topics in Astrophysics.

AST 8120. Topics in Astrophysics. (2.0-4.0 cr.; prereq #; )

AST 8200. Astrophysics Seminar. (1.0-3.0 cr.; prereq #; fall, spring, every year)
TBD

AST 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

AST 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

AST 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. max 12.0 cr.; No Grade Associated; 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.; fall, spring, summer, every year)

TBD

AST 8777. Thesis Credits: Master’s. (1.0-18.0 cr. max 50.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

AST 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. max 100.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

AST 8990. Research in Astronomy and Astrophysics. (1.0-4.0 cr.; prereq #; fall, spring, every year)
Research under supervision of a graduate faculty member.

Biochemistry (BIOC)

College of Biological Sciences

BIOC 5001. Biochemistry, Molecular and Cellular Biology. (5.0 cr.; =BIOC 6001; prereq undergrad course in biochemistry, #; fall, every year)
Integrated course in biochemistry, molecular biology, cell biology, and developmental biology.

BIOC 5213. Selected Topics in Molecular Biology. (3.0 cr.; A-F only; prereq 4332 or 8002 or 3021 or BIOL 4003; #; fall, every year)
Cutting edge areas in molecular biology. Topics focus on the "3 Rs" of DNA: repair, replication, and recombination. Faculty who are experts in these areas teach modules on specific topics, including discussion of their research interests.

BIOC 5216. Current Topics in Signal Transduction. (3.0 cr.; A-F only; prereq BioC 4332 or Biol 4004 or #; spring, every year)
Principles of cell signaling. Important signaling pathways/experimental approaches to study signal transduction. Discussion of current issues/answered problems in field.

BIOC 5225. Graduate Laboratory in NMR Techniques. (1.0 cr.; S-N only; prereq 8001 or #; spring, every year)
Practical aspects of nuclear magnetic resonance (NMR) spectroscopy. 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. Biocatalysis and Biodegradation. (3.0 cr.; =MICB 5309; spring, every year)
Fundamentals of microbial enzymes/metabolism as pertaining to biodegradation of environmental pollutants/biosynthesis for making commodity chemicals. Practical examples. Guest speakers from industry.

BIOC 5351. Protein Engineering. (3.0 cr.; A-F or Audit; prereq Intro physical chemistry or equiv; intro biochemistry recommended; spring, every year)
BIOC 5531. Macromolecular Crystallography I: Fundamentals and Techniques. (1.0 cr.; S-N or Audit; prereq [one organic chemistry or biochemistry course, two calculus or college physics courses] or instructor approval; fall, every year) Macromolecular crystallography for protein structure determination/engineering. Determining macromolecule structure by X-ray diffraction.

BIOC 5532. Macromolecular Crystallography II: Techniques and Applications. (1.0 cr.; S-N or Audit; prereq 5531; spring, every year) Determining structure of macromolecules using software in macromolecular crystallography.

BIOC 5960. Special Topics in Biochemistry. (3.0 cr.; A-F only; prereq [CHEM 2301 or equiv.] or #; spring, every year) In-depth study of topics in biochemistry.

BIOC 8001. Biochemistry: Structure, Catalysis, and Metabolism. (3.0 cr.; prereq BMBB or MCDB&G grad student or #; fall, every year) Protein structure, methods to determine structure, protein folding, forces stabilizing macromolecular structure, protein engineering, protein design, Dynamic properties of proteins/enzymes, enzyme substrate complexes, mechanism of enzyme catalysis. Enzymology of metabolic regulation and cell signaling.

BIOC 8002. Molecular Biology and Regulation of Biological Processes. (3.0 cr.; A-F only; prereq [BMBB or MCDB&G] grad student or #; fall, every year) Classical to current topics in molecular biology. Aspects of DNA, RNA, and protein biology. DNA replication, repair, and recombination. RNA transcription, editing, and regulation. Protein translation/modification. Technologies such as deep-sequencing micro-RNA and piRNAs.

BIOC 8084. Research and Literature Reports. (1.0 cr.; max 5.0 cr.; S-N or Audit; prereq Grad BMBB major or #; fall, spring, every year) Current developments.

BIOC 8184. Graduate Seminar. (1.0 cr. [max 5.0 cr.; S-N or Audit; prereq grad BMBB major or DGS consent; fall, spring, every year] Reports on recent developments in the field and on research projects in the department.

BIOC 8213. Selected Topics in Molecular Biology. (4.0 cr.; [GCD 8213; prereq 8002 or #; fall, every year] Current topics such as DNA replication, recombination and gene conversion, regulation of gene expression, chromatin structure and transcription, developmental gene regulation, organelle gene expression, RNA splicing, initiation/control of translation, animal viruses, transposable elements, somatic recombination, oncogenes.

BIOC 8216. Signal Transduction and Gene Expression. (3.0 cr.; prereq 8002 or #; fall, spring, every year) Cell signaling, metabolic regulation in development. Procarpyotic/eucaryotic systems used as models for discussion. Literature-based course.

BIOC 8290. Current Research Techniques. (1.0-3.0 cr. [max 9.0 cr.]; S-N or Audit; prereq Grad BMBB major; fall, spring, every year) Research project carried out in laboratory of a staff member.

BIOC 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

BIOC 8401. Ethics, Public Policy, and Careers in Molecular and Cellular Biology. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Grad student in [BMBB or MCDB&G]; fall, spring, every year) 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. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

BIOC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

BIOC 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

BIOC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

BTHX 5100. Introduction to Clinical Ethics. (3.0 cr.; prereq Jr or sr or grad student or #; fall, spring, every year) Most frequent ethical problems faced by clinicians, patients/families, and ethics consultants. Forgoing life sustaining treatment, decisional capacity, informed consent, treatment refusals, death/dying, pediatric ethics, reproductive issues, research ethics, psychiatric illness. Real cases.

BTHX 5210. Ethics of Human Subjects Research. (3.0 cr.; prereq Grad student or #; fall, every year) Issues in ethics of human subjects research.

BTHX 5300. Foundations of Bioethics. (3.0 cr.; prereq Grad student or #; spring, every year) Overview of major contemporary frameworks used to approach ethical issues in bioethics.

BTHX 5325. Biomedical Ethics. (3.0 cr.; prereq Jr or sr or grad student or #; fall, spring, every year) Major topics/issues in biomedical ethics. Patients’ rights/duties, informed consent, confidentiality, ethical issues in medical research, initiation/termination of medical treatment, euthanasia, abortion, allocation of medical resources.

BTHX 5400. Intro Ethics in Hlth Policy. (3.0 cr.; prereq Grad student or professional student or #; spring, odd years) Topics vary to reflect issues of current significance. Relates to law/policy as appropriate but focuses on moral analyses of policy issues.


BTHX 5453. Law, Biomedicine, and Bioethics. (3.0 cr.; A-F only; prereq Grad student or #; spring, odd years) Law/bioethics as means of controlling important biomedical developments. Relationship of law and bioethics. Role of law/bioethics in governing biomedical research, reproductive decisionmaking, assisted reproduction, genetic testing/screening, genetic manipulation, and cloning. Definition of death. Use of life-sustaining treatment. Organ transplantation.

BTHX 5610. Research & Publication Seminar. (1.0 cr.; prereq [Junior or senior or grad student], bioethics grad majors must register A-F; fall, every year) Introduction to research and publication. Authorship/ownership issues. Ethics in publication. Manuscript formatting/letters of submission. Peer review.

BTHX 5620. Social Context of Health and Illness. (3.0 cr.; prereq Grad student or #; spring, odd years) Social context in which contemporary meanings of health and illness are understood by providers/patients. Ethical implications.
Readings from history, social science, literature, and first-person accounts.

BTHX 5900. Independent Study in Bioethics. (1.0-4.0 cr. [max 8.0 cr.]; prereq #; fall, spring, summer, every year)
Students propose area for study with faculty guidance, write proposal which includes outcome objectives and work plan. Faculty member directs student's work and evaluates project.

BTHX 8000. Advanced Topics in Bioethics. (1.0-4.0 cr. [max 8.0 cr.]; prereq Grad student; fall, spring, every year)
Topics of contemporary interest. Topics specified in Class Schedule.

BTHX 8114. Ethical and legal issues in Genetic Counseling. (3.0 cr.; A-F or Audit; prereq MCDG MS; genetic counseling specialization or #; spring, every year)
Professional ethics. Legal/ethical concerns with new genetic technologies.

BTHX 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser consent, DGS consent; fall, spring, every year)
Supervised placement to apply knowledge/skills from core courses. Individualized plan is developed between student, bioethics adviser or DGS, and mentor at practicum site.

BTHX 8500. Practicum in Bioethics. (1.0-4.0 cr. [max 16.0 cr.]; Student Option No Audit; prereq Bioethics grad [major or minor] or #; fall, spring, every year)
Supervised placement to apply knowledge/skills from core courses. Individualized plan is developed between student, bioethics adviser or DGS, and mentor at practicum site.

BTHX 8510. Gender and the Politics of Health. (3.0 cr.; prereq #; spring, odd years)
Significance of gender to health and health care. Feminist analysis regarding moral/political importance of gender, possibly including contemporary western medicine's understanding of the body, childbirth, and reproductive technologies; cosmetic surgery; chronic illness; disability; participation in research; gender and classification of disease. Care work, paid/non-paid. Readings from feminist theory, history, social science, bioethics, and moral philosophy.

BTHX 8610. Medical Consumerism. (3.0 cr.; spring, odd years)
Roots/implications of "medical consumerism." How consumerist model shapes concepts of disease/disability. Larger historical developments that have led to current situation. How movement toward consumerism changes the profession of medicine. How tools of medical enhancement shape the way we think about our identities and live our lives. Texts from philosophy, history, literature, law, film, and social sciences.

BTHX 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; fall, spring, summer, every year)
tbd

BTHX 8900. Advanced Independent Study in Bioethics. (1.0-4.0 cr. [max 8.0 cr.]; prereq #; fall, spring, summer, every year)
Students propose area for individual study with faculty guidance. Students write proposal, which includes outcome objectives and work plan. Faculty member directs student's work and evaluates project.

Bioinformatics (BINF)

BINF 5460. Bioinformatics Journal Club. (1.0 cr. [max 6.0 cr.]; S-N or Audit; fall, spring, summer, every year)
Bioinformatics Journal Club

BINF 5490. Topics in Bioinformatics. (1.0-6.0 cr. [max 12.0 cr.]; prereq #; fall, spring, summer, every year)
Independent or group study in bioinformatics.

Biology (BIOL)

BIOL 5272. Applied Biostatistics. (3.0 cr.; A-F only; =BIOL 3272; prereq One semester of college-level [(calculus or statistics or computer programming), general biology]; fall, every year)
Characterization of cell-matrix interactions; case study of engineered tissues, including skin, bone marrow, liver, vessel, and cartilage; regulation of biomaterials and engineered tissues.

BIOL 5309. Molecular Ecology And Ecological Genomics. (3.0 cr.; prereq BIOL 3407 or BIOL 4003; fall, even years)
Application of molecular tools (PCR, sequencing, AFLP, SNPs, QTL) and analyses of molecular data for understanding ecological/evolutionary processes. Strengths/weaknesses of techniques/analyses. Questions molecular tools are used to answer.

BIOL 5407. Ecology. (3.0 cr.; =BIOL 3408W, BIOL 3807, EEB 3001, BIOL 3407); prereq [One semester college biology, [MATH 1142 or MATH 1271 or MATH 1281 or equiv], grad student] or #; fall, spring, every year)
Principles of population growth/interactions and ecosystem function applied to ecological issues, including regulation of human populations, dynamics/impacts of disease, invasions by exotic organisms, habitat fragmentation, and biodiversity. Lab.

BIOL 5409. Evolution. (3.0 cr.; =BIOL 3809, BIOL 2822, BIOL 4049); prereq One semester of college biology, grad student; fall, every year)
Diversity of forms in fossil record and in presently existing biology. Genetic mechanisms of evolution. Examples of ongoing evolution in wild/domesticated populations and in disease-causing organisms. Lab.

BIOL 5910. Special Topics in Biology for Teachers. (1.0-4.0 cr. [max 12.0 cr.]; prereq BA or BS in science or science education or elementary education or K-12 licensed teacher; spring, summer, every year)
Courses developed for K-12 teachers depending on topics or subtopics which might include any of the following: plant biology, animal biology, genetics, cell biology, biochemistry, microbiology.

BIOL 5950. Special Topics in Biology. (1.0-4.0 cr. [max 8.0 cr.]; A-F only; fall, spring, summer, offered periodically)
In-depth study of special topic in life sciences.

Biomedical Engineering (BMEN)

BMEN 5001. Advanced Biomaterials. (3.0 cr.; A-F or Audit; prereq 3301 or MatS 3011 or grad student or #; fall, every year)
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. (3.0 cr.; prereq CSE upper div or grad student or med student or #; fall, every year)
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. (3.0 cr.; prereq [CSE upper div, grad student] or #; spring, offered periodically)
Instrumentation, computer systems, and processing requirements for clinical physiological signals. Electrode characteristics, signal processing, and interpretation of physiological events by ECG, EEG, and EMG. Measurement of respiration and blood volume/flow.

BMEN 5111. Biomedical Ultrasound. (3.0 cr.; prereq [[3401 or equiv], [MATH 2373 or equiv], [MATH 2374 or equiv], [CSE upper div or grad student]] or #; spring, every year)
Introduction to biomedical ultrasound, including physics of ultrasound, transducer technology, medical ultrasound imaging, photoacoustic imaging, applications of non-linear acoustics, and high-intensity ultrasound.

BMEN 5151. Introduction to BioMEMS and Medical Microdevices. (2.0 cr.; A-F or Audit; prereq CSE sr or grad student or medical student; spring, every year)
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. (3.0 cr.; prereq [3001 or equiv], [CSE upper div or grad student]) or #; fall, spring, offered periodically)
Introduction to biomechanics of musculoskeletal system. Anatomy, tissue material properties. Kinematics, dynamics,
Neural interface technologies currently in use in patients as well as the biophysical, neural coding, and hardware features relating to their implementation in humans. Practical and ethical considerations for implanting these devices into humans.

**BMEN 5421. Introduction to Biomedical Optics.** (3.0 cr.; A-F or Audit; prereq CSE 5401 or grad student; spring, offered periodically)

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

**BMEN 5444. Muscle.** (3.0 cr.; spring, offered periodically)

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

**BMEN 5501. Biology for Biomedical Engineers.** (3.0 cr.; prereq Engineering upper div or grad student; fall, spring, offered periodically)


**BMEN 5701. Cancer Bioengineering.** (3.0 cr.; A-F or Audit; prereq [Upper division CSE undergraduate, CSE graduate student] or #; fall, every year)


**BMEN 5910. Special Topics in Biomedical Engineering.** (3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)

Special topics in biomedical engineering.

**BMEN 5920. Special Topics in Biomedical Engineering.** (2.0-3.0 cr. [max 6.0 cr.]; fall, every year)

Special topics in biomedical engineering.

**BMEN 8201. Advanced Tissue Mechanics.** (3.0 cr.; A-F or Audit; prereq [MATH 5243 or MATH 5343] or equiv; fall, every year)


**BMEN 8301. Functional Biomedical Imaging.** (3.0 cr.; A-F or Audit; spring, every year)


**BMEN 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

No description.

**BMEN 8334. Laboratory Neuroengineering.** (1.0 cr. [max 6.0 cr.]; S-N only; prereq Grad student in CSE or neuroscience; fall, spring, summer, every year)

Lab rotation in neuroengineering.

**BMEN 8335. Neuroengineering Practicum.** (3.0 cr. [max 6.0 cr.]; A-F; prereq PhD student in BMEn, EE, ME, or NSci or #; spring, every year)

Topics/issues in neuroengineering. Ethics, professional conduct, conflicts, plagiarism, copyright, authorship, research design considerations, IRB, intellectual properties, review process, professional presentations, proposal writing.

**BMEN 8381. Bioheat and Mass Transfer.** (3.0 cr.; prereq CSE grad student, upper div transport/fluids course; [physics, biology] recommended; fall, offered periodically)

Analytical/numerical tools to analyze heat/mass transfer phenomenon in cryobiological, hyperthermic, other biomedically relevant applications.

**BMEN 8401. New Product Design and Business Development.** (4.0 cr.; A-F or Audit; [=ENTR 6041, ENTR 6087, ME 8221]; prereq [CSE grad student or CSOM grad student]; some design experience; 8401, 8402 must be taken same yr; fall, every year)

Student teams work with CSE 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.** (4.0 cr.; A-F or Audit; [=ME 8222]; prereq =ME 8222; 8401; spring, every year)

Student teams work with CSE 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 Drug and Gene Delivery: Materials, Mechanisms, and Technologies.** (3.0 cr.; A-F or Audit; prereq CSE 3011 or equiv; spring, every year)

Models. (4.0 cr.; A-F or Audit; PHM 8431; prerequisite: Differential equations course including partial differential equations or #; spring, every year)

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

BMEN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associate; prerequisite Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

BMEN 8501. Dynamical Systems in Biology. (3.0 cr.; A-F or Audit; prerequisite Grad student in engineering or physics or math or physiology or neuroscience; fall, every year)

Nonlinear dynamics with specific emphasis on behavior of excitable systems (neurons/cardiac myocytes).

BMEN 8502. Physiological Control Systems. (3.0 cr.; A-F only; prerequisite BMEN 8101 or equivalent; fall, every year)

Simulation, identification, and optimization of physiological control systems. Linear and nonlinear systems analysis, stability analysis, system identification, and control design strategies, including constrained, adaptive, and intelligent control. Analysis and control of physiological system dynamics in normal and diseased states.

BMEN 8511. Systems and Synthetic Biology. (3.0 cr.; A-F or Audit; fall, every year)

Systems/synthetic biology methods used to characterize/engineer biological systems at molecular/cellular scales. Integration of quantitative experimental approaches/mathematical modeling to elucidate biological design principles, creating new molecular/cellular functions.

BMEN 8601. Biomedical Engineering Seminar. (1.0 cr.; S-N or Audit; fall, every year)

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

BMEN 8602. Biomedical Engineering Seminar. (1.0 cr.; S-N or Audit; spring, every year)

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

BMEN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associate; prerequisite 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; fall, spring, summer, every year)

TBD

BMEN 8710. Directed Research. (1.0-3.0 cr.; fall, spring, summer, every year)

TBD

BMEN 8720. Internship in Biomedical Engineering. (1.0-3.0 cr. [max 6.0 cr.]; S-N or Audit; prerequisite Grad BMEN major; fall, spring, summer, every year)

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

BMEN 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associate; prerequisite Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

(No description)

BMEN 8820. Plan B Project. (2.0-3.0 cr.; prerequisite BMEN MS student; fall, spring, summer, every year)

Project chosen by student and adviser to satisfy M.S. Plan B project requirement. Written report required.

BMEN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associate; prerequisite PhD student in biomedical engineering; max 14 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

Thesis credit: doctoral.

BMEN 8900. Special Topics in Biomedical Engineering. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; fall, spring, offered periodically)

Topics in biomedical engineering.

BMEN 8910. Independent Study. (1.0-3.0 cr.; prerequisite Grad BMEN major; fall, spring, summer, every year)

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.

BBE 5095. Special Problems. (1.0-5.0 cr.; prerequisite #; fall, spring, summer, every year)

Advanced individual-study project. Application of engineering principles to specific problem.

BBE 5202. Wood and Fiber Science. (3.0 cr.; A-F or Audit; spring, every year)

Wood as a bio-material. Wood’s anatomical/cellular structure compared with other plant-derived materials. Wood’s physical properties/characteristics in various applications. Non-wood fiber, bio-product characteristics.

BBE 5203. Environmental Impacts of Food Production. (3.0 cr.; A-F or Audit; prerequisite intended for non-engineering students; Credit will not be granted if credit has been received for AGET 5203; fall, spring, every year)

Crop production intensity, animal raising options, food processing waste alternatives, pest control.

BBE 5212. Safety and Environmental Health Issues in Plant and Animal Production and Processing. (3.0 cr.; A-F or Audit; prerequisite grad student or #; Credit will not be granted if credit has been received for AGET 5212; fall, spring, summer, every year)

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 5301. Applied Surface and Colloid Science. (3.0 cr.; prerequisite BBE 4301; prerequisite Grad student or #; fall, every year)


BBE 5302. Biodegradation of Bioproducts. (3.0 cr.; prerequisite BBE 4302; prerequisite Grad student or #; spring, every year)

Organisms and their importance to bio-based products: deterioration, control, bioprocesses for benefit.

BBE 5303. Introduction to Bio-based Materials Science. (3.0 cr.; prerequisite BBE 4303; prerequisite Grad student or #; spring, every year)

Principles of materials science, their application to bio-based materials. Project required.

BBE 5305. Pulp and Paper Technology. (3.0 cr.; prerequisite Grad student or #; fall, every year)


BBE 5333. Off-road Vehicle Design. (4.0 cr.; A-F only; prerequisite BBE 4333; prerequisite # or AEM 2001, AEM 3031; prerequisite # or 3012 or &3012 or CE 3502 or ACE 3502, upper div CSE or #; fall, spring, every year)

**BBE 5401. Bioproducts Engineering.** (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year) Unit operations of bioproducts engineering/manufacture. Project required.

**BBE 5402. Bio-based Products Engineering Lab I.** (1.0 cr.; A-F or Audit; =BBE 4402; prereq Grad student or #; spring, every year) Laboratory exercises in bio-based products engineering.

**BBE 5403. Bio-based Products Engineering Lab II.** (1.0 cr.; A-F or Audit; =BBE 4403; prereq Grad student or #; fall, every year) Laboratory exercises in bio-based products engineering.

**BBE 5404. Biopolymers and Biocomposites Engineering.** (3.0 cr.; A-F or Audit; =BBE 4404; prereq grad student or #; fall, every year) Structure/properties of biopolymers. Engineering of composites from biopolymers/plant-based materials.


**BBE 5412. Biocomposites and Biomass Energy.** (4.0 cr.; =BBE 4412V; prereq Grad student or #; spring, every year) Manufacturing processes, end-use applications of bio-based products.

**BBE 5413. A Systems Approach to Residential Construction.** (4.0 cr.; =HSG 4413, BBE 4413; prereq Grad student or #; spring, every year) Dynamic/interrelated issues of energy, moisture control, indoor air quality in residential bldgs. 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.

**BBE 5414. Advanced Residential Building Science.** (4.0 cr.; =BBE 4414; prereq Grad student or #; fall, every year) Building science theory, advanced applications for residential buildings. Focuses on heat/mass transfer.

**BBE 5416. Building Testing & Diagnostics.** (2.0 cr.; =BBE 4416; prereq Grad student or #; spring, every year) Theoretical basis for performance testing. Diagnostics applications for residential structures. Focuses on existing structures and retrofit/mediated applications. Digital differential pressure gauges, blower doors, airflow hoods/grid, duct pressure testing, infrared thermography. Hands-on sessions for equipment use, problem solving.

**BBE 5480. Special Topics.** (3.0-4.0 cr. [max 12.0 cr.]; =BBE 3480; prereq Sr or grad student; fall, spring, every year) Topics specified in Class Schedule.

**BBE 5503. Marketing of Bio-based Products.** (4.0 cr.; A-F or Audit; =BBE 3503; prereq Grad student or #; fall, every year) 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.

**BBE 5504. Bio-based Products Development and Management.** (3.0 cr.; A-F or Audit; prereq Grad student or #; spring, every year) Concepts of new product development and product management and their application to bio-based products.

**BBE 5513. Watershed Engineering.** (3.0 cr.; A-F or Audit; prereq 3023, upper div CSE; fall, every year) 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.

**BBE 5523. Ecological Engineering Design.** (3.0 cr.; A-F only; =BBE 4523; prereq [CHEM 1022 or CHEM 1065, CHEM 1066] BBE 3012, grad student) or #; spring, every year) Application of ecological engineering to design of remediation systems. Artificial ecosystems, ecosystem/wetland restoration, constructed wetlands, biological engineering for slope stability, waste treatments. Restoring ecological service of watersheds.

**BBE 5535. Assessment and Diagnosis of Impaired Waters.** (3.0 cr.; A-F only; =BBE 4535; prereq Grad student or #; fall, every year) Assessing impaired waters and developing TMDL for conventional pollutants. Preparing/communicating legal, social and policy aspects. TMDL analysis of real-world impaired waters problem. Field trip to impaired waters site.

**BBE 5608. Environmental and Industrial Microbiolog.** (3.0 cr.; A-F only; =BBE 4608; prereq [BIOL 1001 or BIOL 1009], CHEM 1011; fall, every year) Use of microbes/enzymes to detoxify contaminants in field or in containment facilities. Contaminants, sources, fates. Biological organisms, pathways, catalysts utilized in bioremediation. Site inspection practices, bioremediation technologies, application in real-world situations.

**BBE 5713. Biological Process Engineering.** (3.0 cr.; A-F only; =BBE 4713; prereq [3033, 4013 or 84013], [upper div CSE or grad student]) or #; spring, every year) Material/energy balances. Homogeneous reactions of bioprocess engineering and biological systems. Fermentation engineering, reactor design fundamentals. Filtration, centrifugation, separation, absorption, extraction, chromatography. Biorefining. Conversion of biomass into bioenergy, biochemicals, and biomaterials.

**BBE 5723. Food Process Engineering.** (3.0 cr.; A-F or Audit; =BBE 4723; prereq [4013 or 40133], [upper div CSE or grad student]) or #; spring, every year) Food processing engineering. Applications of material balance, energy balance, fluid dynamics, and heat/mass transfer to refrigeration, freezing, psychometrics, dehydration, evaporation, non-thermal processing, and separation. Development/control for food products.

**BBE 5733. Renewable Energy Technologies.** (3.0 cr.; A-F or Audit; =BBE 4733; prereq Grad student or #; spring, every year) Energy security and its environmental, economic and societal impacts. Current and emerging technologies for production and use, characteristics of renewable energy, key methods for efficient production, current and probable future, and impact on sustainable development.

**BBE 8001. Seminar I.** (1.0 cr.; A-F only; fall, every year) Presentation/discussions on current research topics, research philosophy/principles, proposal writing, professional presentations.

**BBE 8002. Seminar II.** (1.0 cr. [max 2.0 cr.]; A-F only; prereq 8001 or 8001 or equiv; fall, every year) Organization/critique of seminars on new developments in biosystems and agricultural engineering.

**BBE 8003. Research Seminar II.** (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq 8002 or equiv; spring, every year) Moderation and critique seminars in biosystems and agricultural engineering.

**BBE 8005. Supervised Classroom or Extension Teaching Experience.** (2.0 cr.; S-N or Audit; =SOIL 8005, PLPA 8005, AGRO 8005, LAAS 8005, HORT 8005; prereq #; fall, spring, every year) Teaching experience is offered in the following departments: Biosystems and Agricultural Engineering; Agronomy and Plant Genetics; Horticultural Science; Soil, Water, and Climate; Plant Pathology. Discussions about effective teaching to strengthen skills and develop a personal teaching philosophy.

**BBE 8013. Parameter Estimation in Biosystems and Agricultural Engineering.** (3.0 cr.; A-F or Audit; prereq Stat 3021 or equiv, computer programming course; fall, spring, offered periodically) Procedures for estimating parameter values and parameter uncertainty from experimental data. Values and interpretation of linear and nonlinear models using ordinary and weighted least-squares methods. Design of experiments. Application to biosystems and agricultural engineering problems.

**BBE 8094. Advanced Problems and Research.** (2.0-6.0 cr.; prereq 5095; fall, spring, offered periodically)
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu.

BBE 8300. Research Problems. (1.0-10.0 cr.; prereq #; fall, spring, every year) Independent research under faculty guidance.

BBE 8303. Machinery Modeling. (3.0 cr.; prereq [3012 or CE 3502], AEM 2021; fall, spring, offered periodically) Machinery systems modeling using multibody dynamics simulation software (MBS). Review models presented in literature. Report on limitations of modeling approaches used. Models developed in students' areas of interest.

BBE 8304. Advanced Topics in Wood Drying. (2.0 cr.; prereq 4304; fall, every year) Rheological behavior of first-dried solid wood. Significance of creep to stress-strain pattern, shrinkage, and degrade development in lumber drying. Interpretation/evaluation of schedules, processes, and primary/auxiliary equipment used in commercial drying processes. Energy consideration in drying processes.

BBE 8306. Graduate Seminar. (2.0 cr. [max 6.0 cr.]; spring, offered periodically) Communication of scientific knowledge related to wood and paper science through the media of poster sessions, oral presentations, and the Internet.

BBE 8307. Advances and Methods in Forest Products Pathology and Preservation. (2.0 cr.; prereq 4303; spring, every year) Principles of wood protection, methods of evaluating preservatives. Emphasizes international developments.

BBE 8311. Mechanics of Wood and Wood Composites. (2.0 cr.; prereq #; spring, every year) Advanced topics on behavior of wood composites.

BBE 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

BBE 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

BBE 8513. Hydrologic Modeling of Small Watersheds. (3.0 cr.; prereq [3012 or CE 3502], hydrology course; ) Study/representation of hydrologic processes by mathematical models. Stochastic meteorological variables, infiltration, overland flow, return flow, evapotranspiration, channel flows. Approaches for model calibration/evaluation.

BBE 8523. Coupled Heat, Moisture, and Chemical Transport in Porous Media. (3.0 cr.; A-F or Audit; prereq [CSci 5301 or equiv], [Math 5512, Math 5513] or equiv, [Soil 5232 or equiv], computer programming; ) Mathematical study of coupled heat, moisture, and chemical transport in porous media. Derivation of governing equations for coupled heat, moisture, and chemical transport. Derivation of numerical solution techniques to solve coupled equations. Comparison of numerical solutions to analytical solutions.

BBE 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

BBE 8703. Managing Water in Food and Biological Systems. (3.0 cr.; prereq Chem 3501 or FScN 5451 or MatS 3011 or #; ) Qualitative and quantitative analysis of water in foods and biological materials using NMR and MRI. Water and chemical reactivity, microbial activity, physiochemical properties and changes, and structural properties and changes in foods and biological materials.

BBE 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

BBE 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

BA 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

BA 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

BA 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Carlson Executive MBA (CMBA) Curtis L. Carlson School of Management

CMBA 5554. International Residency. (1.5 cr.; A-F only; spring, every year) Students travel to an international location for nine days, engage in discussions with international colleagues, to apply program concepts and develop broader sensitivity to cultural/social differences. Pre-trip preparation, on-site discussion, and trip assignment are also required. Held in late March.

CMBA 5611. Statistics and Decision Making. (3.0 cr.; A-F only; fall, every year) Exploratory data analysis, inferential procedures, statistical process control, regression analysis.


CMBA 5613. Organizational Behavior. (3.0 cr.; A-F only; fall, every year) Theories/frameworks for analyzing behavior of individuals, groups, and the organization itself. Providing leadership in organizations. Organizational structure, culture, politics, and human resource management.

CMBA 5614. Operations Management. (3.0 cr.; A-F only; fall, every year) Strategic impact of operations decisions. Strategy, process design, productivity/quality management, business process re-engineering, forecasting, demand management, inventory, production planning, scheduling, supply chain, international operations.

CMBA 5621. Financial Management. (3.0 cr.; A-F only; spring, every year) Students apply concepts of risk, return, and valuation to decisions that a corporate financial officer or person in small business must make about sources/uses of funds during changing financial markets.

CMBA 5622. Economics. (3.0 cr.; A-F only; spring, every year) Fundamental micro/macroeconomic tools/applications. Determination of interest rates, GDP, employment, prices (inflation), Federal Reserve policy, how does it affects business. Timely readings.

CMBA 5623. Marketing Management. (3.0 cr.; A-F only; spring, every year) Developing/implementing a firm's strategy in target markets. Applying analytic concepts and decision tools to product offering, distribution, pricing, and communication program.


CMBA 5625. Entrepreneurship and Innovation. (3.0 cr.; A-F only; spring, every year) Entrepreneurial role of employee/management in increasing organizational value through creation/formation of new businesses, products, or markets within entities ranging...
from early stage companies to social ventures to F500 corporations.

CMBA 5710. Leadership. (1.5 cr.; A-F only; fall, every year)
Self-awareness/insight concerning personal leadership/core values. Increase capabilities to understand potential personal derailment patterns/create effective strategies to address challenges. Develop lifelong executive leadership practices/habits for high performance in demanding circumstances.

CMBA 5711. Negotiation. (3.0 cr.; A-F only; fall, every year)
Securing agreements between two or more parties who are interdependent and are seeking to maximize their own outcomes. Negotiation in various settings. Simulations, role-playing, cases.

CMBA 5712. Information Technology Management. (1.5 cr.; A-F only; fall, every year)
Various information technologies, their applications. Competitive advantages associated with information technology. Organizational/managerial implications.

CMBA 5713. Managerial Accounting. (3.0 cr.; A-F only; fall, every year)

CMBA 5714. Advanced Marketing. (3.0 cr.; A-F only; fall, every year)

CMBA 5715. Advanced Financial Management. (3.0 cr.; A-F only; fall, every year)
Executive-level corporate financial policy. Rigorous case-oriented approach. Students apply principles of finance on their own initiative.

CMBA 5721. Advanced Management Topics. (1.5 cr. [max 3.0 cr.]; A-F only; spring, every year)
Topics reflect strengths, talents, and interests of class. Topics integrate different aspects of curriculum while not being limited by specific area/paradigm.

CMBA 5722. International Business. (3.0 cr.; A-F only; spring, every year)

CMBA 5723. Ethics. (1.5 cr.; A-F only; fall, spring, every year)
Role of ethics in corporate strategy. Stakeholder management, individual/collective responsibility, international business ethics. Business's responsibility to the environment.

CMBA 5724. International Residency. (1.5 cr.; A-F only; spring, every year)
Students travel to international location for 11 days. Discussions with international colleagues. Applying program concepts. Sensitivity to cultural/social differences. Pre-trip preparation, on-site discussion, trip assignment.

Carlson School of Management (CSOM)
Curtis L. Carlson School of Management

CMBA 5722. International Business. (1.5 cr.; A-F only; fall, every year)
Role of ethics in corporate strategy. Stakeholder management, individual/collective responsibility, international business ethics. Business's responsibility to the environment.


CSPH 5110. Foundations of Interprofessional Communication and Collaboration. (1.0 cr.; S-N only; prerequisite: CLSP or OT student; fall, every year)
Interprofessional approach to health care. Directed group activities in five two-hour sessions: personal/professional image; teamwork, self/peer assessment; health professions; professional identity/integrity; relationships between professions and those they serve. Includes online modules.

CSPH 5111. Ways of Thinking about Health. (2.0 cr.; S-N or Audit; prerequisite: Jr, Sr, or grad student standing; #; fall, every year)

CSPH 5115. Cultural Awareness, Knowledge and Health. (3.0 cr.; prerequisite Jr or Sr or grad student or #; spring, every year)
How knowledge can become resource for individual, family, community health. Interactive glimpse of wisdom of cultural communities. Develop capacity to see culture within professional education/practice. Cultural constructs underpinning medical system, role of culture in interaction between practitioner/patient, role of reconnection to cultural heritage in healing.

CSPH 5121. Whole Systems Healing: Health and the Environment. (2.0 cr.; prerequisite Jr or Sr or grad student or #; spring, summer, every year)
Selected interfaces between human health and the environment. Using complexity theory as a theoretical framework, students use phenomenological methodologies to analyze and describe the interrelated dynamics of human and natural systems. Case studies. Develop strategies to optimize the healthy functioning of human/environmental systems.

CSPH 5201. Spirituality and Resilience. (2.0 cr.; prerequisite Jr or Sr or grad student or #; spring, summer, every year)
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. (2.0-3.0 cr.; prerequisite Jr or Sr or grad student or #; fall, summer, every year)
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 5212. Peacebuilding Through Mindfulness: Transformative Dialogue in the Global Community. (3.0 cr.; prerequisite Jr or Sr or grad student or #; spring, summer, every year)
Contemplative/mindfulness practice. Tapping into reservoir of strength, compassion, and wisdom that fosters expressions of unconditional love, reconciliation, and forgiveness. Shifting from ego centered cognitive analysis/assessment to heart centered presence and deep listening grounded in humility/compassion. Native American circle process, including use of talking piece.

CSPH 5215. Forgiveness and Healing: A Journey Toward Wholeness. (3.0 cr.; prerequisite Jr or Sr or grad student or #; spring, summer, every year)
CSPH 5221. Significant Spiritual Texts of the 20th Century. (3.0 cr.; prereq Jr or sr or grad student or #: fall, spring, every year) Diverse "spiritual classics" (i.e., elements of western canon 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. (2.0 cr.; 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. (1.0 cr.; prereq [5225, 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. (2.0 cr.; A-F or Audit; prereq Jr or sr or grad student or #: spring, every year) Culturally/spiritually based health care practices of selected native/immigrant 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. (2.0 cr.; A-F or Audit; prereq Jr or sr or grad student or #: spring, summer, every year) 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 5313. Acupressure. (1.0 cr.; fall, summer, every year) Principles/applications. Location, indications for use, and techniques of stimulation of acupressure points. Methods for self care and care of others. Treatment of pain conditions, chronic health conditions, palliative care, oncology, women's health care.

CSPH 5315. Traditional Tibetan Medicine: Ethics, Spirituality, and Healing. (2.0 cr.; 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. (2.0 cr.; summer, every year) 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. (4.0 cr. [max 12.0 cr.]; Student Option No Audit; prereq [5315, 5317] or #: fall, summer, every year) 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. (2.0 cr.; =INMD 7567; prereq Jr or sr or grad student or #: summer, every year) 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. (3.0 cr.; prereq Jr or sr or grad student or #: fall, spring, every year) 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. (2.0 cr.; S-N or Audit; prereq Jr or sr or grad student or #:) 3 ½-day retreat intensive. Shamanic philosophies, ritual etiquette, Core beliefs common to all shamanic healing practices. Cross-cultural healing beliefs/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. (2.0 cr.; S-N or Audit; prereq [5331, Jr or sr in health science or practicing health professional] or #:) 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 5341. Overview of Indigenous Hawaiian Healing. (2.0 cr.; fall, every year) Traditional Hawaiian healing, ho'olomilomi (massage), la'au lapa'au (herbal medicine) and ho'oponopono (conflict resolution). Hawaiian epistemology, traditions, and cultural values compared with western. The science of traditional ecological knowledge for healing and self-reliance.


CSPH 5401. People, Plants, and Drugs: Introduction to Ethnopharmacology. (3.0 cr.; prereq Jr or sr or grad student or #: fall, spring, summer, every year) 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. (4.0 cr.; prereq Jr or sr or grad student or #:) Twelve-day, intensive course. Introduction to ethnobotany/ethnopharmacology. Lectures, field trips, presentations by local experts.


CSPH 5421. Botanical Medicines in Integrative Healthcare. (3.0 cr.; 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. (2.0 cr.; prereq Jr or sr or grad student) in Health Sciences 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 function and achieve optimal health. Emphasizes importance of nutrition as a component of self-care.

CSPH 5503. Aromatherapy Fundamentals. (1.0 cr.; prereq Jr or sr or grad student; spring, summer, every year) For health professional students/practicing health professionals. Essential oil therapy and current aromatherapy practices in clinical settings. Key safety/toxicity issues. Critique scientific/historical evidence about the therapeutic qualities of six essential oils in common use by the public and in clinical settings.

CSPH 5511. Interdisciplinary Palliative Care: An Experiential Course in a Community Setting. (2.0 cr.; prereq #; fall, spring, every year) Multidisciplinary student teams partner with interdisciplinary community hospice teams in delivery of care to patients in a variety of settings. Series of seminars employs self-analysis/case studies.

CSPH 5521. Therapeutic Landscapes. (3.0 cr.; prereq Jr or sr or grad student) in health sciences or therapeutic recreation or horticulture or landscape architecture) or health professional or #; spring, every year) Principles of therapeutic design for specific population requirements. Therapeutic landscape design. Incorporates interdisciplinary interaction between horticulture, landscape architecture, and health science departments.

CSPH 5522. Therapeutic Horticulture. (3.0 cr.; prereq 5101 or Hort 5072 or #) Central elements of therapeutic horticulture in content and practice. Evidence-based history, principles, precepts, and practical application of therapeutic horticulture. Various plant/plant-related modalities from current research findings are related to populations, using therapeutic horticulture as a treatment intervention.

CSPH 5523. Applications in Therapeutic Horticulture. (2.0 cr.; Student Option No Audit; summer, every year) 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. (2.0 cr.; prereq Jr or sr or grad student or #; fall, every year) 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. (1.0 cr.; S-N only; prereq Jr or sr or grad student or #; fall, spring, summer, every year) 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 Reiki treatment. Students provide Reiki treatments, discuss findings. Current literature, research findings.

CSPH 5536. Advanced Reiki Healing: Level II. (1.0 cr.; S-N only; prereq 5535; #; spring, every year) Principles/application of Reiki energy healing. How imagery and Reiki interventions are implemented for healing and to promote health/well-being. Description of Reiki treatments, discussion of current literature, and discussion of case examples.

CSPH 5541. Emotional Healing and Happiness: Eastern and Western Approaches to Transforming the Mind. (2.0 cr.; prereq Sr or grad student or #; fall, every year) Theoretical and practical application of Reiki energy healing. Alternative energy healing modalities, current research findings. How to identify/benchmark positive emotions and mind states. Meditation, integrative approaches. Case examples.

CSPH 5545. Mind-Body Healing Therapies. (2.0 cr.; A-F or Audit; 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. (2.0 cr.; prereq Jr or sr or grad student or #) Theories/approaches of selected somatic therapies, including dance, movement, and body-based therapies. How creative arts therapies are integrated into health care. Art therapy, poetry therapy, dance/movement therapy, music therapy. Guided experiential exercises, discussions, readings, individual learning interventions, lectures.


CSPH 5611. Healthy Humor. (1.0 cr.; 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. Humor and spirituality. Connection between positive outlook and health.

CSPH 5621. Foundations of Integrative Imagery, Phase I. (2.0 cr.; A-F only; prereq Grad student in health sciences or licensed health care professional; fall, summer, every year) Fundamental principles, core concepts of imagery. Current scientific research in the health sciences. Applications for pain/symptom relief, preparation for surgery, promotion of healing, and cancer care. Scope of clinical practice, precautions and safeguards.

CSPH 5631. Healing Imagery I. (2.0 cr.; prereq Jr or sr or grad student; spring, every year) How imagery and imagery interventions are implemented for healing and to promote health/well-being. Experience/create imagery interventions. Instructional strategies include experiential, discussions, readings, lecture, and individual learning interventions.


CSPH 5701. Fundamentals of Health Coaching I. (4.0 cr.; A-F only; prereq Admitted to Integrative Therapies and Healing Practice certificate program's health coaching track or #; fall, every year) Tenets of health coaching model. Tools for self development, deep listening, communication. Building blocks for optimal health from holistic perspective. How to identify/benchmark stages/patterns of change, interface with interdisciplinary health care providers, educate clients on self-care practices.

CSPH 5702. Fundamentals of Health Coaching II. (4.0 cr.; A-F or Audit; prereq 5701; spring, every year) Basic tenets of health coaching model, tools for self development, deep listening, and effective communication. Core building blocks for optimal health from a holistic perspective.
Identifying/benchmarking stages/patterns of change, interfacing with interdisciplinary health care providers, locating resources to assist clients in decision making, and educating clients on self-care practices.


CSPH 5705. Health Coaching Professional Internship. (2.0 cr.; S-N only; prereq 5701, 5702, 5703, admitted to postbaccalaureate certificate in integrative therapies/healing practices health coaching track, [5101, 5102, 5704 recommended]; spring, every year) 120 hours of health coaching practice. Students work with individual clients in acute/longitudinal encounters, provide wellness teaching, design career plan.

CSPH 5711. Optimal Healing Environments. (3.0 cr.; prereq Jr or sr or grad student or #; fall, every year) Development/implementation of optimal healing environments. Evidence base supporting structural, architectural, human, and care processes. Emphasizes identifying models of optimal healing environments and leadership strategies that support diffusion of innovation.

CSPH 8100. Special Topics in Complementary Therapy and Healing Practices. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, offered periodically) Critiquing research on complementary therapies (e.g., design, outcome measures). Synthesizing research findings for a therapy. Hypothesizing future directions for research on complementary therapies.

CSPH 8101. Critiquing and Synthesizing Complementary and Alternative Healing Practices (CAHP) Research. (2.0 cr.; prereq Grad student; fall, spring, every year) Seminar. Students evaluate peer-reviewed literature in complementary/alternative healing practices (CAHP) research. Identifying strengths/weaknesses of published research, synthesizing findings from multiple studies.

CSPH 8191. Independent Study in Integrative Therapies and Healing Practices. (1.0-6.0 cr.; prereq #; fall, spring, summer, every year) Individual study with faculty guidance. Students write proposal, including outcome objectives/work plan. Faculty member directs work, evaluates project.

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**Chemical Engineering (CHEN)**

**College of Science and Engineering**


CHEN 5551. Survey of Renewable Energy Technologies. (3.0 cr.; A-F or Audit; prereq [Upper div or #]; basic knowledge of chemistry, thermodynamics; fall, every year) 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. (1.0-4.0 cr. [max 12.0 cr.]; A-F only; prereq ChEn major upper div; fall, spring, summer, every year) New or experimental special topics.

CHEN 5751. Biochemical Engineering. (3.0 cr.; A-F or Audit; prereq [3005 or 4005], [3006 or 4406], [3102 or 4102]; spring, every year) 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 5771. Colloids and Dispersions. (3.0 cr.; A-F or Audit; prereq Physical chemistry; fall, every year) Preparation, stability, coagulation kinetics or colloidal solutions. DLVO theory, electrokinetic phenomena. Properties of micelles, other microstructures.


CHEN 8102. Principles and Applications of Rheology. (2.0 cr.; A-F or Audit; prereq 8101; spring, offered periodically) Deformation and flow of non-Newtonian and viscoelastic fluids, plastic materials, and perfectly elastic solids. Phenomenological and molecular interpretation of rheology of elastomers, polymer melts and polymer solutions, application of rheology to polymer processing.


CHEN 8112. Rheology Laboratory Project. (1.0 cr.; A-F or Audit; prereq 8101, 4702 or 8102 or 84102; spring, every year) How to make rheological lab measurements. Students select/characterize rheologically interesting material with help of instructor. Oral/written report. Half-semester course.

CHEN 8115. Electron Microscopy of Soft Matter. (2.0 cr.; A-F or Audit; prereq Chemical engineering or materials science/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, and limited signal-to-noise ratio. TEM/SEM digital imaging.

CHEN 8201. Applied Mathematics I: Linear Analysis. (3.0 cr.; A-F or Audit; =CHEN 4701; prereq Chemical engineering grad student or #; fall, every year) 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 8202. Applied Mathematics II: Nonlinear Analysis. (2.0 cr.; A-F or Audit; prereq [Grad-level course in linear analysis, chemical engineering grad major] or #; spring, every year)

CHEN 8211. Physical Chemistry of Polymers. (4.0 cr.; [CHEM 8211, MATS 8211]; prereq Undergrad physical chem or #; spring, every year)

CHEN 8221. Synthetic Polymer Chemistry. (4.0 cr.; A-F or Audit; [CHEM 8221, CHEM 5221, MATS 8221, MATS 6221, CHEM 4221]; prereq [Undergraduate organic chemistry course, undergrad physical chemistry course] or #; fall, every year)
Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

CHEN 8301. Physical Rate Processes I: Transport. (3.0 cr.; A-F or Audit; fall, spring, offered periodically)

CHEN 8302. Physical Rate Processes II: Mass Transfer. (3.0 cr.; A-F or Audit; 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 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CHEN 8401. Physical and Chemical Thermodynamics. (3.0 cr.; A-F or Audit; prereq [Undergraduate [engineering course or chemistry course in thermodynamics], Chemical engineering grad student] or #; fall, every year)
Principles of classical thermodynamics. Introduction to nonequilibrium thermodynamics, with applications in chemical engineering and materials science.

CHEN 8402. Statistical Thermodynamics and Kinetics. (3.0 cr.; A-F or Audit; prereq Chemical engineering grad student or #; spring, every year)
Introduction to statistical mechanical description of equilibrium and non-equilibrium properties of matter. Emphasizes fluids, classical statistical mechanics.

CHEN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CHEN 8501. Chemical Rate Processes: Analysis of Chemical Reactors. (3.0 cr.; A-F or Audit; prereq [Course in chemical reactor engineering, chemical engineering grad student] or #; spring, every year)

CHEN 8502. Process Control. (3.0 cr.; A-F or Audit; 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. (3.0 cr.; A-F or Audit; 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. (1.0-6.0 cr. max 12.0 cr.); No Grade Associated; 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 or; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr; fall, spring, summer, every year)
tbd


CHEN 8754. Systems Analysis of Biological Processes. (3.0 cr.; prereq Grad student in [life sciences or chemical/physical sciences or engineering]; ChEn students must take A/F; spring, every year)
Relating biological processes at molecular level to physiological level of cells/organisms/populations. Methodology for analyzing data. Quantification of molecular interplays.

CHEN 8771. Interfaces and Colloids. (3.0 cr.; A-F or Audit; prereq Physical Chemistry; fall, every year)
Interfacial tension/thermodynamics, capillarity, contact angle wettability, adhesion, preparation/stability of colloids, DLVO theory, electrokinetic phenomena, micelles, rheology of dispersions.

CHEN 8777. Thesis Credits: Master’s. (1.0-18.0 cr. max 50.0 cr.); No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

CHEN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. max 100.0 cr.); No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

CHEN 8900. Seminar. (1.0 cr.; S-N or Audit; fall, every year)
Presentation and discussion of papers concerning newer developments in chemical engineering, materials science, and related fields.

CHEN 8901. Seminar. (1.0 cr. max 9.0 cr.); S-N only; spring, every year)
Presentation and discussion of papers concerning the newer developments in chemical engineering.

CHEN 8902. Seminar: Finite Element Methods of Computer-aided Analysis. (1.0 cr.; A-F or Audit; prereq Chemical engineering grad student or #; spring, every year)
Fundamentals of finite element method as applied mathematics. How to construct finite element codes and put them into operation.

CHEN 8993. Directed Study. (1.0-12.0 cr. ; fall, spring, summer, every year)
CHEN 8994. Directed Research. (1.0-12.0 cr.; fall, spring, summer, every year)
CHEN 8995. Special Topics. (1.0-4.0 cr.; fall, spring, summer, every year)
New or experimental courses offered by department or visiting faculty.

Chemical Physics (CHPH) Institute of Technology

CHPH 8081. M.S. Plan B Project I. (4.0 cr.; A-F only; prereq Grad chem phys major; fall, spring, summer, every year)
Topic arranged by student adviser. Written report required.

CHPH 8082. M.S. Plan B Project II. (4.0 cr.; A-F only; prereq Grad chem phys major; fall, spring, summer, every year)
Topic arranged by student adviser. Written report required.
Langevin equation and Brownian motion.

Hamilton's/Lagrange's equations of motion.

(3.0 cr.; =CHEM 8551); prereq Undergrad physical chem course; #; fall, offered periodically

Review of classical mechanics. Postulates of quantum mechanics, with applications to determination of single particle bound state energies and scattering cross-sections in central field potentials. Density operator formalism, with applications to description of two-level systems, two-particle systems, entanglement, and Bell inequality.

CHEM 5755. X-Ray Crystallography. (4.0 cr.; A-F or Audit; prereq Chem grad student or #; spring, every year)

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. Data collection, correction/refinement, structure solutions, generation of publication materials, use of Cambridge Crystallographic Structure Database.

CHEM 8011. Mechanisms of Chemical Reactions. (4.0 cr.; prereq 2302 or equiv; fall, every year)


CHEM 8021. Computational Chemistry. (4.0 cr.; prereq 4502 or equiv; spring, every year)


CHEM 8025. Introduction to Graduate Research. (1.0-2.0 cr.; A-F or Audit; prereq Grad student in chem; fall, every year)

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 Research. (1.0 cr.; S-N or Audit; prereq Chem grad student; fall, spring, every year)

Builds sensitivity to ethical issues in chemical research. Readings/case studies, small-group/large-group discussion, summarizing comments from instructors/guests/panels having special expertise. Weekly seminar.

CHEM 8081. M.S. Plan B Project I. (1.0-4.0 cr.; A-F or Audit; prereq grad chem major; fall, spring, summer, every year)

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 8151. Analytical Separations and Chemical Equilibria. (4.0 cr.; prereq #; fall, spring, every year)

Advanced treatment of principles of analytical chemistry, chemical equilibria, and dynamics. Chromatographic and other modern analytical scale separation techniques. Emphasizes column dynamics and retention mechanisms.

CHEM 8152. Analytical Spectroscopy. (4.0 cr.; prereq grad chem major or #; fall, every year)

Survey of analytical spectroscopic methods. Design/application of spectroscopic instruments, including signal generation, acquisition, and interpretation. May include nuclear magnetic resonance, electron paramagnetic resonance, infrared and ultraviolet/visible spectroscopy, and mass spectrometry.

CHEM 8153. Extracting Signal From Noise. (5.0 cr.; A-F or Audit; prereq [4101 or equiv], differential equations course; spring, every year)

Use of analog/digital electronics and computational methods in experiments. Passive circuits, operational amplifiers, filters, oscillators and Laplace transform techniques in analysis, domain conversion for data acquisition/control, statistics, experimental design. Introduction to chemometrics, Fourier analysis, convolution/deconvolution, curve fitting.

CHEM 8155. Advanced Electroanalytical Chemistry. (4.0 cr.; spring, every year)

Thermodynamics/kinetics of electron/ ion transfer, electric double layer, mass transfer by diffusion/migration. Ion-selective potentiometry, chronocoulometry, chronocoulometry, cyclic voltammetry, pulse voltammetry, ion-transfer voltammetry, impedance spectroscopy, bioelectroanalysis, rotating disk electrodes, microelectrodes, chemically modified electrodes. Scanning electrochemical microscopy. EC-STM, quartz crystal microbalance.

CHEM 8157. Bioanalytical Chemistry. (4.0 cr.; A-F or Audit; spring, offered periodically)

Theory and practical aspects of analytical methods used in determination/characterization of biologically important materials. Enzymatic/kinetic methods in study of proteins, carbohydrates, lipids, and nucleic acids.

CHEM 8159. Nuclear Magnetic Resonance Spectroscopy. (4.0 cr.; prereq Sem of organic chem; )

Detailed understanding of relaxation processes, chemical exchange, quadrupolar effects, NOW, 2D NMR, NMR hardware, and solid state NMR. NMR imaging and Pulsed Field Gradient (PFG) NMR are discussed.
CHEM 8180. Special Topics in Analytical Chemistry. (2.0-4.0 cr.; prereq Grad chem major or #; )
Topics (and availability) vary by year depending on instructor and development of the field.

CHEM 8201. Materials Chemistry. (4.0 cr.; A-F or Audit; –[CHEM 4201]; prereq [4701, 3502] or #; fall, every year)
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 8211. Physical Polymer Chemistry. (4.0 cr.; –[MATS 8211, CHEM 8211]; prereq Undergrad physical chem course; spring, every year)
Chain conformations. Thermodynamics of polymer solutions, blends, and copolymers.

CHEM 8221. Synthetic Polymer Chemistry. (4.0 cr.; –[CHEM 5221, CHEM 8221, MATS 8221, MATS 221, CHEM 4221]; prereq [Undergrad organic chemistry course, undergraduate physical chemistry course] or #; fall, every year)
Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

CHEM 8280. Special Topics in Materials Chemistry. (2.0-4.0 cr.; prereq Grad chem major or #; fall, spring, offered periodically) Topics (and availability) vary by year depending on instructor and development of the field.

CHEM 8321. Organic Synthesis. (4.0 cr.; prereq 2302 or equiv; fall, every year)
Core course; fundamental concepts, reactions, reagents, structural and stereochemical issues, and mechanistic skills necessary for understanding organic chemistry.

CHEM 8322. Advanced Organic Chemistry. (4.0 cr.; prereq 2302 or equiv; spring, every year)
Modern studies. Topics, which vary by year, include natural products, heterocycles, asymettric synthesis, organometallic chemistry, and polymer chemistry.

CHEM 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CHEM 8352. Physical Organic Chemistry. (4.0 cr.; prereq 4011 or 8011; spring, every year)
Fundamental concepts, mechanistic tools for analyzing organic reaction mechanisms.

CHEM 8351. Quantum Mechanics I. (4.0 cr.; –[CHEM 5551]; prereq undergrad physical chem course; fall, every year)
Review of classical mechanics. Postulates of quantum mechanics with applications to determination of single particle bound state energies and scattering cross-sections in central field potentials. Density operator formalism with applications to description of two-level systems, two particle systems, entanglement, and Bell inequality.

CHEM 8561. Thermodynamics, Statistical Mechanic, and Reaction Dynamics I. (4.0 cr.; prereq undergrad physical chem course; fall, every year)
Two-part sequence. Thermodynamics, equilibrium statistical mechanics, ensemble theory, partition functions. Applications, including ideal gases/crystals. Theories of simple liquids, Monte Carlo, and molecular dynamics simulations. Reaction dynamics from microscopic viewpoint.

CHEM 8562. Thermodynamics, Statistical Mechanics, and Reaction Dynamics II. (4.0 cr.; prereq 8561; spring, every year)
Two-part sequence. Thermodynamics, equilibrium statistical mechanics, ensemble theory, partition functions. Applications, including ideal gases/crystals. Theories of simple liquids, Monte Carlo, and molecular dynamics simulations. Reaction dynamics from microscopic viewpoint.

CHEM 8563. Molecular Simulations. (2.0 cr.; prereq grad chem major or #; spring, every year)
Principles of Monte Carlo/molecular dynamics simulations. Algorithms, simulation set-up/ analysis, applications to chemical systems. Hands-on computational project that requires writing of computer code.

CHEM 8564. Laser Spectroscopy. (2.0 cr.; prereq grad chem major or #; spring, every year)

CHEM 8580. Special Topics in Physical Chemistry. (2.0-4.0 cr.; [max 8.0 cr.]; prereq grad chem major or #; spring, offered periodically) Topics (and availability) vary depending on instructor and development of the field.

CHEM 8601. Seminar: Modern Problems in Chemistry. (1.0 cr.; S-N or Audit; prereq grad chem major or #; fall, spring, every year)
Weekly seminar series on modern chemical topics.
CHEM 8602. Seminar Presentation: Modern Problems in Chemistry. (1.0 cr.; A-F or Audit; prereq grad chem major or #; fall, spring, every year) Weekly seminar series on modern chemical topics presented by students.

CHEM 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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 to up to four times, up to 60 combined cr; fall, spring, summer, every year) TBD

CHEM 8700. Advanced Concepts in Medicinal Chemistry: Combinatorial Methods in Chemical Biology. (2.0 cr.; A-F or Audit; MEDC 8700, PHAR 6247H; prereq [2302 or equiv], [BioC 4331 or equiv]; Principles of current combinatorial methods for generation of biological/chemical libraries. Emphasizes utility in biology and in drug design. Material is drawn from primary literature.

CHEM 8715. Physical Inorganic Chemistry. (4.0 cr.; prereq 4701 or equiv, grad chem major or #; fall, every year) Physical methods and concepts applied to inorganic and organometallic systems, including many of the following methods: NMR, IR, UV-VIS, ESR, M[0]ssbauer and mass spectroscopy, magnetic measurements, X-ray diffraction.

CHEM 8725. Organometallic Chemistry. (4.0 cr.; prereq 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. (4.0 cr.; prereq 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. (4.0 cr.; prereq 8715, grad chem major or #; spring, offered periodically) Survey of topics in main group and transition metal chemistry; emphasizes synthesis, structure, physical properties, and chemical reactivity.

CHEM 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

CHEM 8780. Special Topics in Inorganic Chemistry. (2.0-4.0 cr.; 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. (2.0-4.0 cr.; prereq Grad chem major or #; spring, every year) Topics (and availability) vary depending on instructor and development of the field.

CHEM 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 16 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Chicano Studies (CHIC) College of Liberal Arts


CHIC 5920. Topics in Chicana(o) Studies. (3.0 cr.; prereq Sr or grad student; fall, spring, every year) Multidisciplinary themes in Chicana(o) studies. Issues of current interest.

CHIC 5993. Directed Studies. (1.0-3.0 cr. [max 16.0 cr.]; prereq #; fall, spring, summer, every year) Guided individual reading, research, and study for completion of the requirements for a senior paper or honors thesis.

Child Psychology (CPSY) College of Education and Human Development

CPSY 5187. Master's Paper in Early Childhood Education. (2.0-4.0 cr.; S-N only; prereq Students must have satisfied all licensure requirements and student teaching; fall, spring, summer, every year) Students choose an ECE topic/write a paper using primarily empirical research data/provide rationale for chosen topic, interpret, analyze, and critique the research studies, draw conclusions, describe how research may be applied to field, provide suggestions for future research.

CPSY 5251. Social and Philosophical Foundations of Early Childhood Education. (2.0 cr.; A-F only; prereq Student in ECE or ECSE; fall, every year) Surveys imagery, history, philosophy, and psychology of early childhood education. Trends in early education, including diversity, special needs, legislation, public policy, and educationally appropriate practice.

CPSY 5252W. Facilitating Social and Emotional Learning in Early Childhood Education. (3.0 cr.; A-F only; prereq Student in ECE or ECSE; spring, every year) Strategies for facilitating growth in social/ emotional aspects of development. Addresses guidance/classroom management issues.

CPSY 5253. Facilitating Cognitive and Language Learning in Early Childhood Education. (3.0 cr.; A-F only; prereq Student in ECE or ECSE; fall, every year) Overview of cognitive and language characteristics of children ages 0-5 years and of how teachers can plan curriculum to facilitate children's development in these areas.

CPSY 5254. Facilitating Creative and Motor Learning in Early Childhood Education. (2.0 cr.; A-F only; prereq Student in ECE or ECSE; spring, every year) Unique/diverse qualities and characteristics children possess while progressing through universal sequence of physical growth/development and creative development. Students engage in inquiry, research/planning, and reflection as they complete the action-oriented and applied assignments with small groups of children.

CPSY 5281. Student Teaching in Early Childhood Education. (1.0-6.0 cr.; S-N or Audit; prereq MED student in early childhood ed or early childhood special ed; fall, spring, summer, every year) Application of theory/research relating to teaching preschool children. For individuals obtaining ECE licensure.

CPSY 5301. Advanced Developmental Psychology. (3.0 cr.; A-F only; fall, every year) Overview of theories/research regarding human development across lifespan. Contexts that shape development. Theoretical frameworks that are applied to study of human development, cognitive, social, emotional development. Research methods in developmental psychology.

CPSY 5413. Early Childhood and Public Policy. (3.0 cr.; fall, every year) 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. (1.0-3.0 cr.; prereq Early Childhood Policy Certificate student, #; spring, offered periodically) 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. (3.0 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]; fall, odd years)
History, theory, research, concepts, and issues in infant mental health. Issues pertinent to difficulties in development. Readings, visual material. Expert guest lectures.

**CPSY 5503. Foundations in Infant and Early Childhood Mental Health II.** (3.0 cr.; A-F only; prereq 5501; spring, even years) History, theory, research, concepts, and issues in infant mental health. Typical development. Difficulties in development. Expert guest lectures. Readings, visual material.

**CPSY 5506. Infant Observation Seminar I.** (1.0 cr.; Student Option No Audit; prereq 5501; #: spring, even years) 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.** (1.0 cr.; Student Option No Audit; prereq 5506; summer, even years) 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.** (1.0 cr.; Student Option No Audit; prereq 5508; fall, even years) 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.** (2.0 cr.; prereq [Baccalaureate degree in early-childhood-related field from accredited U.S. institution or documented equiv], [experience in early childhood research or practice]; summer, even years) 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.** (2.0 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]; summer, even years) 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.** (3.0 cr.; A-F only; prereq 5501, 5503, 5506, 5508; fall, even years) 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.** (3.0 cr.; A-F only; prereq 5518; spring, even years) Students design prevention/intervention programs and apply evidence-based strategies in workplace/practicum settings. Readings, in-class reflective practice groups.

**CPSY 5523. Reflective Supervision in Infant and Early Childhood Mental Health: Community-based.** (1.0 cr.; S-N only; prereq &5518 or &5521; spring, odd years) Principles/strategies of reflective supervision/consultation. Discussion, final assignment designated by instructor.

**CPSY 5525. Reflective Supervision in Infant and Early Childhood Mental Health: Clinical.** (1.0 cr.; S-N only; prereq &5518 or &5521; spring, odd years) Principles and strategies of reflective supervision/consultation. Discussion, final assignment designated by instructor.

**CPSY 8102. Writing Developmental Psych Grants for NIH and NSF.** (1.0-3.0 cr. [max 4.0 cr.]; A-F only; prereq Doctoral students in second year of study or beyond; spring, even years) Research/identify potential funding sources at NIH/NSF, create right fit between proposals/ agency program goals, address guideline of proposals, write effective key elements of proposal, understand review criteria, complete grant review, interpret feedback from reviews.

**CPSY 8301. Developmental Psychology: Cognitive Processes.** (4.0 cr.; prereq Doctoral student; #; fall, every year) Perceptual, motor, cognitive and language development, and biological bases of each. Conceptual framework of research issues.

**CPSY 8302. Developmental Psychology: Social and Emotional Processes.** (4.0 cr.; prereq Doctoral student; #; spring, every year) Normative issues and individual differences in social development from infancy through adolescence. Emphasizes developmental psychopathology, life span considerations.

**CPSY 8307. Prelim Seminar.** (1.0 cr.; S-N only; prereq Child psychology PhD student in second year of study; spring, every year) Prepare for written preliminary examination during summer of second year of doctoral study. Critically discuss issues/themes in field using key readings suggested by faculty/past readings from core child development doctoral courses.

**CPSY 8311. Landmark Issues and Great Controversies in Child Development.** (2.0 cr.; S-N or Audit; prereq CPsy doctoral student or #: fall, every year) History of developmental psychology and child development/movement in context of conceptual/theoretical controversies. Presentations by students/instructor.

**CPSY 8321. Seminar in Teaching Developmental Psychology.** (1.0 cr.; prereq CPsy doctoral student or #: fall, every year) Apprentices attend weekly seminar meetings covering all aspects of university teaching. Planning course coverage, teaching techniques, developing learning activities and examinations. Preparation for CPSY 8322.

**CPSY 8322. Apprenticeship in Teaching Developmental Psychology.** (1.0-3.0 cr.; prereq Child psychology doctoral student; spring, every year) Co-instruct a section of a CPSY undergraduate course. Plan syllabus, prepare/deliver lectures, devise active learning activities, prepare exams/assignments, and grade. Meet with apprenticeship supervisor to discuss teaching progress/issues.

**CPSY 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**CPSY 8360. Special Topics in Developmental Psychology.** (1.0-3.0 cr. [max 21.0 cr.]; prereq Doctoral student; fall, spring, every year) Intensive study in specialized areas of developmental psychology. Topics/credits vary.

**CPSY 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**CPSY 8606. Advanced Developmental Psychopathology.** (3.0 cr.; prereq Doctoral student or #: fall, every year) Alternative formulation of childhood disorders, emphasizing competency training rather than medical nosology.

**CPSY 8660. Advanced Developmental Psychology.** (1.0-4.0 cr. [max 21.0 cr.]; prereq Doctoral student; fall, spring, offered periodically) Intensive study in advanced areas of developmental psychology. Topics/credits vary.

**CPSY 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) tbd

**CPSY 8777. Thesis Credits: Master’s.** (1.0-18.0 cr. [max 80.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

**CPSY 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

**CPSY 8980. Research Seminar in Child Psychology.** (1.0-3.0 cr. [max 15.0 cr.]; prereq Doctoral student; fall, spring, summer, every year)
Participation in organized research group in developmental psychology.

**CAPY 5693. Directed Study in Child Psychology.** (1.0-4.0 cr.; prereq Doctoral student or #; fall, spring, every year) TBD

**CAPY 5944. Research Problems in Child Psychology.** (1.0-6.0 cr. [max 24.0 cr.]; prereq Doctoral student or #; fall, spring, every year) Individual empirical investigation.

**CAPY 8996. Directed Field Experiences in Child Psychology.** (1.0-6.0 cr.; S-N or Audit; prereq Doctoral student, #; fall, spring, summer, every year) Emphasizes field experiences focusing on intellectual and/or social development of children as individuals or members of groups; may include interactions with children in natural settings, or research on applied topics or with atypical populations.

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### Child and Adolescent Psychiatry (CAPY)

**CAPY 5623. Assessment and Treatment Interventions: Anxiety and Depression in Children and Adolescents.** (1.0 cr.; fall, spring, offered periodically) Characteristics of depression and suicidal behavior in children/adolescents. Methods of crisis intervention, treatment, and prevention.


**CAPY 5660. ADHD Throughout the Life Span: Perspectives on Diagnosis, Assessment, and Developmental Course.** (1.0-2.0 cr.; = [CAPY 5620, CAPY 5669]; prereq Upper div.; fall, summer, every year) 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 5663. Building Friendships and Peer Relationship Skills: Interventions for Socially Rejected Children.** (1.0 cr.; spring, offered periodically) Basic milestones in social development. Behaviors/mechanisms leading to peer acceptance/rejection during childhood.


**CAPY 5669. Attention Deficit Hyperactivity Disorder Throughout the Life Span: Current Perspectives on Treatment.** (1.0 cr.; = [CAPY 5660, CAPY 5620]; fall, offered periodically) Standard medication, psychosocial, and educational interventions. Recent advances in long-acting stimulant medications. Setting up behavioral programs in home/school. Educational accommodations in school. Coaching. Cognitive-behavioral/neuro-biofeedback therapies.

**CAPY 5670. Preventing Violence and Antisocial Behavior in Children and Adolescents: Interventions, Practices.** (1.0 cr.; = [CAPY 5662]; prereq Community and school-based intervention programs aimed at the prevention of antisocial behavior are reviewed and evaluated.; fall, offered periodically) Community/school-based intervention programs aimed at preventing antisocial behavior.

**CAPY 5671. Suicide Prevention: Examining What Interventions May Alter Suicide Risk.** (1.0 cr.; fall, offered periodically) 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.** (1.0 cr.; spring, offered periodically) 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.** (1.0 cr.; fall, every year) 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.

**CAPY 5674. Serious Emotional Disturbance in Children and Adolescents.** (1.0 cr.; spring, every year) Anxiety, mood, behavioral and trauma disorders. Case examples. Cognitive behavioral therapy, play therapy, behavior modification, parent-child interaction therapy, family Therapy. Discussion, exercises, session videotapes.

**CAPY 5675. Childhood Psychiatric Disorders: Case Studies and Interventions.** (1.0 cr.; spring, every year) Anxiety, mood, behavioral and trauma disorders. Case examples. Cognitive behavioral therapy, play therapy, behavior modification, parent-child interaction therapy, family Therapy. Discussion, exercises, session videotapes.

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### China Executive MBA (CHMB)

**CHMB 5800. Organizational Behavior.** (3.0 cr.; A-F only; fall, every year) Theories/frameworks for analyzing behavior of individuals, groups, and the organization itself. Emphasizes making decisions and developing action plans that enable managers to provide effective leadership. Personnel selection, reward/compensation systems, collective bargaining.

**CHMB 5801. Financial Accounting.** (3.0 cr.; A-F only; fall, every year) External accounting system used by firms to measure their economic performance and financial position. Students analyze corporate financial reports to discover impact of significant economic events. Rise of financial reporting standards and financial intermediaries in efficient allocation of capital in a modern economy. Discussions, cases.

**CHMB 5802. Statistics and Decision Making.** (3.0 cr.; A-F only; fall, every year) Exploratory data analysis, basic inferential procedures, statistical process control, regression analysis.

**CHMB 5803. Operations Management.** (3.0 cr.; A-F only; fall, every year) How to manage operations function in manufacturing/service organizations. Emphasizes strategic impact of operations decisions. Operations strategy, process design, productivity improvement, quality management, business process re-engineering, service quality, forecasting, demand management, inventory management, production planning, project management, scheduling, supply chain management, international operations management.

**CHMB 5804. Managerial Accounting.** (3.0 cr.; A-F only; spring, every year) How to analyze accounting for use in management decisions. Planning and control. Transfer pricing, performance measurements, cost behavior, cost allocation, activity based costing, standard costs.
CHMB 5805. Financial Management. (3.0 cr.; A-F only; spring, every year) Theory/practice of finance from analytical approach. Students apply basic financial concepts of risk, return, and valuation to decisions that a corporate financial officer or person engaged in small business must make about sources/uses of funds during changing financial markets.

CHMB 5806. Marketing Management. (3.0 cr.; A-F only; spring, every year) Developing/implementing most appropriate combination of variables to carry out a firm's strategy in its target markets. Applying analytic perspectives, concepts, and decision tools to marketing to decisions in product offering, distribution, pricing, and communication.


CHMB 5808. Strategic Marketing. (3.0 cr.; A-F only; ) Product markets in which an organization should compete. Sustainable competitive advantage that should be developed. Matching marketing strategy with the environment. Coordination between marketing and other business functions. Organization/management of marketing. Case studies.

CHMB 5809. Advanced Financial Management. (3.0 cr.; A-F only; ) Executive level corporate financial policy. Students are challenged to apply basic principles of finance on their own initiative. Rigorous case-oriented approach.

CHMB 5811. Information Technology Management. (3.0 cr.; A-F only; ) Managing information resources/technology. Students gain exposure to various information technologies, examine their applications, explore competitive advantages associated with information technology, and address organizational/managerial implications.

CHMB 5813. Ethics and Leadership. (3.0 cr.; A-F only; fall, spring, every year) Role that ethics can play in corporate strategy. Key concepts include stakeholder management, individual/collective responsibility, and international business ethics. Theoretical considerations applied to issues such as a business’s responsibility to the environment, truthful/tasteful advertising, obligations to local community, and managing a diverse workforce.

CHMB 5814. Business, Government, and Macroeconomics. (3.0 cr.; A-F only; ) Analyzing major economic events, predicting their ramifications. Changes in monetary/fiscal policies, unemployment, international financial markets, country risk, financial crises. Implications of macroeconomic policies and global trends for economic growth. Topics are presented within an integrated conceptual framework and are supported by experiences of the U.S., Europe, Japan, and enveloping countries.

CHMB 5815. International Human Resources Management. (3.0 cr.; A-F only; spring, every year) Topics reflect the strengths, talents, and interests of the class. Integrates different aspects of the curriculum while not being limited by a specific area or paradigm.

CHMB 5816. International Residency. (6.0 cr.; A-F only; fall, spring, every year) Students travel to an international location for 11 days and engage in discussions with international colleagues, apply program concepts, and develop a broader sensitivity to cultural/social differences. Pre-trip preparation, on-site discussion, and trip assignment are required.

Chinese (CHN) College of Liberal Arts

CHN 5011. Research Methods. (4.0 cr.; prereq 3032 or 3112; ) Introduction to the sources and approaches of research in language and literature.

CHN 5040. Readings in Chinese Texts. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 4042 or equiv or #; fall, spring, every year) Students read authentic materials of various types to increase reading/speaking ability. Topics specified in Class Schedule.

CHN 5101. Chinese Survival Skills. (1.0 cr.; S-N or Audit; prereq Enrolled in U of M law school; summer, every year) For students about to depart for China who have had no formal Chinese language instruction.

CHN 5111. Beginning Intensive Chinese. (2.0 cr.; prereq Enrolled in U of M Law School; summer, every year) Offered in Beijing.

CHN 5112. Intermediate Intensive Chinese. (2.0 cr.; prereq Enrolled in U of M Law School; summer, every year) Offered in Beijing.

CHN 5120. Topics in Chinese Linguistics. (4.0 cr. [max 8.0 cr.]; prereq 4121 or 4125; ) Studies of the structure and change in the Chinese language.

CHN 5211. Introductory Classical Chinese I. (3.0 cr.; =JPN 5211, KOR 5211; prereq Two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or #; fall, offered periodically; spring) Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English.

CHN 5212. Introductory Classical Chinese II. (3.0 cr.; =JPN 5212, KOR 5212; prereq 5211 and two years of an East Asian language (Chinese, Japanese, Korean) or its equivalent or #; spring, offered periodically)

Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English.

CHN 5393. Directed Study. (1.0-5.0 cr. [max 18.0 cr.]; fall, spring, every year) Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

CHN 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CHN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CHN 8494. Directed Research. (1.0-5.0 cr. [max 16.0 cr.; ] fall, spring, every year) Individual study/research with guidance of a faculty member.

CHN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) (No description)

CHN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

Civil Engineering (CE) College of Science and Engineering

CE 5094. Civil Engineering Research. (1.0-4.0 cr.; prereq #; fall, spring, every year) Research or independent study in concrete, structural steel, soils, hydraulics, hydrology/municipal, environmental, or transportation problems. Investigations, reports, tests, designs.

CE 5180. Special Topics. (1.0-4.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Topics vary depending on faculty and student interests.

CE 5211. Traffic Engineering. (3.0 cr.; prereq 3201, Stat 3021 or equiv; spring, offered periodically) Principles of vehicle and driver performance as they apply to the safe and efficient operation of highways. Design and use of traffic control devices. Capacity and level of service. Trip generation and traffic impact analysis. Safety and traffic studies.
CE 5212. Transportation Policy, Planning, and Deployment. (4.0 cr.; [PA 5232]; prereq 3201 or equiv; fall, every year) Techniques of analysis and planning for transportation services. Demand-supply interactions. Evaluating transportation alternatives. Travel demand forecasting. Integrated model systems. Citizen participation in decision-making.


CE 5214. Transportation Systems Analysis. (4.0 cr.; prereq 3201; fall, every year) Systems approach, its application to transportation engineering/planning. Prediction of flows and level of service. Production functions, cost optimization, utility theory, demand modeling, transportation network analysis, equilibrium assignment, decision analysis, multidimensional evaluation of transportation projects.


CE 5341. Wave Methods for Nondestructive Testing. (4.0 cr.; A-F or Audit; prereq [AEM 2021, AEM 3531] or #; fall, offered periodically) Introduction to nondestructive methods for nondestructive characterization of objects of civil infrastructure (e.g., highways, bridges, geotechnical 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. (3.0 cr.; A-F or Audit; prereq [Math 2263 or Math 2374 or equiv]; [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. (3.0 cr.; A-F or Audit; prereq [Upper div CSE or grad student] or #; fall, every year) Principal stresses and failure criteria in 3 dimensions. Introduction to plane elasticity, energy methods, torsion of beams, and bending of unsymmetrical beams.

CE 5414. Prestressed Concrete Design. (3.0 cr.; A-F or Audit; prereq [Grade of at least C- in 4401, [upper div CSE or grad student]] or #; fall, every year) Design of prestressed concrete structures. Time dependent effects, behavior, flexure, shear, torsion, deflections, continuous systems.

CE 5415. Masonry Structures. (3.0 cr.; A-F or Audit; prereq [Grade of at least C- in 3401, [upper div CSE or grad student]] or #; 4401 recommended; fall, offered periodically) Masonry materials and their production. Mortars, grouts. Design of unreinforced, reinforced, and prestressed masonry structural systems. Walls, columns, lintels, arches. Codes/specifications, testing, inspection.

CE 5511. Urban Hydrology and Land Development. (4.0 cr.; A-F or Audit; prereq CE 4501; fall, every year) Urban hydrology for small watersheds and the management of storm water quality and quantity.

CE 5541. Environmental Water Chemistry. (3.0 cr. [max 4.0 cr.]; A-F or Audit; prereq Chem 1021, Chem 1022; fall, every year) 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 5542. Experimental Methods in Environmental Engineering. (3.0 cr.; A-F or Audit; prereq Chem 1021, Chem 1022; fall, spring, offered periodically) Tools necessary to conduct research in environmental engineering and chemistry. Theory of operation of analytical equipment. Sampling and data handling methods, statistical analyses, experimental design, laboratory safety. Lecture, laboratory.


CE 5551. Environmental Microbiology. (3.0 cr.; A-F or Audit; prereq [Upper div or grad student] or #; every year) Role of microorganisms in environmental bioremediation, pollution control, water/wastewater treatment, biogeochemistry, and human health. Lecture.

CE 5552. Environmental Microbiology Laboratory. (1.0 cr.; A-F only; prereq 5551 or 5551E) Basic microbiological techniques: isolation, identification/enumeration of bacteria, BOD, biodegradable kinetics, disinfection. Lab.

CE 5561. Air Quality Engineering. (3.0 cr.; A-F only; prereq Grad student in engineering or #; spring, every year) Introduction to air pollution problems and solutions, local to global. Quantitative analysis of chemistry and physics of atmospheric pollutants. Sources, sinks, and controls; atmospheric transport and transformation; air quality management and regulation; health impacts; global issues.

CE 5570. Design for Sustainable Development: Discovery. (1.0-3.0 cr.; A-F only; prereq Juniors or seniors with minimum 3.0 GPA or grad student; fall, every year) Intensive, experiential learning opportunity on infrastructure, development, environment issues in Delhi, India.

CE 5571. Acara Global Venture Design: Grand Challenges. (3.0-4.0 cr. [max 8.0 cr.]; A-F only; prereq #; fall, spring, every year) Project-based course focused on designing venture solutions to global grand challenges related to environment, health, development. Identify specific social-environmental problem. Design financially-viable venture solution. Collaborate with professional mentors/technical experts. Create venture plan, may pitch for funding. Course is part of Acara program.

CE 5572. Acara Social Venture Launchpad: Ideas to Impact. (2.0 cr. [max 4.0 cr.]; A-F only; prereq #; spring, every year) Project-based Acara entrepreneurship course in which students refine existing venture solutions to social-environmental challenges. Students work on business model/develop effective pitch. Teams interact with entrepreneurs, investors/Acara staff.

CE 5573. Design for Sustainable Development: Create II. (1.0-5.0 cr. [max 10.0 cr.]; S-N only; spring, every year) Weekly discussion on social or environmental venture.

CE 8022. Numerical Methods for Free and Moving Boundary Problems. (3.0 cr.; A-F or Audit; prereq 8401 or #; , ) Examples of free and moving boundary problems: metal solidification, filling, polymer molding, flow in porous media, ground freezing. Solutions: analytical, fixed finite difference, fixed finite element, front tracking schemes, general deforming finite element methods.

CE 8094. Civil Engineering Research. (1.0-4.0 cr. [max 12.0 cr.]; #; fall, spring, summer, every year) Research or independent study in concrete, structural steel, soils, hydraulics, hydrology, and municipal, environmental, or transportation problems. Investigations, reports, tests, or designs.

CE 8200. Seminar: Transportation. (1.0 cr.; [max 3.0 cr.]; S-N or Audit; fall, spring, every year) Content depends on instructor and student. Sample topics: traffic safety, traffic flow theory, transportation materials, transportation planning, transportation economics.

CE 8202. Networks and Places: Transportation, Land Use, and Design. (4.0 cr.; A-F or Audit; spring, every year) 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.

CE 8212. Advanced Travel Demand Modeling and Supply Analysis. (3.0 cr.; prereq 5211 or equiv, Stat 3021; fall, spring, odd years) Application of random utility theory to model travel demand; deterministic and stochastic trip assignment; network design problems; transportation planning software.

CE 8213. Advanced Transportation Seminars. (1.0 cr.; S-N or Audit; =ME 8772; fall, spring, offered periodically) Advantaged technologies specifically related to transportation. Topics drawn from core science/technology areas of human factors, intelligent vehicles, traffic modeling/management, sensing, communications, and controls.

CE 8214. Transportation Economics. (4.0 cr.; A-F or Audit; spring, offered periodically) Application of microeconomic theory to transportation. Demand/demand estimation, cost/cost estimation, pricing/investment, regulation/deregulation. Urban/intercity passenger transportation, freight transportation.

CE 8215. Transportation Data Analysis. (3.0 cr.; prereq [8210 or 8211], [STAT 5021 or equiv]; spring, odd years) Maximum likelihood methods for generalized linear models, with logit/probit models. Linear regression as special cases. Applications to gap acceptance, discrete choice, speed/headway distributions, accident modeling. Introduction to Bayesian inference.

CE 8216. Urban Traffic Operations. (3.0 cr.;) 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 8231. Advanced Pavement Engineering. (3.0 cr.; 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, Burmeister model, and Westergaard model; load transfer in rigid pavements; temperature induced stresses; mechanics of drainage.

CE 8233. Advanced Bituminous Materials Characterization. (3.0 cr.; prereq 3402, grad student or #;) Applications of viscoelasticity, rheology, elastoplasticity, and fracture mechanics to bituminous materials characterization. Lectures, discussions of advanced research reading assignments, laboratory assignments.

CE 8300. Seminar: Geomechanics. (1.0-3.0 cr. [max 4.0 cr.]; S-N or Audit; =GEOE 8300; fall, spring, every year) Presentations on various topics.


CE 8311. Advanced Rock Mechanics. (3.0 cr.; A-F or Audit; =GEOE 8311; prereq CSE grad student, 4311 or GeoE 4311 or #; fall, offered periodically) 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 rock breakage.


CE 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CE 8336. Boundary Element Methods I. (3.0 cr.; A-F or Audit; =GEOE 8336; prereq CSE grad student; fall, even years) Introduction to boundary element methods for elastostatics; stress discontinuity, displacement discontinuity, and direct boundary integral methods. Derivation of basic mathematical solutions from the theory of elasticity. Applications in geomechanics.

CE 8337. Boundary Element Methods II. (3.0 cr.; A-F or Audit; =GEOE 8337; prereq 8336, GeoE 8336 or #; fall, offered periodically) Transient and nonlinear problems.


CE 8352. Advanced Groundwater Mechanics II. (3.0 cr.; A-F or Audit; =GEOE 8352; prereq 4351, CSE grad student or #; fall, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq CSE grad student or #; fall, even years) 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. (1.0 cr.; max 3.0 cr.; S-N or Audit; fall, spring, every year) 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 8401. Fundamentals of Finite Element Method. (3.0 cr.; A-F or Audit; prereq 4411 or #; spring, every year)
Elements of calculus of variations; weak and strong formulations of linear continuum and structural problems. Isoparametric elements and numerical integration. Basic concepts of error analysis and convergence. Analysis of plates and shells. Introduction to mixed methods and time dependent problems.

CE 8402. Nonlinear Finite Element Analysis. (3.0 cr.; A-F or Audit; prereq 8401 or #; offered alt yrs; )

CE 8411. Plate Structures. (3.0 cr.; A-F or Audit; prereq 5411 or #; offered alt yrs; )

CE 8412. Shell Structures. (3.0 cr.; A-F or Audit; prereq CSE grad or #; fall, offered periodically)

CE 8413. Fracture and Scaling. (3.0 cr.; A-F or Audit; prereq 5411; spring, offered periodically)
Linear elastic fracture mechanics, cohesive fracture, scaling, strength statistics.

CE 8421. Structural Dynamics. (3.0 cr.; A-F or Audit; prereq [3401, AEM 2012] or #; 4411 recommended; fall, every year)

CE 8422. Earthquake Engineering. (3.0 cr.; A-F or Audit; prereq 8421 or #; spring, offered periodically)
Introduction to earthquake engineering; response spectra; energy absorption capacity of structures; estimation of damping; earthquake resistant design; seismic design codes; base isolation; soil-structure interaction. Blast resistant design. Wind effects on structures.

CE 8431. Structural Stability. (3.0 cr.; A-F or Audit; prereq CSE grad student or #; fall, spring, offered periodically)
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. (3.0 cr.; A-F or Audit; prereq 5411 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 inelastic material behavior on buckling.

CE 8441. Ductile Behavior of Steel Structures. (3.0 cr.; A-F or Audit; prereq 4411 or #; fall, even years)

CE 8442. Nonlinear Analysis of Structural Systems. (3.0 cr.; A-F or Audit; 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 designing steel and composite structures.

CE 8443. Fracture of Materials and Structures. (3.0 cr.; A-F or Audit; prereq 4401 or #; spring, every year)

CE 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DHS consent; fall, spring, summer, every year)
No description

CE 8451. Behavior of Reinforced Concrete Structures. (3.0 cr.; A-F or Audit; prereq 4412 or #; fall, spring, every year)
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 8461. Structural Reliability. (3.0 cr.; A-F or Audit; prereq [4412, 4413] or #; )

CE 8490. Special Topics. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically)
Topics vary depending on faculty and student interests.

CE 8500. Environmental Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq grad CE major or #; spring, every year)
Broad coverage of topics in environmental engineering and science. Speakers consist primarily of graduate students in these areas, but presentations may also be given by University faculty and guest speakers.

CE 8501. Environmental Fluid Mechanics I. (4.0 cr.; A-F or Audit; prereq 3502 or equiv or #; fall, every year)
Basic laws of mass, energy, and momentum transport in environmental fluid flow. Exact and approximate solutions for viscous flow. Irrotational flow; gravity waves. Similitude and inspectional analysis. Laminar boundary layers and slender flows. Application to engineering and environmental problems.

CE 8502. Environmental Fluid Mechanics II. (4.0 cr.; A-F or Audit; prereq 8501 or #; fall, spring, every year)
Reynolds equations. Developed and developing turbulent boundary layers and slender flows, and their interaction with inviscid flow. Jets, plumes, wakes and shear layers. Statistical description of turbulence; data analysis.

CE 8503. Environmental Mass Transport. (4.0 cr.; A-F or Audit; prereq 3502, 3501 or equiv or #; )
Principles of intraphase and interfacial chemical transport and 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. (4.0 cr.; A-F or Audit; prereq 5541; fall, spring, offered periodically)
Theoretical basis, design, operation of chemical/physical processes used in treating/ controlling water quality. Adsorption, ion exchange, sedimentation, thickening, filtration, gas transfer, coagulation, flocculation, membrane processes, disinfection.

CE 8505. Biological Processes. (3.0 cr.; A-F or Audit; prereq 4502, 4501 or #; spring, every year)
Theoretical principles underlying 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. (4.0 cr.; A-F or Audit; 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 8507. Advanced Methods in Hydrology. (4.0 cr.; A-F or Audit; prereq 8506; )
Notions of scale-invariance, scaling, and multiscaling in geophysical processes; methods of multiscale analysis; wavelet transforms; time-frequency-scale analysis and fractal analysis. Applications in atmospheric, hydrologic, and geomorphic processes.

**CE 8508. Ecological Fluid Mechanics.** (4.0 cr.; A-F or Audit; prereq 3502 or equiv; fall, every year)
Fluid mechanics of microbiological processes in lakes, rivers, and wetlands. Small-scale fluid motion, nutrient uptake, growth kinetics, ecosystem metabolism, scaling, lab/field microstructure measurements.

**CE 8511. Mechanics of Sediment Transport.** (3.0 cr.; A-F or Audit; =ESE 5511; prereq 3502 and 4501 or #; fall, every year)

**CE 8521. The Atmospheric Boundary Layer.** (4.0 cr.; A-F or Audit; prereq CSE or COAFES grad student or #; summer, offered periodically)
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.** (3.0 cr.; A-F or Audit; prereq 4541 or #; spring, offered periodically)
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 dissolves natural organic matter.

**CE 8542. Chemistry of Organic Pollutants in Environmental Systems.** (3.0 cr.; A-F or Audit; 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.** (4.0 cr.; A-F or Audit; fall, even years)
Introduction to microbial genetics and molecular phylogeny. Application of nucleic-acid techniques in environmental microbiology and microbial ecology.

**CE 8552. Groundwater Microbiology: Laboratory.** (4.0 cr.; A-F or Audit; prereq grad CE major or #, exposure to basic environ engr and microbiol)
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 8553. Biofilms.** (3.0 cr.; A-F or Audit; prereq 4551 or #)
Science/engineering concepts to investigate formation/function of biofilms. Properties/ composition of biofilms, transport/ transformation processes in biofilms, communication in biofilms, mathematical modeling. Applications in environmental engineering.

**CE 8561. Analysis and Modeling of Aquatic Environments.** (3.0 cr.; A-F or Audit; prereq One sem grad work or #; spring, every year)

**CE 8562. Analysis and Modeling of Aquatic Environments II.** (3.0 cr.; [max 6.0 cr.]; prereq One sem grad work or #; fall, spring, offered periodically)
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.** (3.0 cr.; A-F or Audit; prereq 3501, 4501, 4502, or equiv or #)
Introduction to industrial waste treatment. Individual industries, emphasizing constituents of the waste-stream 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.** (3.0 cr.; A-F or Audit; prereq 3502 or #)
Lab and field methods and instruments for measuring hydraulic pressure, velocity, and discharge.

**CE 8572. Computational Environmental Fluid Dynamics.** (4.0 cr.; A-F or Audit; prereq grad student in CSE or COAFES or #; spring, offered periodically)
Finite difference methods, their application to solution of one-/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.** (0.5 cr.; S-N or Audit; =WRS 8581; prereq [Environmental engineering or water resource science] grad student or #; spring, every year)
Ethics of water resources science and environmental engineering research/practice.

Societal responsibility, plagiarism, recording-keeping, authorship, confidentiality, conflicts of interest, professional relationships, fraud, reporting misconduct. Meets during first eight weeks of spring semester.

**CE 8601. Introduction to Stream Restoration.** (3.0 cr.; A-F or Audit; fall, every year)
Background material required to participate in a stream restoration project. How to assimilate geologic, hydrologic, and ecological data at watershed and reach scales to plan a restoration project and evaluate/critique existing stream restoration projects.

**CE 8602. Stream Restoration Practice.** (2.0 cr.; S-N only; =ESE 8602, EEB 8602; prereq 8601 or Geo 8601; summer, every year)
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-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
TBD

**CE 8777. Thesis Credits: Master’s.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

**CE 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

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**Classical and Near Eastern Studies (CNES)**

**College of Liberal Arts**

**CNES 5013. Introduction to Roman Law.** (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Survey of Roman law from social and historical perspectives. Basic concepts of Roman private law and legal procedure.

**CNES 5051. Before Herodotus: History and Historiography of Mesopotamia and the Ancient Near East.** (3.0 cr.; A-F or Audit; =HIST 5051; prereq Previous coursework in Ancient Near Eastern history recommended; fall, spring, offered periodically)
Seminar. Historical method/sources for Ancient Near Eastern history. Historical tradition and historiographic texts of Mesopotamia and neighboring regions of Ancient Near East/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. (3.0 cr.; max 18.0 cr.; prereq Sr or grad student or #; fall, spring, offered periodically) 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 5076. Apostle Paul: Life, Letters, and Legacy. (3.0 cr.; =CNES 3076; fall, spring, odd years) How/what we can know about Paul. What his message was. How he was later understood by friends/foes.

CNES 5080. New Testament Proseminar. (3.0 cr. [max 18.0 cr.; prereq 1082 or 3072 or equiv; fall, spring, offered periodically) 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 5083. Ancient Comedy. (3.0 cr.; =ARTH 5083; prereq Jr, Class/Arth 3008 or #; spring, offered periodically) Greek/Roman comic drama (eg. Aristophanes, Menander, Plautus, Terence).

CNES 5108. Greek Architecture. (3.0 cr.; =ARTH 5108; prereq Jr, Class/Arth 3008 or #; spring, offered periodically) Geometric through classical examples of religious and secular architecture and their setting at archaeological sites in Greece, Asia Minor and Italy.

CNES 5115. Midrash: Jewish Biblical Interpretation. (3.0 cr.; =RES 3115, JWST 3115, RELS 3115, CNES 3115, JWST 5115; fall, spring, offered periodically) Jewish law studies as mirror of society and as way to actualize its value. Original socioreligious contexts, current applications. Biblical interpretations addressing moral, theological, legal, and literary problems.

CNES 5172. House, Villa, Tomb: Roman Art in the Private Sphere. (3.0 cr.; =ARTH 5172; prereq Intro art history course or #; fall, spring, offered periodically) Architecture, painting, and sculpture of urban houses, country estates, and tombs in Roman world. Relationships between public/private spheres and literary/physical evidence. Usefulness of physical evidence in illuminating gender roles.

CNES 5185. Hellenistic and Islamic Asia: Art and Archaeology of Hellenistic, Scythian, Kushan, and Sogdian Asia. (3.0 cr.; fall, spring, every year) Transformations of Greek architecture, sculpture, painting, mosaic, decorative arts beginning of eastern Mediterranean/ Hellenistic Asia. Art/archaeology of post-Hellenistic Iranian world. Religious, political, historical contexts of archaeological sites, monuments, art objects.

CNES 5188. Art and Archaeology of Early Christianity and the Late Roman Empire. (3.0 cr.; fall, spring, offered periodically) Emergence of Christian visual culture in Rome. Age of Tetrarchs and Constantine the Great. Age of Justinian. Development of liturgical environments such as Jewish synagogue and Christian church. Melding of imperial and Christian art, architecture, and ritual. Constantinople, from its founding through sixth century. Church architecture. Early icon/ manuscript painting.

CNES 5192. Persia and the Ancient Iranian World: Art and Archaeology of Achaemenid Persia and Sasanian Persia. (3.0 cr.; =CNES 3192; fall, spring, every year) Art, archaeology of ancient Persia and the wider ancient Iranian world from the rise of the Achaemenid empire in 650 BCE to the advent of Islam in the seventh century CE.

CNES 5204. The Dead Sea Scrolls. (3.0 cr.; =JWST 5204, JWST 3204, RELS 3204, RELS 5204, CNES 3204; fall, spring, offered periodically) Introduction to Dead Sea Scrolls and Qumran. Contents of Dead Sea Scrolls, significance for understanding development of the Bible. Background of Judaism and Christianity. Archaeological site of Qumran.

CNES 5502. Ancient Israel: From Conquest to Exile. (3.0 cr.; =JWST 3502, RELS 3502, HIST 3502, CNES 3502; prereq Knowledge of Hebrew not required; 5501 recommended; fall, offered periodically) 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 5513W. Scripture and Interpretation in Israelite Religion and Judaism. (3.0 cr.; =JWST 5513W, RELS 5513W, CNES 8513; prereq At least one upper level course (3xxx or higher) in academic biblical or religious studies; spring, every year) Idea of divine revelation. Impact upon religion/literature. How history of Bible's creation, transmission, interpretation helps us think critically about role of revelation in history of religious traditions.

CNES 5535. Death and the Afterlife in the Ancient World. (3.0 cr.; =RES 3535, CNES 3535; fall, offered periodically) Beliefs, attitudes, and behaviors related to death and afterlife found in cultures of ancient Mediterranean and Near East. Literature, funerary art/epitaphs. Archaeological evidence for burial practices and care of dead.

CNES 5601. Sexuality and Gender in Ancient Greece and Rome. (3.0 cr.; =CNES 3601; spring, every year) SWWhat we know (or think we know) about ancient Greek/Roman ideas about sexuality and gender roles. Nature of evidence/methodologies by which it is analyzed.


CNES 5713. Introduction to Ugaritic. (3.0 cr.; =CNES 3713, JWST 3713; fall, every year) 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 5786. Theorizing City and Space in the Mediterranean and Western Asia. (3.0 cr.; spring, every year) Development of greatest cities of Eastern Mediterranean/Western Asia from age of Alexander to rise of Islam. Methodological/theoretical approaches to study of cities where as much evidence exists in texts as archaeological form.

CNES 5794. Introduction to Classical and Near Eastern Studies. (1.0 cr.; S-N or Audit; prereq grad major or minor or #; fall, every year) Introduction to core research materials and reference materials in the various disciplines which make up classical studies.

CNES 5796. Classical Texts: Approaches and Methods. (3.0 cr.; prereq CNES grad student or #; fall, odd years)
Methods/approaches, from antiquity to present, for reading/interpreting Greek/Latin literary texts.

CNE5 5940. Topics in Classical Literature. (3.0 cr. [max 9.0 cr.]; prereq Two literature courses or #; )
Additional work for graduate credit. Topics specified in Class Schedule. Meets with 3940.

CNE5 5950. Aspects of Classical Culture. (1.0-3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)
Topics specified in Class Schedule.

CNE5 5993. Directed Studies. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, every year)
Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

CNE5 5994. Directed Research. (1.0-12.0 cr.; fall, spring, every year)
Guided individual research. Prereq-instr consent, dept consent, college consent.

CNE5 5996. Directed Instruction. (1.0-12.0 cr.; fall, spring, every year)
Guided individual research. Prereq-instr consent, dept consent, college consent.

CNE5 8190. Seminar: Issues in Ancient Art and Archaeology. (3.0 cr. [max 12.0 cr.]; = [ARTH 8190]; fall, spring, offered periodically)
Selected issues, with special attention to current scholarly disputes. Topics specified in [Class Schedule].

CNE5 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, every year)
(No description)

CNE5 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, every year)
(No description)

CNE5 8513. Scripture and Interpretation. (3.0 cr.; A-F or Audit; = [WJST 5513W, RELS 5513W, CNE5 5513W]; prereq Grad student; fall, spring, even years)

CNE5 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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 80 combined cr; fall, spring, summer, every year)
To be determined

CNE5 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year)
(No description)

CNE5 8794. Practicum for Future Faculty in Classics. (1.0 cr.; S-N only; prereq Doctoral [major or minor] in Classical/Near Eastern studies; spring, every year)
Workshop in professional development. Developing the dissertation. Preparing a portfolio to document/reflect on teaching the ancient world and its languages. Readings, workshops, peer teaching, reflective writing.

CNE5 8888. Thesis Credits: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year)
(No description)

CNE5 8950. Topics in Classical & Near Eastern Studies. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)
Topics such as slavery, women in antiquity, pagans and Jews, the taboo, and modern study of myth.

Clinical Laboratory Science (CLS)

Medical School

CLS 5090. Special Laboratory Methods. (1.0-2.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
Assignment on an individual basis to one of a variety of special areas of experience in the clinical lab.

CLS 5100. Virology, Mycology, and Parasitology for Medical Technologists. (2.0 cr.; A-F or Audit; prereq microbiology course with lab, biochem course; spring, every year)
Lab diagnosis of viral, fungal, and parasitic infections. Lecture.

CLS 5120. Seminar: Clinical Laboratory Science. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Current literature. Presentation/discussion of research.

CLS 5121. Journal Presentations. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq 1st yr CLS grad student; fall, spring, every year)
Critical analysis, evaluation, discussion of current journal articles in student's specialty area.

CLS 5125. Practicum Teaching. (1.0-2.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
Supervised teaching experience, develop skills using instructional materials, tests, and measurements.

CLS 5129. Elements of Laboratory Administration. (2.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
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. (2.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
Supervised experience and assignment of specific problems related to lab service and management in health care institutions.

CLS 5140. Techniques for Teaching. (2.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
Developing objectives, classroom activities, and evaluation criteria for medical technology education.

CLS 5165. Advanced Clinical Immunohematology. (3.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
Observation, study, and practice in special problems, advanced techniques, and methodology.

CLS 5402. Molecular Diagnostics. (1.0 cr.; A-F only; prereq #; fall, every year)
Basic theory/application of molecular diagnostics in clinical lab. Lecture, lab.

CLS 5768. Advanced Hematology. (5.0-10.0 cr. [max 30.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)
Practical experience collecting bone marrow from patients. Diagnosing hematological diseases by evaluating and interpreting cells from clinical specimens of bone marrow, peripheral blood, and, if applicable, lymph nodes.

CLS 5864. Research Seminar. (1.0 cr. [max 10.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Departmental research seminar series.

CLS 5865. Departmental Seminar. (1.0 cr. [max 10.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Departmental clinical lab research seminar series.

CLS 8193. Advanced Topics in Clinical Chemistry. (2.0 cr.; prereq #; fall, spring, summer, every year)
Includes use of molecular approaches to diagnosis and risk assessment of selected diseases.

CLS 8194. Research on Clinical Laboratory Problems. (1.0-3.0 cr.; prereq #; fall, spring, summer, every year)
Individual research project in a selected area.

CLS 8293. Educational Administration in Medical Technology. (2.0 cr.; prereq #; fall, spring, summer, every year)
Responsibilities of administration to students, faculty, and educational community. Curriculum planning, accreditation, staffing, student selection, finances. Sample administrative problems and decisions used as practice vehicles.

CLS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CLS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)
# Courses Listed in this Catalog are Current as of December 12, 2014.

For up-to-date information, visit www.catalogs.umn.edu

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<tr>
<th>College of Education and Human Development</th>
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<tr>
<td><strong>CPMS 5101. Introduction to Clinical Physiology and Movement Science.</strong> (3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, offered periodically) Overview of clinical physiology and clinical movement science. For students in such diverse fields as bioengineering, kinesiology, neuroscience, physical therapy, physiology, psychology, public health, occupational therapy.</td>
</tr>
<tr>
<td><strong>CPMS 5201. Colloquium in Clinical Physiology and Movement Science.</strong> (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq Undergrad level in basic anatomy and physiology is highly recommended; fall, spring, every year) Interdisciplinary course meets 1st and 3rd week of the month. Current research areas, scientific methods, and interpretation of results in the areas of clinical movement science and clinical physiology.</td>
</tr>
<tr>
<td><strong>CPMS 8201. Seminar in Clinical Physiology and Movement Science.</strong> (1.0 cr. [max 4.0 cr.]; S-N or Audit; spring, every year) Serves 1st and 3rd week of the month. Current research areas, scientific methods, and the interpretation of results in the areas of clinical movement science and clinical physiology.</td>
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<tr>
<th>Cognitive Science (CGSC)</th>
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<tr>
<td><strong>CGSC 8000. Seminar: Philosophy of the Cognitive Sciences.</strong> (3.0 cr. [max 6.0 cr.]; [PHIL 8640]; prereq Grad cog sci minor or #; spring, even years) 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.</td>
</tr>
<tr>
<td><strong>CGSC 8011. Proseminar in Cognitive Science.</strong> (2.0 cr.; S-N or Audit; prereq Grad cog sci minor or #; fall, offered periodically) Survey of major topics, including theoretical assumptions, methods, and samples of current research.</td>
</tr>
<tr>
<td><strong>CGSC 8041. Cognitive Neuroscience.</strong> (4.0 cr.; A-F or Audit; [NSC 8041]; prereq #; spring, odd years) Relations between brain activity and cognitive function in mammals. Working memory, attention, decision processing, executive function, categorization, planning, sequence processing. Behavioral/physiological perspectives. Disruption of cognitive function following brain damage. Extracellular recording of single neuron activity in nonhuman primates. Functional neuroimaging/ magnetoencephalography in humans.</td>
</tr>
<tr>
<td><strong>CGSC 8360. Seminar: Topics in Cognitive Science.</strong> (1.0-4.0 cr. [max 24.0 cr.]; prereq Grad cog sci minor or #; fall, spring, offered periodically) Lectures and in-depth discussion on a topic.</td>
</tr>
<tr>
<td><strong>CGSC 8410. Perspectives in Learning, Perception, and Cognition.</strong> (2.0 cr. [max 24.0 cr.]; S-N only; fall, spring, every year) Lectures/discussions in cognitive sciences by local/visiting faculty.</td>
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<tr>
<td><strong>CGSC 8444. FTE: Doctoral.</strong> (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser consent, DGS consent; fall, spring, summer, every year) TBD</td>
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<tr>
<td><strong>CGSC 8666. Doctoral Pre-Thesis Credits.</strong> (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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.; fall, spring, summer, every year) TBD</td>
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<th>College of Science and Engineering (CSE)</th>
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<tr>
<td><strong>CSE 5101. Introduction to Engineering Design for Teachers.</strong> (3.0 cr.; Student Option No Audit; summer, every year) History, career opportunities, portfolios, visualization, geometry, modeling, construction, analysis, documentation. Part of Project Lead the Way curriculum. Prereq-college consent.</td>
</tr>
<tr>
<td><strong>CSE 5102. Principles of Engineering for Teachers.</strong> (3.0 cr.; Student Option No Audit; summer, every year) Communication/documentation, design process, engineering systems, strength of materials, testing, reliability, statics/dynamics. Part of Project Lead the Way curriculum. Prereq-college consent.</td>
</tr>
<tr>
<td><strong>CSE 5103. Digital Electronics for Teachers.</strong> (3.0 cr.; Student Option No Audit; summer, every year) Fundamentals of digital electronics, number systems, gates, Boolean algebra, circuit design, adding, flip-flops, shift registers/counters, families/specifications, microprocessors, design topic. Part of Project Lead the Way curriculum. Prereq-college consent.</td>
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<tr>
<td><strong>CSE 5104. Civil Engineering and Architecture.</strong> (3.0 cr.; Student Option No Audit; summer, every year) Overview of civil engineering and architecture, their interrelationship/dependence on each other. Students use software to solve real world problems. Project/site planning. Project documentation/presentation. Part of Project Lead the Way. Prereq-college consent.</td>
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<tr>
<td><strong>CSE 5105. Gateway to Technology.</strong> (3.0 cr.; Student Option No Audit; summer, every year) Activity-oriented middle school curriculum to help students in grades six-eight explore math, science, and technology. Five independent, nine-week units: design/modeling, automation/ robotics, magic of electrons, science of technology, and flight/space. Prereq-college consent.</td>
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<tr>
<th>Communication Studies (COMM)</th>
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<tr>
<td><strong>COMM 5110. Special Topics in Communication Theory.</strong> (3.0 cr. [max 9.0 cr.]; fall, spring, summer, every year) Advanced theoretical problems. See department office for current offering.</td>
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<tr>
<td><strong>COMM 5211. Critical Media Studies: Theory and Methods.</strong> (3.0 cr.; A-F only; prereq Grad student or #; spring, every year) Survey of theories, research methods, and scholars dominating critical media studies since late 1920s.</td>
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<tr>
<th>College of Food, Agri &amp; Natural Resource Sciences (CFAN)</th>
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<tr>
<td><strong>CFAN 5201. Career and Job Search Preparation for Graduate Students.</strong> (1.0 cr.; S-N only; prereq Grad student; fall, spring, every year) Job search and career development tools. Goals, networking, job search, resume/CV, interviewing. Assignments include resume/CV, informational interview, career development plan.</td>
</tr>
<tr>
<td><strong>CFAN 5480. Topics in CFANS.</strong> (1.0-4.0 cr. [max 8.0 cr.]; prereq Grad student; fall, spring, offered periodically) Lectures by visiting scholar(s) or regular faculty member. Topics specified in Class Schedule.</td>
</tr>
<tr>
<td><strong>CFAN 5500. International Field Studies Seminar.</strong> (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Interface of agriculture with natural resource, environmental, economic, food safety, public policy, ethical issues transcending national borders. Seminars take place in various countries/regions. Active learning, lectures, discussion tutorials, field trips, reports, exams.</td>
</tr>
<tr>
<td><strong>CFAN 5501. Costa Rica--Sustainable Development.</strong> (3.0 cr.; A-F only; prereq grad student, #; spring, every year) Costa Rica's development strategy. Agriculture, tourism, energy, urbanization. Synergies/tension between economic, social, environmental impacts. How organizations maximize benefits associated with sustainable development.</td>
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</table>
COMM 5221. Media, Race, and Identity. (3.0 cr.; prereq 3211, sr; fall, offered periodically) Critical media studies perspective on cultural politics of race and ethnicity. Social construction of race, politics of racism, media representations of race.

COMM 5231. Media Outlaws. (3.0 cr.; fall, even years) People working outside of mainstream media institutions who find creative/provocative ways to use media as space for cultural, political, or economic critique/resistance.

COMM 5250. Environmental Communication. (3.0 cr.; A-F only; spring, every year) Historical, cultural, material contexts within which environmental communication takes place. Understand environmental communication as well as develop communication strategies that lead to more sustainable social practices, institutions, systems.

COMM 5261. Political Economy of Media Culture. (3.0 cr.; prereq 3211 or #; fall, spring, every year) Organizational practices of media communicators. Media content as link between communicators and audiences. How viewers use/process media content.

COMM 5401. Advanced Theories of Communication. (3.0 cr.; prereq 3401 or grad; fall, spring, summer, every year) Survey of major theoretical approaches to communication including, positivism, constructivism, and systems.

COMM 5402. Advanced Interpersonal Communication. (3.0 cr.; prereq 3401 or 3402; spring, every year) Social scientific approaches to interpersonal communication. Theory, research findings.

COMM 5404. Language and Culture. (3.0 cr.; prereq 3401 or #; fall, spring, summer, every year) How language/communication transmit cultural knowledge, attitudes, and beliefs. Connections among language, thought, and culture. Social/ethnic perspectives on study of language/communication.

COMM 5406. Communication and Gender. (3.0 cr.; [GWSS 5300]; prereq One women’s studies course; #; fall, spring, offered periodically) 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 5411. Small Group Communication Research. (3.0 cr.; A-F or Audit; prereq 3411 or #; spring, every year) Survey of small group communication research; theory and practice. Group decision-making and leadership.

COMM 5421. Quantitative Methods in Communication Research. (3.0 cr.; A-F or Audit; prereq 3401 or #; fall, every year) Social scientific methods used in studying human communication. Optional data processing laboratory for additional credit.

COMM 5431. The Process of Persuasion. (3.0 cr.; prereq 3431; fall, spring, every year) Communication campaigns (e.g., advertising, political) illustrating persuasive processes and theories. Research paper required.

COMM 5441. Communication in Human Organizations. (3.0 cr.; fall, spring, summer, every year) Communication in organizational settings. Organizational structure and dynamics and their effect upon the communication process. Individual projects.

COMM 5451W. Intercultural Communication Processes. (3.0 cr.; fall, offered periodically) Theory and research on cultural differences in values, norms, behaviors, and perceptions that affect communication across cultures internationally and domestically.

COMM 5615W. Introduction to Rhetorical Criticism. (3.0 cr.; prereq 1101; 3601 recommended; spring, every year) Analysis of public discourse using various theoretical perspectives.

COMM 5617. History and Criticism of U.S. Public Discourse: 1630-1865. (3.0 cr.; prereq Jr; fall, offered periodically) 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.

COMM 5970. Directed Study. (1.0-3.0 cr. [max 6.0 cr.]; S-N or Audit; fall, spring, summer, every year) Guided individual reading or study. Prereq-Nine 3xxx-5xxx Spch cr, inscr consent, dept consent, college consent.

COMM 5994. Communication Research Practicum. (1.0-3.0 cr. [max 9.0 cr.]; S-N or Audit; fall, spring, every year) Students participate in research group.

COMM 8110. Seminar: Advanced Speech Problems. (3.0 cr. [max 15.0 cr.]; prereq undergrad degree in spch-comm or equiv; fall, spring, summer, every year) Evaluation of research methods in speech-communication.

COMM 8210. Seminar: Selected Topics in U.S. Electronic Media. (3.0 cr. [max 18.0 cr.]; prereq 5210 or #; offered when feasible; fall, spring, offered periodically) Literature survey; evaluating research on topics; conducting independent research project on a particular topic.

COMM 8211. Critical Communication Studies: History, Theory, Method. (3.0 cr.; fall, spring, summer, every year) Qualitative research methods for studying media institutions, texts, audiences, and contexts.

COMM 8231. Seminar: National and International Electronic Media Systems. (3.0 cr.; prereq 4231 or #; fall, offered periodically) 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.

COMM 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

COMM 8402. Seminar: Interpersonal Communication. (3.0 cr.; prereq 5402 or #; fall, spring, summer, every year) Evaluate and develop new perspectives for analyzing, diagnosing, and managing interpersonal communication problems.

COMM 8403. Seminar: Emotion and Communication. (3.0 cr.; fall, spring, summer, every year) Major theories of emotion and the role of emotion in communication.

COMM 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

COMM 8451. Seminar: Intercultural and Diversity Research. (3.0 cr.; prereq #; fall, spring, summer, every year) Development of ideas/methods for research project, M.A. Plan B project, or Ph.D. dissertation.

COMM 8452. Seminar: Methods of Intercultural/Diversity Facilitation. (3.0 cr.; prereq 4451 or 5452 recommended; fall, spring, summer, every year) Theories and techniques for managing effective intercultural communication and diversity. Intercultural training.

COMM 8502. Seminar: Communication Theory Construction. (3.0 cr.; prereq 5421 or #; fall, spring, offered periodically) Logic of communication theory development and modification from a social scientific perspective. Types of communication theories.

COMM 8504. Seminar: Rhetorical Criticism. (3.0 cr.; prereq 5615 or #; fall, spring, summer, every year) Rhetorical criticism theories and methods. Rhetoric as applied to literary studies and the growth of hermeneutics as vantage points for reassessing rhetorical methods.

COMM 8611. Seminar: Rhetoric. (3.0 cr. [max 6.0 cr.]; prereq 5611 or #; fall, spring, offered periodically) History/criticism of rhetorical theory. Research in rhetoric.

COMM 8625. Seminar: Communication Ethics. (3.0 cr.; A-F or Audit; prereq Ethics course or #; fall, offered periodically) Independent research on communication ethics in interpersonal, group, organizational, intercultural, and media settings. Theories of ethics and methods of analysis.
Comparative Literature (CL)

College of Liberal Arts

CL 5311. Discourse of the Novel. (3.0 cr.; [CSCL 5311]; fall, offered periodically)
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. (3.0 cr.; [CSCL 5555, CSDS 5555]; spring, offered periodically)
Problems of the nature of the sign; sign function; sign 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 5910. Topics in Comparative Literature. (3.0-4.0 cr. [max 32.0 cr.]; fall, spring, every year)
Topics specified in Class Schedule.

CL 5992. Directed Reading in Comparative Literature. (1.0-3.0 cr. [max 9.0 cr.]; [CSCL 5992]; fall, spring, every year)
Guided individual reading and study.

CL 8001. Basic Research Seminar in Comparative Literature I. (3.0 cr.; [CSDS 8001]; fall, every year)
Key texts, positions, methodologies in field of comparative critical theory. Historical precursors, influential contemporary debates, disciplinary genealogies.

CL 8002. Basic Research Seminar in Comparative Literature II. (3.0 cr.; [CSDS 8002]; spring, every year)
Key texts, positions, methodologies in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, disciplinary genealogies.

CL 8066. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
(No description)

CL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CL 8362. Modernity and Its Others. (4.0 cr.; fall, spring, offered periodically)
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. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
(No description)

CL 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; fall, spring, summer)
(No description)

CL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

CL 8894. Directed Research. (1.0-3.0 cr. [max 6.0 cr.]; S-N or Audit; fall, spring, summer, every year)
Supervised research project.

CL 8901. Pedagogy of Cultural Studies and Society I. (1.0 cr.; No Grade Associated; fall, spring, summer, every year)
(No description)

CL 8920. Advanced Topics in Comparative Literature. (3.0 cr. [max 15.0 cr.]; fall, spring, offered periodically)
Practical applications of specific methodologies and theories to a determined area. Topics vary by instructor and semester.

CL 8921. Pedagogy of Cultural Studies and Society II. (3.0 cr.; [max 24.0 cr.]; fall, spring, every year)
Practical applications of specific methodologies and theories to a determined area. Topics vary by instructor and semester.

CL 8992. Directed Reading in Comparative Literature. (1.0-4.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year)
(No description)

CL 8994. Directed Research in Comparative Literature. (1.0-4.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year)
(No description)

Comparative Studies in Discourse and Society (CSDS)

College of Liberal Arts

CSDS 5301. Society, Ideology, and the Production of Art. (3.0 cr.; [CSDS 5301]; fall, spring, offered periodically)
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. (3.0 cr.; [CSDS 5302]; spring, offered periodically)
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-renaissance Western culture.

CSDS 5555. Introduction to Semiotics. (3.0 cr.; [CSCL 5555, CL 5555]; spring, offered periodically)
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 5910. Topics in Comparative Studies in Discourse and Society. (3.0-4.0 cr. [max 32.0 cr.]; fall, spring, every year)
Themes in comparative, sociohistorical analysis of discursive practices. Individually or team taught. Topics specified in Class Schedule.

CSDS 5993. Directed Study. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; fall, spring, every year)
Guided individual reading and study.

CSDS 8001. Basic Research Seminar: Comparative Studies in Discourse and Society I. (3.0 cr.; [CL 8001]; fall, every year)
Key texts, positions, methodologies in field of comparative critical theory. Historical precursors, influential contemporary debates, disciplinary genealogies.

CSDS 8002. Basic Research Seminar in Comparative Studies in Discourse and Society II. (3.0 cr.; [CL 8002]; spring, every year)
Key texts, positions, methodologies in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, disciplinary genealogies.

CSDS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)
CMB 5200. Statistical Genetics and Genomics. (4.0 cr.; A-F or Audit; fall, even years)
Statistical issues in genomics. Gene detection, including statistical analysis/designs for linkage study and for mapping quantitative trait loci. Linkage analysis using pedigree data for codominant/dominant markers. Using radiation hybrid mapping and single cell typing. Design issues in linkage analysis, parentage testing, and marker polymorphism.

CMB 5303. Comparative Models of Disease. (2.0 cr.; A-F only; spring, every year)

CMB 5335. Molecular Biotechnology Laboratory for the Novice. (2.0 cr.; S-N only; summer, every year)
Five day course. Understanding/applying basic concepts of biotechnology. Lectures, hands-on lab experiments.

CMB 5381. Pathogenesis of Infectious Zoonotic Diseases. (3.0 cr.; A-F only; prereq [Microbiology, biochemistry] courses or #; spring, every year)
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. (1.0-4.0 cr.; max 8.0 cr.; prereq Jr, #; fall, spring, summer, every year)
Independent study as determined by instructor. Usual activity includes conducting research in instructor's lab.

CMB 5910. Grantwriting: What Makes a Winning Proposal?. (2.0 cr.; =VMED 5910; spring, every year)
Components of a strong proposal. Grant submission process. What reviewers look for. How to locate grant announcements that match research interests.

CMB 8012. Basic Concepts in Skeletal Biology. (2.0 cr.; A-F only; prereq CMB grad student or #; spring, every year)
Cells (osteoblasts, osteoclasts, chondrocytes) that make up skeleton. Transcription/signaling networks regulating cell growth/differentiation. Mechanisms of bone remodeling. Regulation of bone by agents such as hormones.

CMB 8100. Research Rotation in Comparative and Molecular Biosciences. (1.0-2.0 cr.; S-N only; prereq CMB grad student; fall, spring, every year)
Current developments in faculty research. Topics specific to research adviser's area of interest. Eight weeks.

CMB 8134. Ethical Conduct of Animal Research. (3.0 cr.; A-F or Audit; =VMED 8134, ANSC 8134; prereq [Grad or professional school] student or #; fall, every year)

CMB 8201. Mechanisms of Animal Health and Disease I. (3.0 cr.; A-F or Audit; prereq 1st yr CMB grad student or approval of crse coordinator; fall, spring, every year)

CMB 8202. Mechanisms of Animal Health and Disease II. (3.0 cr.; A-F only; fall, every year)
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/pathogenesis.

CMB 8208. Neuropsychopharmacology. (3.0 cr.; A-F or Audit; =PSY 8061; prereq graduate student and #; fall, every year)

CMB 8303. Comparative Models of Disease. (2.0 cr.; A-F only; prereq Enrollment in a biological sciences grad program or #; spring, every year)

CMB 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

CMB 8344. Mechanisms of Hormone Action. (2.0 cr.; prereq Course in biochemistry or cell biology or #; fall, every year)
Mechanisms of hormone/cytokine action. Focuses on 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.

CMB 8361. Neuro-Immune Interactions. (3.0 cr.; prereq [MICB 5218 or equiv], [NSC 5561 or equiv]; fall, odd years)
Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation. Offered fall of even-numbered years.
CMB 8371. Mucosal Immunobiology. (3.0 cr.; A-F or Audit; =OBIO 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.

CMB 8394. Research in Comparative Biomedical Sciences. (1.0-6.0 cr. [max 18.0 cr.]; prereq Grad CMB major; fall, spring, summer, every year) Directed research determined by student's interests, in consultation with faculty mentor.

CMB 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CMB 8481. Advanced Neuropharmaceutics. (4.0 cr.; A-F or Audit; =NSC 8481, PHM 8481; prereq #; fall, even years) 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.

CMB 8550. Comparative and Molecular Biosciences Seminar. (1.0 cr. [max 8.0 cr.]; S-N or Audit; prereq Biol sciences grad student; fall, spring, every year) Student/faculty presentations of their own research or a directed topic.

CMB 8560. Research and Literature Reports. (1.0 cr. [max 8.0 cr.]; S-N or Audit; prereq Grad CMB major or #; fall, spring, every year) Current developments in cellular and molecular mechanisms of animal health and disease.

CMB 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

CMB 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only; fall, spring, summer, every year]) (No description)

CMPE 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CMPE 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only; fall, spring, summer, every year]) (No description)

Computer Science (CSCI)

Institute of Technology

CSCI 5103. Operating Systems. (3.0 cr.; prereq 4061 or #; fall, every year) Conceptual foundation of operating system designs and implementations. Relationships between operating system structures and machine architectures. UNIX implementation mechanisms as examples.

CSCI 5105. Introduction to Distributed Systems. (3.0 cr.; prereq [5103 or equiv] or #; spring, offered periodically) Distributed system design and implementation. Distributed communication and synchronization, data replication and consistency, distributed file systems, fault tolerance, and distributed scheduling.

CSCI 5106. Programming Languages. (3.0 cr.; prereq 4011 or #; fall, every year) 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.

CSCI 5115. User Interface Design, Implementation and Evaluation. (3.0 cr.; prereq 4041 or #; fall, every year) 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 project group.

CSCI 5117. Developing the Interactive Web. (3.0 cr.; prereq 4131 or 5131 or #; upper div or grad in CSci recommended; spring, odd years) Hands-on design experience using modern web development tools. Students work in teams to develop software programs using each of four toolkits. Analyze developments in forum posts and classroom discussions.

CSCI 5125. Collaborative and Social Computing. (3.0 cr.; prereq 5115 or #; spring, odd years) Introduction to computer-supported cooperative work, social computing. Technology, research methods, theory, case studies of group computing systems. Readings, hands-on experience.

CSCI 5143. Real-Time and Embedded Systems. (3.0 cr.; A-F only; prereq [4061 or #], experience with C language; spring, offered periodically) 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. (3.0 cr.; prereq [2021, 5106 or #]; spring, every year) Techniques for translating modern programming languages to intermediate forms or machine-executable instructions/their organization into compiler. Lexical analysis, syntax analysis, semantic analysis, data flow analysis, code generation. Compiler project for prototypical language.

CSCI 5204. Advanced Computer Architecture. (3.0 cr.; =EE 5364; prereq 4203 or EE 4363; fall, every year) Instruction set architecture, processor microarchitecture, memory, I/O systems. Interactions between computer software and hardware. Methodologies of computer design.

CSCI 5211. Data Communications and Computer Networks. (3.0 cr.; =CSCI 4211; prereq [4061 or #], basic knowledge of [computer architecture, operating systems, probability]; grad student; fall, every year) Concepts, principles, protocols, and applications of computer networks. Layered network architectures, data link protocols, local area networks, network layer-routing protocols, transport, congestion/flow 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. (3.0 cr.; prereq 4211 or 5211 or equiv; intro course in computer networks recommended; spring, odd years) Design principles, protocol mechanisms. Network algorithmics, implementation techniques. Advanced network architectures, state-of-art/emerging networking technologies/applications, network modeling, Simulation, experiments.

CSCI 5231. Wireless and Sensor Networks. (3.0 cr.; prereq 4211 or 5211 or #; spring, even years) 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. (3.0 cr.; prereq 4061 or equiv or #; fall, every year) Concepts of computer, network, and information security. Risk analysis, authentication, access control, security evaluation, audit trails, cryptography, network/database/application security, viruses, firewalls.

CSCI 5302. Analysis of Numerical Algorithms. (3.0 cr.; prereq 2031 or 2033 or #; spring, every year) Additional topics in numerical analysis. Interpolation, approximation, extrapolation, numerical integration/differentiation, numerical
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

CSCI 5715. From GPS and Virtual Globes to Spatial Computing. (3.0 cr.; prereq Familiarity with Java, C++, or Python; spring, odd years) Mathematical concepts, geo-information, representations, algorithms, data-structures/access methods, analysis, architectures, interfaces, reasoning, time.

CSCI 5801. Software Engineering I. (3.0 cr.; prereq [1902, 2011] or #; fall, every year) Advanced introduction to software engineering. Software life cycle, development models, software requirements analysis, software design, coding, maintenance.

CSCI 5802. Software Engineering II. (3.0 cr.; prereq 5801 or #; spring, offered periodically) Introduction to software testing, software maturity models, cost specification models, bug estimation, software reliability models, software complexity, quality control, and experience report. Student groups specify, design, implement, and test partial software systems. Application of general software development methods and principles from 5801.

CSCI 5980. Special Topics in Computer Science. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; may be repeated for cr; fall, spring, offered periodically) Lectures and informal discussions on current topics in computer science.

CSCI 5991. Independent Study. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; may be repeated for cr; fall, spring, summer, every year) Independent study arranged with CS faculty member.

CSCI 5994. Directed Research. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; may be repeated for cr; fall, spring, summer, every year) Directed research arranged with faculty member.

CSCI 5996. Curricular Practical Training. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq [CSci or CompE] major; #; fall, spring, summer, every year) Industrial work assignment involving advanced computer technology. Reviewed by faculty member. Grade based on final report covering work assignment.

CSCI 8001. Introduction to Research in Computer Science I. (1.0 cr.; A-F only; prereq 1st yr CS PhD student; fall, every year) First of two-part sequence course. Students must take both parts to complete course and receive grade. Conducting literature review. Identifying research questions. Writing a research proposal. Research areas in CS. Practical research skills. Research ethics. Resources.

CSCI 8002. Introduction to Research in Computer Science II. (2.0 cr.; A-F only; prereq 8001, 1st yr CS PhD student; spring, every year) Second of two-part sequence course. Students must take both parts to complete course and receive grade. Conducting literature review. Identifying research questions. Writing a research proposal. Research areas in CS. Practical research skills. Research ethics. Resources.

CSCI 8101. Advanced Operating Systems. (3.0 cr.; prereq 5103 or #; fall, offered periodically) Successful research systems and existing theory of systems design. Goal is not merely to catalog systems or learn mathematics, but to develop a sense of elegance of design that leads to successful systems.

CSCI 8102. Foundations of Distributed Computing. (3.0 cr.; prereq 8101 or #; spring, offered periodically) Fundamental principles underlying design of distributed and multiprocessor operating systems. Foundations of distributed computing systems; shared multiprocessor systems.

CSCI 8115. Human-Computer Interaction and User Interface Technology. (3.0 cr.; prereq 5115 or #; fall, spring, offered periodically) 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 8117. Understanding the Social Web. (3.0 cr.; prereq CS grad or #; fall, spring, offered periodically) Research on the social web. Read, present, and discuss papers, do homework using social web research techniques such as data analysis and simulation. Semester research project.

CSCI 8161. Advanced Compiler Techniques. (3.0 cr.; prereq 4061 or #; fall, spring, offered periodically) Techniques for uniprocessors and parallel computers. Fundamental program analysis instruments such as data flow analysis and data dependence analysis. Variety of code generation and transformation techniques.


CSCI 8211. Advanced Computer Networks and Their Applications. (3.0 cr.; prereq 5211 or #; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq [5211, 5103] or #; 5471 or EE 5248 or Math 5248 or equiv recommended; fall, offered periodically) 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 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description) CSCI 8363. Numerical Linear Algebra in Data Exploration. (3.0 cr.; prereq 5304 or #; spring, offered periodically) Computational methods in linear algebra, matrix decompositions for linear equations, least squares, eigenvalue problems, singular value decomposition, conditioning, stability in method for machine learning, large data collections. Principal directions, unsupervised clustering, latent semantic indexing, linear least squares fit. Markov chain models on hyperlink structure.

CSCI 8442. Computational Geometry and Applications. (3.0 cr.; prereq 5421 or #; spring, offered periodically) 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. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description) CSCI 8551. Intelligent Agents. (3.0 cr.; prereq 5511 or #; fall, offered periodically) Theories of intelligent agents. Agent architectures; knowledge representation, communication, cooperation, and negotiation among multiple agents; planning and learning; issues in designing agents with a physical body; dealing with sensors and actuators; world modeling.
CSCI 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

CSCI 8701. Overview of Database Research. (3.0 cr.; prereq 5708 or #; fall, spring, offered periodically) 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 8715. Spatial Databases and Applications. (3.0 cr.; prereq 4707 or 5707 or GIS 5571 or GIS 5573; fall, spring, offered periodically) 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. (3.0 cr.; prereq 4707 or 5707 or #; spring, offered periodically) DBMS support for biological databases, data models. Searching integrated public domain databases. Queries/analyses, DBMS extensions, emerging applications.

CSCI 8735. Advanced Database Systems. (3.0 cr.; A-F or Audit; prereq 4707 or 5707 or #; fall, offered periodically) Database systems for emerging applications, nontraditional query processors, multi-dimensional data indexing. Current research trends.

CSCI 8760. Plan B Project. (3.0 cr.; S-N or Audit; prereq CSCI MS student, #; fall, spring, every year) Project arranged between student and faculty.

CSCI 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

CSCI 8801. Advanced Software Engineering. (3.0 cr.; prereq 5801 or #; fall, spring, offered periodically) Software reusability, internet/intranet programming, software reengineering, and software safety.

CSCI 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

CSCI 8970. Computer Science Colloquium. (1.0 cr.; S-N or Audit; fall, spring, every year) Recent developments in computer science and related disciplines. Students must attend 13 of the 15 lectures.

CSCI 8980. Special Advanced Topics in Computer Science. (3.0 cr. [max 27.0 cr.]; prereq #; fall, spring, every year) Lectures and informal discussions.

CSCI 8991. Independent Study. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; fall, spring, every year) Independent study with professor.

CSCI 8994. Directed Research in Computer Science. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; fall, spring, every year) Directed research with professor.

Conservation Biology (CBIO) College of Food, Agricultural and Natural Resource Sciences

CBIO 8001. Conservation Biology Seminar. (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Topics vary.


CBIO 8093. Directed Study Experience. (1.0-5.0 cr. [max 6.0 cr.]; S-N or Audit; prereq #; ) Directed Study Experience

CBIO 8095. Contemporary Problems in Conservation Biology. (1.0 cr.; S-N or Audit; prereq 8004, FW 8452, #; fall, spring, every year) Comprehensive review of conservation biology issue. Written exam.

CBIO 8103. Research in Support of Resource Management: a Dialog With Land Managers. (2.0 cr.; S-N only; fall, odd years) 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. (2.0 cr. [max 8.0 cr.]; S-N only; fall, every year) Overview of history/philosophy of science as framework for writing thesis or dissertation. How to conduct research. Time management.

CBIO 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CBIO 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CSCI 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

CBIO 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; prior to passing written and oral prelims, must have: 1 yr coursework in program; approval on a degree program; 1-2 pg research proposal (approved by adviser) to DGS asst; fall, spring, summer, every year) Doctoral thesis credit.

Control Sciencces and Dynamical Systems (CSDY) College of Science and Engineering

CSDY 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CSDY 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) Doctoral Pre-Thesis Credits

CSDY 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

CSDY 8899. Seminar in Control Science and Dynamical Systems. (1.0-3.0 cr. [max 9.0 cr.]; S-N or Audit; prereq CSDY or IT grad; fall, spring, every year) Current research and advanced topics.

Coptic (COPT) College of Liberal Arts

COPT 5001. Elementary Coptic. (3.0 cr.; ) Introduction to Coptic grammar and vocabulary, chiefly in the Sahidic dialect.

COPT 5002. Elementary Coptic. (3.0 cr.; prereq 5001 or equiv; ) Reading a variety of Coptic literature, such as Gnostic, martyrological, or monastic texts.
CSCL 5147. Teaching as Dialogue. (3.0 cr.; fall, offered periodically)
Teaching and the teacher are the subject. Entering into dialogue is the method. Issues with the politics of teaching, the means of entering into dialogue, questions of judgment, and the idea of self-teaching as the goal of teaching.

CSCL 5154W. Theoretical Constructions of Space. (3.0 cr.; spring, odd years)
Inquiry into theories of space drawn from various disciplines including anthropology, architecture, 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. (3.0 cr.; fall, offered periodically)
Suburbia from origins in 18th-century England to the present. Historical changes and present challenges, especially in America. Ideology, 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. (3.0 cr.; =CSDS 5301; spring, offered periodically)
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. (3.0 cr.; =CSDS 5302; fall, spring, offered periodically)
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 5305. Vision and Visuality: An Intellectual History. (3.0 cr.; A-F only; fall, spring, offered periodically)
Central role of vision/visuality in modernity. Modern age as scopic regime. Ways that ideas/ideologies of perception have shaped aesthetic experience within social existence.

CSCL 5331. Discourse of the Novel. (3.0 cr.; =CL 5331; fall, offered periodically)
Comparative study of the novel, 18th century to present. Its relations to ordinary language practices, emergent reading publics, technologies of cultural dissemination, and its role in articulating international cultural relations.

CSCL 5411. Avant-Garde Cinema. (4.0 cr.; A-F or Audit; prereq 1921 or ARTH 1921W or equiv; fall, every year)
History/theory of avant-garde cinema, from classical period (1920s) to post-WWII.

CSCL 5501. Origins of Cultural Studies. (3.0 cr.; fall, spring, offered periodically)
Intellectual map of the creation of cultural studies as a unique approach to studying social meanings. Key figures and concepts, including nineteenth- and early twentieth century precursors.

CSCL 5555. Introduction to Semiotics. (3.0 cr.; =CL 5555, CSDS 5555; spring, offered periodically)
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 5566. Film Music: Theory, History, Practice. (4.0 cr.; A-F only; fall, spring, offered periodically)
Role of music in American/European film from early 20th century silent cinema to near present. Narrative features, shorts, documentary, horror, thriller, science fiction, comedy, cartoon. Film music as social/cultural practice and as part of political economy within culture industry.

CSCL 5711. Sociocriticism. (3.0 cr.; fall, offered periodically)
Sustained consideration of the modern tradition of sociological reflection on literature. Early and late Birmingham School, Frankfurt School, Bakhtin circle, and the various French initiatives associated with both Les Temps Modernes and Tel Quel.

CSCL 5800. Translation Studies. (1.0 cr.; S-N only; prereq CSCL grad student; fall, spring, offered periodically)
Techniques of reading/translating prose texts in fields of cultural studies/comparative literature. Attention to grammar, syntax, lexicon.

CSCL 5810H. Topics in Cultural Studies. (2.0-4.0 cr.; max 8.0 cr.; A-F only; prereq Honor student; fall, spring, every year)
Topics on special subjects.

CSCL 5833. Marx, Freud, Nietzsche: Intellectual Foundations. (3.0 cr.; fall, spring, offered periodically)
Three thinkers who defined modernity: Marx, Freud, and Nietzsche. Central tenets of their thought/terms associated with their theories. Their careers portrayed against the background of their times; their place in intellectual history.

CSCL 5910. Topics in Cultural Studies and Comparative Literature. (3.0-4.0 cr.; max 32.0 cr.; fall, spring, summer, every year)
Topics specified in Class Schedule.

CSCL 5910H. Topics in Cultural Studies. (2.0-4.0 cr.; max 8.0 cr.; A-F only; fall, spring, every year)
Topics on special subjects.

CSCL 5993. Directed Study. (1.0-3.0 cr.; max 9.0 cr.; fall, spring, summer, every year)
Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

Curriculum and Instruction (CI)

College of Education and Human Development

CI 5008. Theory and Practice of Teaching Art in Elementary Schools. (1.0-2.0 cr. [max 3.0 cr.]; A-F or Audit; fall, spring, every year)
Art concepts, skills, processes appropriate for elementary school. Methods of art instruction. Children's production of responses to art.

CI 5045. Advanced Contemporary Crafts. (2.0 cr.; A-F or Audit; fall, spring, summer, offered periodically)
In-depth experiences in craft techniques, including ceramics, fibers, jewelry, and metal design, with emphasis on design analysis, understanding of materials, and mastery of processes.

CI 5049. Art Media Techniques. (1.0-4.0 cr.; A-F or Audit; summer, every year)
Lectures, demonstrations, studio labs and critique session on creative processes; handling specific media. Topic varies.

CI 5050. Issues in Art Education. (1.0-4.0 cr.; max 12.0 cr.; fall, summer, every year)
Issues/trends, current practices, recent research.

CI 5065. Improving Art Programs in the Schools. (3.0 cr.; A-F or Audit; prereq Initial lic students majoring in art ed; fall, every year)
Issues of art instruction, including teaching methods and evaluation, philosophical frameworks of pedagogy, and institutional issues concerning art programs in primary and secondary schools; social and cultural structures of schooling, practical issues of teaching art.

CI 5069. Curriculum Innovations in Art Education. (3.0 cr.; A-F or Audit; fall, every year)
Study and analysis of innovations; evaluation of materials for teaching units and projects.

CI 5075. The Social and Historical Foundations of Art Education. (1.0-3.0 cr.; A-F or Audit; prereq Grad student; fall, offered periodically)
Issues of culture in education; examination of various forms of art as representations of knowledge, belief, and cultural capital. Epistemology, the meaning of function, and the conceptual location of visual culture in education and general culture. Seminar discussions include problems of cross-cultural and multicultural art education.

CI 5078. Application of Aesthetic Theory in Education. (2.0 cr.; A-F or Audit; spring, summer, every year)
Contemporary theories of art; psychological and philosophical foundations. Open to teachers, supervisors, and administrators concerned with art in general education at all levels.

CI 5096. Art Education: Practicum. (1.0-6.0 cr.; A-F or Audit; fall, every year)
Issues of art instruction, including teaching methods and evaluation, philosophical frameworks of pedagogy, and institutional issues concerning art programs in primary and secondary schools. Practicum requiring students to work in a public school setting.
CI 5097. Student Teaching in Art Education. (8.0 cr.; S-N or Audit; prereq Licensure student in art ed; spring, summer, every year) Observation of, participation in, and supervisory experiences with various types and levels of art classes.

CI 5111. Introduction to Elementary School Teaching. (3.0 cr.; A-F or Audit; prereq Foundations of ed major or elem ed initial lic; fall, spring, summer, every year) Curriculum organization, instruction, management, assessment, professional decision making.

CI 5113. Classroom Management in the Elementary School. (3.0 cr.; summer, every year) 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 5136. History of the American Curriculum. (3.0 cr.;) Survey of formation of public school subjects and curriculum theory in United States. Social, political, and economic implications of curriculum theory.


CI 5138. Multicultural and Moral Perspectives on Classroom Instruction. (3.0 cr.; 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. (3.0-4.0 cr.; 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. (3.0 cr.; A-F or Audit; spring, every year) 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 5150. Curriculum Topics. (1.0-6.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Special topics, current trends in curriculum. Subject integration, curriculum contexts, development, implementation, evaluation.

CI 5155. Contemporary Approaches to Curriculum: Instruction and Assessment. (3.0 cr.; A-F or Audit; prereq Grad students only; fall, spring, summer, every year) Current research/issues that cross disciplinary boundaries in curriculum development, instructional practices, and assessment methods. Interrelations among curriculum, instruction, and assessment within framework of constructivist learning theory. Individual classroom practices/theories.

CI 5156. Popular Culture, Teaching, and Learning. (3.0 cr.; A-F only; prereq Grad student or sr in a program that values teaching as a component of the discipline; fall, every year) Approaches to the study of popular culture and education. Intersection between everyday life and broader historical contexts. Sporting events, toys, clothing, shopping malls, vampire mania, music festivals, video, and comics are the kinds of popular forms of culture we will engage as we develop teaching/learning strategies.

CI 5162. Peer Coaching for Teachers. (1.0-2.0 cr.; A-F or Audit; prereq Teaching experience or #; ) Teachers coaching teachers; acquiring concepts, skills, and dispositions necessary for observing classroom instruction and providing constructive feedback.

CI 5177. Practical Research. (3.0 cr.; A-F or Audit; prereq CI MEd student, or CI or EdPA Teacher Leadership MEd student; fall, spring, summer, every year) 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. (3.0-6.0 cr. [max 3.0 cr.]; = [OLPD 5361]; prereq CI or EdPA teacher leadership MEd student; fall, spring, summer, every year) 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. (2.0-10.0 cr. [max 30.0 cr.]; S-N or Audit; prereq Foundations of education and elem ed initial licensure only; fall, spring, summer, every year) Students spend full days in the elementary classroom, gradually assuming responsibility for teaching, and prepare portfolio based on criteria given. One seminar per week.

CI 5285. Clinical Experience in Elementary School Teaching. (12.0 cr. [max 24.0 cr.]; S-N only; prereq M.Ed./Elementary education initial licensure students; fall, spring, summer, every year) Field-based practicum in elementary school setting. In-class discussions about application of classroom learning to school setting.

CI 5286. Student Teaching Seminar: Elementary Education. (3.0 cr. [max 6.0 cr.]; A-F only; prereq M.Ed./Elementary education initial licensure only; fall, spring, every year) Weekly seminar supplementing student teaching experience. Class discussions, sharing of artifacts from the classroom, reflections, and readings.

CI 5287. Capstone Project: Improvement of Teaching in Elementary and Pre-Kindergarten Schools. (3.0 cr.; A-F only; prereq M.Ed./elementary education initial licensure student; fall, spring, summer, every year) Elementary school classroom teaching project to improve specific teaching skills. Approved/directed by adviser.

CI 5300. Teaching Introductory Computer Concepts and Skills. (1.0-3.0 cr.; A-F or Audit; spring, every year) Pedagogical strategies for teaching keyboarding and word processing.

CI 5301. Foundations of Computer Applications for Business and Education. (3.0 cr.; A-F only; fall, spring, summer, every year) Instructional uses of computers/representative business, education, marketing applications.
Word processing, databases, spreadsheets, graphic design. Expectations are for demonstrations of skills on apps/understanding of concepts that go beyond basic.

CI 5304. Data Management for Online Integration. (3.0 cr.; spring, every year)
Using database software to organize, manage, and display online data, to create content management systems, and to integrate into existing Web sites.

CI 5305. Integrated Computer Applications in Business and Marketing Education. (3.0 cr.; fall, spring, every year)
Case-based authentic business computing problems requiring integration of two or more application packages. Pedagogical issues of learning/teaching advanced computer applications.

CI 5321. Foundations of Distance Education. (3.0 cr.; A-F or Audit; summer, every year)

CI 5322. Online Learning Communities. (3.0 cr.; A-F or Audit; spring, every year)
Students design/research an online learning environment that promotes community.
What community is, how it fosters learning 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. (3.0 cr.; A-F or Audit; fall, every year)
Students research, use, and evaluate technologies for distance learning and design their own learning environments.

CI 5327. Designing Online Adventure Learning. (3.0 cr.; A-F or Audit; spring, every year)
Designing, developing, and integrating adventure learning environments in K-16. Examples of effective adventure learning environments.

CI 5330. Special Topics in Learning Technologies. (1.0-3.0 cr. [max 12.0 cr.]; fall, summer, every year)
Topics related to needs of in-service teachers. Topics, location, credits. Duration flexible.

CI 5331. Introduction to Learning Technologies. (3.0 cr.; fall, every year)
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 5336. Planning for Multimedia Design and Development. (3.0 cr.; spring, every year)
Theory, research, practice in instructional design. Generic components of instructional design process. Applying principles to design/development of computer-based instructional materials.

CI 5337. Planning for K-12 Technology Design and Integration. (3.0 cr.; A-F or Audit; spring, every year)
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 5344. Facilitating Technology Integration in Classrooms I. (1.0 cr.; A-F or Audit; fall, odd years)
Intersection of student learning theories and research base on effective technology practices. Video cases of technology-supported teaching, peer teaching exercise.

CI 5347. Teaching Digital Writing: Blogs, Wikis, Online Talk, Podcasting, and E-Portfolios to Teach Writing. (3.0 cr.; A-F or Audit; = [CI 5475]; fall, every year)

CI 5351. Technology Tools for Educators. (3.0 cr.; A-F or Audit; fall, every year)
Develop skills in using technology applications to support teaching and learning. Internet applications, presentation software, Web 2.0 technologies, and Web site development.

CI 5351. Teaching and Learning with the Internet. (3.0 cr.; spring, every year)
Implications/challenges in using Internet-based technologies in classroom. Pedagogical models.

CI 5362. Foundations of Interactive Design for Web-based Learning. (3.0 cr.; fall, every year)
Processes of designing/developing interactive learning media and online applications from ground up. Focuses on usability/aesthetics in online learning.

CI 5363. New Media and Interaction Design for Online and Mobile Learning. (3.0 cr.; fall, every year)

CI 5364. Computer-Based Instruction: Games and Simulation. (3.0 cr.; A-F or Audit; 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 5365. Contemporary Software Development Issues and Tools. (3.0 cr.; prereq Familiar with standard computer/Internet operations; summer, every year)
Software used in multimedia design/ development. Uses of the software, intricacies of interface, relevant programming principles.

Introduction to developing multimedia applications.

CI 5367. Interactive Multimedia Instruction. (3.0 cr.; A-F or Audit; prereq Knowledge of principles and procedures of CBI design and one multimedia authoring system; spring, every year)
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 5390. Learning Technologies Field Experiences. (2.0 cr.; S-N only; prereq Students in teachers of computer/keyboard/related technology applications additional licensure program; fall, spring, every year)
Field-based experience for students enrolled in computers, keyboarding, and related technology applications methods classes. Apply learning from University courses to the K-12 school setting. In-class discussions about the application of classroom learning to the school setting.

CI 5401. Literature for the Elementary School. (3.0 cr.; A-F or Audit; prereq Children's lit course or #;spring, offered periodically)

CI 5402. Introduction to Special Collections. (3.0 cr.; A-F or Audit; prereq Children's lit course or #; fall, offered periodically)
Uses Children's Literature Research Collection as research material. Study of manuscripts, original art, and letters.

CI 5403. Writing For and By Children . (3.0 cr.; A-F only; prereq Children's Lit course or #; fall, every year)

CI 5404. Culturally Diverse Books for Children and Adolescents. (3.0 cr.; A-F or Audit; prereq MEd, MA, PhD student; fall, odd years)
Reading of literature for children/adolescents about diverse cultures. Critique of literary quality and cultural depiction. Development of ways to use culturally diverse literature.

CI 5405. Middle School Language Arts Methods. (2.0 cr.; A-F only; prereq Elem ed licensure student; fall, odd years)
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. (1.0-3.0 cr. [max 12.0 cr.]; fall, summer, every year)
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Topics related specifically to the needs of inservice teachers. Topics, location, credits, and duration will be highly flexible.

CI 5411. Teaching Reading in the Elementary School. (3.0 cr.; A-F or Audit; fall, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq 5411 or 5451; spring, offered periodically) Causes, diagnosis and assessment, prevention and correction; intervention practices useful to the classroom teacher and special teacher of reading.

CI 5413. Foundations of Reading. (3.0 cr.; A-F or Audit; spring, offered periodically) Reading processes, development of readers. Assessment/tutoring of individual children in reading and other literacy practices.

CI 5415. Literacy Development in the Primary Grades. (3.0 cr.; A-F or Audit; prereq Elem teaching exp or #; fall, every year) 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 5417. Elementary literacy Instruction for ESL Students. (3.0 cr.; A-F or Audit; prereq Bachelor's degree completed; fall, odd years) 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. (3.0 cr.; A-F or Audit; 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 5422. Teaching Writing in Schools. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Theory/practice of teaching writing in schools. How race, gender, and social class impact teaching/learning.


CI 5425. Reading Instruction in the Elementary Grades. (3.0 cr.; A-F only; prereq [Elementary or early childhood] licensure student; fall, spring, every year) Curricular/methodological issues in teaching of reading. Reading/orthographic processes, strategy instruction for word recognition/comprehension, authentic assessment strategies, and teaching diverse students.


CI 5431. Introduction to Instructional Leadership in K-12 Reading. (3.0 cr.; A-F or Audit; prereq Minnesota license valid for classroom teaching in pre-kindergarten, [adult basic education or grades kindergarten through 12; summer, every year) K-12 curriculum in reading, major theories/research that motivate curriculum. Major instructional principles, alignments needed, resources available.

CI 5432. Instructional Leadership in Reading in Kindergarten and the Elementary Grades. (3.0 cr.; A-F or Audit; prereq 5431; fall, every year) Research-based reading instruction for elementary grades. How to help other teachers improve practice. Characteristics of effective schools within context of improving students' reading achievement.

CI 5433. Instructional Leadership in Reading for the Middle and Secondary Grades. (3.0 cr.; A-F or Audit; prereq 5432; spring, every year) Curriculum/instruction for middle/secondary school students.

CI 5434. Professional Development and Evolving Practice in K-12 Reading. (3.0 cr.; A-F or Audit; prereq 5433; summer, every year) Developing e-portfolios to assess competence in standards for teaching K-12 reading. Evolving teaching practices. Applications of current technologies.


CI 5442. Literature for Adolescents. (3.0 cr.; A-F or Audit; fall, spring. offered periodically) 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. (3.0 cr.; A-F or Audit; fall, every year) Methods of accommodating to students' abilities and facilitating reading in regular content classes.


CI 5463. Minnesota Writing Project Annual Invitational Summer Institute. (3.0 cr.; A-F only; prereq Licensed teacher or administrator or [space available, faculty letter of recommendation]; summer, every year) Workshop. Participants reflect on their own literacy processes, participate in a writing group, discuss current reading texts, and demonstrate best practices in classroom.

CI 5469. Minnesota Writing Project Directed Studies. (1.0-3.0 cr.; A-F only; prereq Teaching license, [CI 5463 or enrolled in the Certificate for Teaching Writing and Critical Literacy]; summer, every year) Directed study for teachers involved in MWP. Capstone course for those enrolled in the Certificate in Teaching Writing and Critical Literacy. Teachers investigate current theory and practice of literacy instruction. Ongoing cohort for those enrolled in the Certificate.

CI 5472. Teaching Film, Television, and Media Studies. (3.0 cr.; A-F or Audit; fall, spring, every year) 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.
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Participants expand their repertoire of tasks/activities, gather samples of learner language, and practice analyzing those samples to identify language features that learners do/do not know.

CI 5623. Improving Language Learning: A Practical Course in Styles- and Strategies-based Instruction. (2.0 cr.; Student Option No Audit; summer, every year) Learner-focused approach to teaching that helps students understand and make the most of their own learning styles/strategies. Participants create materials/lessons and explore ways to incorporate strategies into their own language curricula.

CI 5624. Content-based Language Instruction and Curriculum Development. (2.0 cr.; Student Option No Audit; summer, every year) Intensive professional development to help foreign language teachers learn to implement the CBI curricular approach in the language classroom. Introduces all phases of CBI curricular development and provides resources necessary to ensure successful implementation.

CI 5625. Developing Assessments for the Second Language Classroom. (2.0 cr.; Student Option No Audit; summer, every year) Assessment fundamentals and various topics, including assessment frameworks, performance assessment models, national standards, effective evaluation, and authentic materials. Participants use backward design to develop rating criteria and rubrics, and a standards-based performance assessment unit.

CI 5626. Developing Learners' Sociocultural Competence. (2.0 cr.; Student Option No Audit; summer, every year) Overview of how to incorporate a pragmatics component into second/foreign language curriculum to enhance learners' sociocultural competence. Includes approaches to teaching/evaluating pragmatics.

CI 5628. Analyzing Learner Language in Second Language Acquisition. (3.0 cr.; Student Option No Audit; prereq 5646, 5649 [or other course on the grammar of a language]; fall, every year) Review broad findings in second language acquisition (SLA) research. Cognitive/social process of becoming multilingual. How to carry out classroom-based research projects focused on learner language development.

CI 5631. Second Language Curriculum Development and Assessment. (3.0 cr.; A-F or Audit; prereq SLC initial licensure only; fall, every year) Instruction/assessment of ESL and World Languages in the modalities of speaking, listening, reading, and writing. Backwards design, proficiency-oriented approach, use of content-based instruction. Planning for the integration of instruction and assessment.

CI 5632. Literacy and Language Development in Second Language Classrooms. (3.0 cr.; A-F or Audit; prereq SLC initial licensure only; fall, every year) Processes/instructional approaches in developing second language proficiency in the modalities of reading, writing, speaking, and listening and communicative modes (interpretive, presentational, interpersonal); development of literacy in a second language; planning second language instruction based on research on L1 and L2 literacy development; integration of instruction/assessment in language teaching.

CI 5634. Content-Based Instruction in Second Language Settings. (3.0 cr.; A-F or Audit; prereq SLC initial licensure only; spring, every year) Building on foundation from other courses in the sequence. Instruction/assessment of ESL and World Languages at the secondary level. Prepares students to connect language teaching with other content areas, analyze/address the academic language needs of English learners, and advocate for second language programs and students.

CI 5635. Culture and Diversity in Second Language Classrooms. (3.0 cr.; prereq Initial licensure program only; spring, every year) Teaching culture as content and including students' home cultures in the curriculum and diverse student needs. Needs of students of various educational, social, and cultural backgrounds/ways to develop academic success through instruction in learning strategies and other approaches to differentiation.

CI 5641. Language, Culture, and Education. (3.0 cr.; A-F or Audit; prereq MED or grad student; spring, summer, offered periodically) Applies current sociolinguisitc and discourse theory/research to study of relationships between language and culture in educational settings: language curriculum and instruction; classroom language use; borders between school and home/community language use; and educational policies on literacy/second-language instruction.

CI 5642. Assessing English Learners. (3.0 cr.; A-F or Audit; prereq MED or grad student; spring, every year) Current practices concerning language and academic content assessment of English learners (ELs) at the school site, state, and national level; factors affecting academic learning needs of ELs/where assessment fits into that picture.

CI 5645. Teaching English Learners in the Elementary Classroom. (3.0 cr.; A-F only; prereq Early Childhood or Elementary Education ILP; fall, spring, summer, every year) Benefits/challenges of working with English learners (ELs). Linguistically/culturally diverse students. Instructional practices/strategies for teaching ELs in elementary classrooms. Language learning/bilingualism. Cultural differences.

CI 5646. English Grammar for ESL Teachers. (3.0 cr.; prereq LING 5001 or #; fall, every year) English syntax from pedagogical perspective. Grammatical structures that challenge ESL learners. Analyzing learner errors. Issues/activities related to teaching grammar in ESL contexts.


CI 5648. Advanced Practices in Teaching Academic Language. (3.0 cr.; A-F only; prereq Grad student, #; spring, every year) Prepares K-12 teachers for student development of academic language proficiency. Read/discuss current research. Implement innovative teaching practices.

CI 5649. Language Analysis for ESL Teaching in Higher Ed. (4.0 cr.; Student Option No Audit; prereq 5646; spring, every year) Overview of complex aspects of English grammar not covered in 5646. Academic uses of passives, indirect objects, conditionals, relative clauses, complementation, reported speech, deixis/reference, articles, prepositions, phrasal verbs, pragmatics.

CI 5651. Foundations of Second Languages and Cultures Education. (3.0 cr.; A-F or Audit; fall, every year) Historical overview of second language teaching/learning in U.S. introduction to second language acquisition. Second language instructional concepts across elementary, secondary/university options for foreign language, bilingual education, immersion language programs, and English as a second language programs. Theoretical frameworks for language instruction are tied to practice.

CI 5653. Methods in Teaching English as a Second Language (ESL) in Higher Education. (3.0 cr.; Student Option No Audit; prereq An intro to linguistics course; fall, spring, every year) Theory/practice teaching academic English as second or foreign language in contexts of higher education. History of field/varied methods in language teaching. Current best practices in teaching academic English pronunciation, listening, speaking, reading, writing skills.

CI 5654. Practicum in Teaching English as a Second Language (ESL) in Higher Education. (6.0 cr.; S-N only; prereq 5653; spring, every year) Practical, hands-on training in teaching of English as Second Language. Applying theoretical/descriptive material studied in 5653. Discuss readings/research articles on ESL in higher ed, applying theoretical/practical principles to specific critical classroom incidents.

CI 5656. Teaching Literacy in Second Language Classrooms. (3.0 cr.; A-F or Audit; fall, every year) Reading comprehension/composing processes in a second language; relationship between first and second literacy development; relationship between reading and
writing; relationship of culture to reading comprehension and writing; politics of literacy; assessment of second language literacy; using technology to enhance literacy instruction.

CI 5677. Teaching Speaking and Listening in Second Language Classrooms. (3.0 cr.; A-F or Audit; spring, odd years) Theories/methods in teaching language as communication in oral/aural modes; planning student interaction; classroom organization for oral language learning/acquisition; using technology to enhance interaction; assessment of listening comprehension and oral communication.

CI 5658. Foreign Language Testing and Assessment. (3.0 cr.; A-F or Audit; spring, even years) For world language/EFL teachers. Aligning curriculum development in second language instruction/assessment; language testing/assessment; classroom-based and large-scale proficiency testing/assessment; assessing proficiency in speaking, listening, reading, writing and communicative modes (interpretive, presentational, interpersonal); creation of formative/summative assessments; critique of contemporary assessment instruments.

CI 5660. Special Topics in the Teaching of Second Languages and Cultures. (1.0-4.0 cr. [max 12.0 cr.]; spring, summer, every year) Topics related specifically to the needs of the in-service teacher. Topics, location, credits, and duration are flexible.

CI 5662. Second Language Curriculum Design. (3.0 cr.; A-F or Audit; spring, every year) 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/state standards and implications for curriculum development; effects of technology on second language curriculum.

CI 5670. Foundations of Dual Language and Immersion Education. (3.0 cr.; prereq: Enrollment in certificate program or dual language immersion edcr or #; fall, every year) Research foundations and program principles for dual language/immersion. Second language acquisition; critical features of program design/implemention; benefits/challenges of dual language/immersion; program assessment; advocacy. Theory/research for dual language/immersion tied to practical application.

CI 5671. Curriculum Development and Assessment in Dual Language/Immersion Classrooms. (3.0 cr.; prereq #; fall, odd years) Content-based language instruction and curriculum development for dual language, bilingual, and immersion contexts; balancing content/language goals/objectives in curriculum and instruction; integration of language, literacy content, and culture in curriculum; standards-based instruction; backwards design; assessment that aligns with content-based curriculum and instruction.

CI 5672. Language-Focused Instructional Practices and Strategies for Dual Language/Immersion Classrooms. (3.0 cr.; prereq #; spring, every year) Counterbalancing content with integrated focus on language and literacy development for dual language, bilingual, and immersion classrooms. Materials development; proactive/reactive instructional techniques; noticing and awareness-raising strategies; structuring student language production; differentiating for content, ability, and language.

CI 5673. Immersion 101: An Introduction to Immersion Teaching. (2.0 cr.; Student Option No Audit; CI 5674; summer, every year) Research-based introduction to issues for teachers, administrators, and district personnel in K-12 immersion education. One-way (foreign language), two-way (bilingual), and indigenous programs. Principles/practices that inform language-attentive curriculum development/instruction.

CI 5674. Immersion 101: An Introduction to Immersion Teaching in Character-based Languages. (2.0 cr.; Student Option No Audit; CI 5673; summer, every year) Research-based introduction to issues for teachers, administrators, and district personnel in K-12 immersion education. One-way (foreign language) and two-way (bilingual) programs. Principles/practices that inform language-attentive curriculum development/instruction.

CI 5683. Directed Study in Second Languages and Cultures. (1.0-4.0 cr.; spring, summer, every year) Individual or group work on curricular, instructional, or assessment problems.

CI 5696. Practicum: Teaching World Languages and Cultures in Elementary Schools. (2.0-6.0 cr.; prereq 5619, adviser approval; credits cannot be counted on a graduate degree program for endorsement candidates; fall, spring, summer, every year) Teaching and learning experiences in Second Languages and Cultures at the elementary-school level. Requires students to work in a public school setting.

CI 5697. Practicum: ESL in the Elementary School. (2.0-6.0 cr.; prereq Adviser approval; fall, spring, summer, every year) Teaching/learning experiences in an English as a Second Language setting at elementary school level. Requires students to work in a public school setting.

CI 5698. Student Teaching in Second Languages and Cultures. (2.0-6.0 cr. [max 14.0 cr.]; prereq Adviser approval; credits cannot be counted on a graduate degree program; fall, spring, summer, every year) 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. (3.0-12.0 cr. [max 16.0 cr.]; A-F or Audit; prereq SLC initial licensure program only; fall, spring, every year) Teaching and learning experiences in secondary and secondary second language instructional settings. Includes a seminar held concurrently to support the student teaching experience.

CI 5702. Social Studies Instruction in the Elementary Grades. (3.0 cr.; A-F only; prereq Early Childhood or Elementary Education ILP; fall, spring, every year) Content/organization of elementary social studies programs. Programs of understanding. Improving learning situation.

CI 5705. Middle School Social Studies Methods. (2.0 cr.; A-F only; prereq Elem ed licensure student; fall, every year) 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 5731. Social Studies for the In-Service Elementary and Middle School Teacher. (3.0 cr.; A-F or Audit; fall, every year) 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. (3.0 cr.; A-F only; prereq social studies initial licensure student; summer, every year) 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. (3.0 cr.; A-F only; prereq Secondary social studies initial licensure; fall, every year) 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. (3.0 cr.; A-F only; prereq Secondary social studies initial licensure student; fall, every year) 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. (3.0 cr.; A-F only; prereq Secondary social studies initial licensure student; spring, every year) 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. (3.0 cr.; A-F only; spring, every year)
Ways to engage students (grades 5-12) in social studies (textbooks, literature, speeches, editorials, political cartoons, tables, graphs, maps, film.). Developing middle/high school students' disciplinary literacy.

CI 5746. Global and Multicultural Education in the Secondary Classroom. (3.0 cr.; A-F only; spring, every year) 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. (3.0 cr.; A-F or Audit; spring, every year) 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. (3.0 cr.; fall, offered periodically) 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. (3.0 cr.; A-F or Audit; spring, summer, offered periodically) Philosophies, strategies, and research on developing civic discourse in secondary social studies classroom. Selecting issues. Democratic classroom climate. Relating to social/cultural contexts.

CI 5782. Mathematics Instruction in the Elementary Grades. (3.0 cr.; A-F or Audit; prereq Early Childhood or Elementary Education LLP; fall, spring, every year) Principles of learning mathematics in elementary grades. Objectives, content, philosophy, instructional materials, methods of instruction/evaluation.

CI 5922. Family and Consumer Sciences Curriculum in Grades 5-12. (3.0 cr.; A-F only; prereq ILP student; fall, every year) Examination, development, and implementation of family and consumer sciences curriculum in grades 5-12.

CI 5923. Educational Strategies in Family Education. (3.0 cr.; A-F only; spring, every year) Examination, development, and implementation of a variety of educational strategies.

CI 5924. Family and Consumer Sciences Student Teaching I. (1.0 cr.; S-N only; prereq ILP student; summer, every year) 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. (2.0 cr.; prereq 5924; fall, every year) 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. (8.0 cr.; prereq 5925; spring, every year) Full-time supervised teaching experience in family/consumer sciences programs. On-campus seminars.

CI 5927. Family and Consumer Sciences Student Teaching IV. (1.0 cr.; prereq 5926; spring, every year) Full-time supervised teaching experience in family/consumer sciences programs.

CI 5933. Directed Study in Family, Youth, and Community. (1.0-3.0 cr; max 9.0 cr.; A-F only; prereq #; fall, spring, summer, every year) Self-directed study in areas not covered by regular courses. Specific program of study is jointly determined by student and advising faculty member.

CI 5966. Internship in Family, Youth, and Community. (1.0-6.0 cr; prereq #; fall, offered periodically) 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. (2.0 cr.; A-F or Audit; prereq Educ grad student or #; fall, spring, offered periodically) Reports, evaluation of problems, and review of recent literature.

CI 8079. Research in Art Education. (3.0 cr.; A-F or Audit; prereq Educ grad student or #; ) Current research agenda. Helps students identify research questions and choose appropriate methodologies.

CI 8095. Problems: Art Education. (1.0-12.0 cr.; prereq Grad art educ major or #; fall, spring, summer, every year) 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. (1.0-3.0 cr.; 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. (3.0 cr.; A-F or Audit; 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. (3.0 cr.; 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. (3.0 cr.; 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. (3.0 cr.; A-F or Audit; prereq CI PhD or MA student or #; fall, spring, offered periodically) Central concepts, ideas, and debates in professional field of curriculum. Curriculum in general education.

CI 8132. Curriculum and Instruction Core: Teaching Theory and Research. (3.0 cr.; A-F or Audit; prereq CI PhD or MA student or #; fall, spring, every year) Overview of research on teaching: historical perspective, modern research/findings, implications for practice/research.

CI 8133. Research Methods in Curriculum and Instruction. (3.0 cr.; A-F or Audit; prereq CI PhD or MA student or #; fall, spring, summer, every year) Survey of educational research methods, comparison of underlying assumptions/procedures.

CI 8145. Using Mixed Methods in Educational Research. (3.0 cr.; A-F or Audit; prereq [CI 8133, 8148, OLDP 8812] or equiv. [CI PhD student or #; ] additional quantitative/qualitative methodology courses recommended; fall, spring, every year) Conceptual issues surrounding design/use of mixed methods in addressing problems/research questions in education. Critique of select mixed design exemplars published in respected research publications/practical application of analyses of data using mixed inquiry methods.

CI 8146. Critical Ethnography in Education. (3.0 cr.; A-F or Audit; prereq [8148, EDPA 5061, WOST 5101] or #; spring, even years) Theoretical/methodological foundations. Possibilities and problems for
understanding inequality/disparities in education. Research design, data collection, analysis, writing.

CI 8147. Critical Discourse Analysis in Educational Research. (3.0 cr.; A-F or Audit; prereq [MA or PhD] student; fall, odd years) Students apply CDA methods to analysis of written, visual, and spoken texts in social settings such as schools, families, and communities.

CI 8149. Conducting Qualitative Studies in Educational Contexts. (3.0 cr.; prereq CI 8133 and [CI or OLPD PhD student]; spring, every year) Qualitative research methods. Ethnography, sociolinguistics, symbolic interactionism. Observation.

CI 8149. Qualitative Research: Coding, Analysis, Interpretation, and Writing. (3.0 cr.; A-F or Audit; prereq [MA or Ed.D or Ph.D.] student or #; spring, every year) 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 & Instruc. (1.0-6.0 cr. [max 12.0 cr.]; prereq [M.A. or Ed.D or Ph.D.] student or #; spring, every year) 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. (3.0 cr.; A-F or Audit; prereq Grad student; fall, odd years) 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. (3.0 cr.; A-F or Audit; fall, even years) 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. (3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, every year) Doctoral seminar. Interdisciplinary perspectives on theme central to cultural study of teaching. Theme varies year to year.

CI 8161. Research Experience I: Study Design and Planning. (3.0 cr.; Student Option No Audit; prereq [8133, 6-12 cr. of research methodology, CI PhD student] or #; fall, every year) 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. (3.0 cr.; Student Option No Audit; prereq 8161; spring, every year) Students complete data collection/analysis, prepare research manuscript. Seminar discussions, critical examination of their own and peers’ work.

CI 8181. Seminar in Teaching in Colleges of Education. (3.0 cr.; prereq CI PhD student or #) Goals, instructional strategies, evaluation procedures, and professional considerations.

CI 8195. Problems: Improvement of Instruction. (1.0-6.0 cr.; prereq #; fall, summer, every year) Independent research in curriculum and instruction.

CI 8196. Practicum in Teaching in Colleges of Education. (1.0 cr.; prereq 8181; fall, spring, offered periodically) Supervised teaching in an education course at the University of Minnesota or other college or university.

CI 8197. Problems: Curriculum Studies. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq MA student; fall, every year) Directs students to completing Plan B paper for M.A. degree.

CI 8198. Problems: Teacher Education. (1.0-6.0 cr. [max 12.0 cr.]; prereq #; spring, every year) Independent research.

CI 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser approval, DGS approval; fall, spring, summer, every year) TBD

CI 8350. Special Topics in Learning Technologies. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, offered periodically) Topics in learning technologies. Topics and credits are flexible.

CI 8361. Advanced Courseware and Design: Issues. (3.0 cr.; A-F or Audit) 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. Learning Technologies Seminar. (1.0-3.0 cr. [max 6.0 cr.]; prereq CI grad student or #; fall, spring, every year) Topics related to needs of the in-service teacher; topics, location, credits, and duration are highly flexible.

CI 8395. Directed Study: Learning Technologies. (1.0-4.0 cr. [max 12.0 cr.]; A-F only; prereq #; fall, spring, summer, every year) Students work with faculty member on a directed project or study focused on exploring literature, organizing and engaging in research, designing and developing projects, etc.

CI 8400. Special Topics in Children’s and Young Adult Literature. (1.0-6.0 cr.; prereq grad course in children’s or young adult lit; fall, offered periodically) 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. (1.0-6.0 cr.; prereq [MA or PhD] student; spring, offered periodically) Research at all levels. Topics vary. May include research designs, trends, and specific studies.

CI 8412. Research in Reading. (3.0 cr. [max 6.0 cr.]; prereq [MA or PhD] student; fall, spring, every year) Theory of and research on writing process. Applications to developing writing curriculum/instruction.


CI 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser approval, DGS approval; fall, spring, summer, every year) TBD


CI 8470. Special Topics on Literacy. (1.0-6.0 cr.; prereq [MA or PhD] student; fall, offered periodically) 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. (1.0-3.0 cr.; [max 10.0 cr.]; prerequisite #: fall, spring, summer, every year) Independent study course.

CI 8495. Problems: Teaching English and Reading. (1.0-6.0 cr.; A-F or Audit; prerequisite #: fall, spring, summer, every year) Individual research.

CI 8511. Seminar: Research in Science Education. (1.0 cr. [max 6.0 cr.]; prerequisite CI grad student or #: fall, spring, every year) Students and faculty present research projects for comment and critique. Special topics may also be considered.

CI 8541. History and Philosophy of Engineering and Engineering Education. (3.0 cr.; A-F only; prerequisite PhD or MA student or #: fall, spring, every year) History and philosophy of engineering/education. Critical reflection/analysis of philosophical, epistemological, historical arguments.

CI 8542. Modeling and Model-Based Reasoning in STEM Education. (3.0 cr.; A-F or Audit; prerequisite STEM Education PhD or MA student or #: fall, spring, every year) Models/modeling perspectives for engineering, mathematics, and science education. Theorists/researchers that shaped STEM model-based reasoning. Discussions, individual/group presentations, small-group activities.

CI 8570. Advanced Topics in Science Education. (1.0-4.0 cr. [max 6.0 cr.]; A-F or Audit; prerequisite CI grad student or #: fall, spring, every year) Examination/critique of current research topics, methods, and issues.

CI 8571. Equity, Policy, and Social Justice in Science Education. (3.0 cr.; Student Option: No Audit; prerequisite Science ed grad student or #: fall, every year) Interactions of issues of diversity, equity, policy, and social justice as related to science education. Diverse perspectives on purposes/scopes of science education. Consequences for diversity, equity, access, social justice, empowerment, and educational policy.

CI 8572. Learning Theory and Classical Research in STEM Education. (3.0 cr.; A-F only; prerequisite Grad math educ major; fall, spring, odd years) STEM education research. Theorists/classical research. Mathematics, science, engineering education.

CI 8573. Nature of Inquiry in STEM Education. (3.0 cr.; A-F only; prerequisite MA or PhD student or #: fall, spring, every year) STEM Education. Mathematics, science, engineering. Teaching/learning/teacher education through evaluation of national teaching standards, current research, current cognitive theories of learning.

CI 8594. Conducting Research in Science Education. (3.0 cr.; prerequisite sci educ research course; ) Application of research methodology to a specific science education issue.

CI 8595. Problems: Science Education. (1.0-6.0 cr. [max 12.0 cr.]; prerequisite CI grad student or #: fall, spring, every year) Independent research.

CI 8650. Seminar: Special Topics in Second Languages and Cultures Research. (1.0-3.0 cr. [max 6.0 cr.]; prerequisite CI grad student or #: fall, summer, offered periodically) Research topics vary.

CI 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; prerequisite: CI grad 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; fall, spring, summer, every year) TBD

CI 8691. Readings in Second Languages and Cultures Education. (1.0-3.0 cr.; prerequisite #: fall, spring, every year) Independent reading.

CI 8695. Problems: Second Languages and Cultures Education. (1.0-6.0 cr. [max 12.0 cr.]; prerequisite #: fall, spring, every year) Independent research.

CI 8741. History and Theory of Social Studies Education. (3.0 cr. [max 6.0 cr.]; A-F or Audit; spring, every year) History/theory of social studies education in United States. Organization, subject matter, methods of instruction.

CI 8742. Seminar: Research in Social Studies Education. (3.0 cr.; A-F or Audit; prerequisite CI grad student or #: spring, every year) Critical review and analysis of seminal research studies; criteria for appraising research findings; educational implications.

CI 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; fall, spring, summer, every year) TBD

CI 8795. Problems: Social Studies Education. (1.0-6.0 cr. [max 12.0 cr.]; prerequisite CI grad student or #: fall, spring, summer, every year) Independent research.

CI 8796. Research Internship in Social Studies Education. (1.0-6.0 cr.; A-F or Audit; prerequisite CI grad student; fall, spring, every year) 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. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prerequisite Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) Thesis credits: Doctoral

CI 8900. Family, Youth, and Community Colloquium. (1.0-4.0 cr.; S-N only; prerequisite MA or PhD student; fall, spring, offered periodically) Theories, 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. (3.0 cr.; A-F only; fall, odd years) 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, Communities, and Education: Historical and Contemporary Perspectives. (3.0 cr.; A-F only; prerequisite MEd or MA or PhD student; spring, even years) Teaching/learning in family/community settings and in formal education settings. Interrelationships, implications.

CI 8913. Interpretive Research. (3.0 cr.; A-F only; fall, every year) Hermeneutic, ethnographic, and phenomenological methodologies. Ethics, evaluation, and usefulness of interpretive research. Practice in conducting interpretive research.

CI 8914. Critical Science Research. (3.0 cr.; A-F only; spring, every year) Origins, 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. (1.0-6.0 cr.; A-F only; prerequisite Family, Youth, and Community student doing Plan B research; fall, spring, summer, every year) TBD

Dakota (DAKO)
College of Liberal Arts

DAKO 5126. Advanced Dakota Language I. (3.0 cr.; max 12.0 cr.; A-F or Audit; fall, every year) Focuses on immersion method.

DAKO 5129. Advanced Dakota Language II. (3.0 cr.; max 12.0 cr.; A-F or Audit; spring, every year) Focuses on immersion method.

Dance (DNCE)
College of Liberal Arts

DNCE 5010. Modern Dance Technique 7. (2.0 cr.; max 4.0 cr.; prerequisite %, audition; fall, every year) Continuation of technical development. Performance range/style. Students study with various guest artists.

DNCE 5020. Modern Dance Technique 8. (2.0 cr.; max 4.0 cr.; prerequisite 5010, %, audition; spring, every year)
Continuation 5010. Performance range/style. Students study with various guest artists.

DNCE 5110. Ballet Technique 7. (1.0 cr. [max 2.0 cr.; prereq %, audition; fall, every year]) Continuation of ballet technique. Musically, performance, stylistic differences. Practical work conducted within context of choreographic/aesthetic development of ballet.

DNCE 5120. Ballet Technique 8. (1.0 cr. [max 2.0 cr.; prereq 5110, %, audition; spring, every year]) Continuation of 5110. Musically, performance, stylistic differences. Practical work conducted within context of choreographic/aesthetic development of ballet.

DNCE 5334. Introduction to Dance/Movement Therapy. (2.0 cr.; prereq %; spring, every year) Historical/theoretical perspectives on use of movement/dance in relationship to psychology/healing. D/MT pioneers/techniques. Applications of D/MT with various populations/settings. Experiential course.

DNCE 5443. Theorizing Dancing Bodies. (3.0 cr.; =DNCE 4443; prereq #: fall, every year) Major developments in Western philosophic thought on dance and dance theory, from its beginnings to present.

DNCE 5454. (Re)Writing the Dancing Body. (3.0 cr.; =DNCE 4454W; prereq Grad student; spring, every year) Modes of writing found in dance studies. Oral histories, historical documentation, performance reviews, performance ethnographies, scholarly essays. Discussion/ critique of current modes of writing. Writing/rewriting practice.


DNCE 5495. Dance and Global Tourism. (3.0 cr.; Student Option No Audit; prereq Grad student; fall, every year) Politics of dance/performance for tourism industry. Ways in which dancing body produces ideas of nation-state. How this reflects stereotypes of female identity in global context.

DNCE 5500. Topics in Dance. (1.0-3.0 cr. [max 10.0 cr.; fall, spring, offered periodically]) Topics specified in Class Schedule.

DNCE 5601. Dance Composition 5. (1.0 cr.; prereq 4601, 4602; %; spring, every year) Final part of six-semester sequence in dance composition. Exploration of movement through independently scheduled rehearsals. Choreographic concepts. Tools in dance creation, development/refinement of movement, structure of group choreography.

DNCE 5700. Performance. (1.0 cr. [max 4.0 cr.; prereq & technique course, %; fall, spring, every year]) Technique, improvisation, choreography, music, design, and technical production as they relate to dance performance.

DNCE 5858. Teaching Dance. (4.0 cr.; prereq 1020, %, #: fall, every year) Methods, principles, and techniques of teaching dance.

DNCE 5993. Directed Studies. (1.0-4.0 cr. [max 10.0 cr.; fall, spring, every year]) Guided individual study. Prerequisite/consent, dept consent, college consent.

Dental Hygiene (DH) School of Dentistry

DH 5201. Management Internship. (5.0 cr.; S-N only; prereq Dental hygiene grad student; fall, spring, summer, every year) Supervised experience in oral health care industry. Experience in corporations, health care management organizations, long-term care facilities, publishing firms, or professional organizations.

DH 5203. Capstone Project. (3.0 cr.; S-N only; prereq Dental hygiene grad student; fall, spring, summer, every year) Formulation of extensive business plan/project related to area of interest based on coursework taken or internship experience.

DH 5401. Research Methods in Health Sciences. (2.0 cr. [max 3.0 cr.; A-F only; prereq Dental hygiene grad student, summer, every year]) Developing skills in scientific method. Analyzing research findings. Types of research, problem selection, hypothesis writing, research planning/design, data collection/measuring techniques, analysis/interpretation of data. Ethics.

DH 5403. The Discipline of Dental Hygiene. (2.0 cr.; A-F only; prereq Dental hygiene grad student; summer, every year) Dental hygiene practice grounded in science and guided by research evidence. Etiology, prevention, and treatment of dental caries, periodontal diseases, oral cancer, and other conditions. Advances in technology.

DH 5405. Curriculum and Course Development. (2.0 cr. [max 4.0 cr.; A-F only; prereq Dental hygiene grad student; fall, every year) Curriculum/course development/management, competency-based education/outcomes assessment. Role of accreditation in dental hygiene education. Students develop competency-based dental hygiene curriculum/course.

DH 5407. Instructional Strategies for Effective Teaching. (2.0 cr.; A-F only; prereq Dental hygiene grad student; fall, every year) Application of principles of learning. Learning/teaching styles, student-centered teaching, instructional strategies. Microteaching selected strategies.

DH 5409. Dental Hygiene Clinic Administration. (2.0 cr.; A-F only; prereq Dental hygiene grad student; spring, every year) Theory/practice of dental hygiene preclinical/clinical instruction. Administration of clinic. Developing protocols, calibrating faculty, monitoring student progress. Central Regional Dental Testing Service exam, clinic evaluation mechanisms, quality assurance.

DH 5411. Administrative Leadership and Professional Development. (1.0 cr. [max 2.0 cr.; A-F only; prereq Dental hygiene grad student; spring, every year) Application of leadership theory. Models of administrative roles in education, health care, research, and corporate health care settings. Education/organization culture, strategic planning, human resource management/budgeting. Professional development/advancement.


DH 5415. Dental Hygiene Supervised Didactic Course Student Teaching. (1.0 cr. [max 2.0 cr.; A-F only; prereq Dental hygiene grad student; fall, spring, summer, every year) Observation/participation in supervised clinical teaching experiences in dental hygiene education. Psychomotor skill acquisition.

DH 5420. Master of Dental Hygiene Independent Study. (0.0-5.0 cr. [max 10.0 cr.; S-N or Audit; prereq Enrolled master of dental hygiene student; fall, spring, summer, every year) Directed study with dental hygiene faculty member on selected topic.

DH 5421. Grant Writing for Health Professionals. (1.0 cr.; A-F only; prereq Enrolled in Dental Hygiene grad program; spring, every year) Introduction to grant writing for health care professionals. Grant sourcing, matching goals/objectives to funding sources, developing evaluation plan, writing proposals, responding to critiques. Effect of economic environment/social responsibility of non-profits.

DH 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

Dental Therapy (DT) School of Dentistry

DT 5000. Dental Therapy Capstone Project. (0.0-1.0 cr.; S-N only; fall, spring, every year) In-depth, independent, project-based research topic from interests in oral health. Intensive,
active-learning initiative requiring significant effort in planning/implementation. Final written product/oral presentation mandatory, demands extensive systematic investigation/research.

**DT 5110. Periodontology I.** (1.0 cr.; A-F only; prereq 2nd yr dental therapy masters student; summer, every year)


**DT 5130. Preclinical Pediatric Dentistry.** (2.0 cr.; A-F only; summer, every year)


**DT 5140. Preventive Pediatric Dental Clinic.** (1.0 cr.; A-F only; fall, every year)

Oral health promotion of pediatric patients. Brushing techniques, fluoride application, dietary analysis/counseling. Students interact with parents of pediatric patients.

**DT 5141. Clinical Pediatric Dentistry III.** (2.0 cr.; A-F only; prereq Must be in the dental therapy program, passed basic foundation competencies; fall, every year)

Early childhood development, dental care for children.

**DT 5211. Applied Pharmacology for the Dental Therapist.** (2.0 cr.; A-F only; summer, every year)

Principles of pharmacological drugs used in dentistry, modes of drug administration, therapeutic/adverse effects of drugs. Preparation for pharmacology of local anesthetics. Nitrous oxide sedation, prescription writing.

**DT 5212. Local Anesthesia and Pain Management.** (2.0 cr.; A-F or Audit; summer, every year)


**DT 5230. Oral and Maxillofacial Radiology.** (2.0 cr.; A-F only; spring, every year)

Production/utilization of radiographs in accordance with good professional judgement, as well as state/federal radiation regulations. Processing radiographs in darkroom. Processing a digital image. Prereq-DT grad program.

**DT 5231. Oral and Maxillofacial Radiology II.** (1.0 cr.; A-F only; fall, every year)

Use of X-rays in accordance with state/federal radiation regulations. Radiographic assessment of developed and acquired anomalies of teeth, osseous structures, and maxillary sinus.

**DT 5232. Oral and Maxillofacial Radiology Preclinical Laboratory.** (0.0 cr.; S-N only; summer, every year)

Preclinical demonstration-participation phases using mounted human skulls.

**DT 5241. Oral Radiology Clinic II.** (1.0 cr.; A-F only; prereq Must be in dental therapy masters program; fall, every year)

Clinical instruction in oral radiography. Intraoral/extraoral radiographic procedures, evaluations.

**DT 5250. Oral Histology and Embryology.** (2.0 cr.; A-F only; spring, every year)


**DT 5251. General and Oral Pathology.** (1.0 cr.; A-F only; summer, every year)

Principles of general and oral pathology with focus on etiology, progression, recognition, and treatment. Overview of diagnostic process and normal clinical findings.

**DT 5320. Comprehensive Care Clinic.** (4.0 cr.; S-N only; fall, every year)

Assessment, treatment, and management of patients. Concepts/principles of evidence-based dentistry as applied to clinical practice.

**DT 5321. Treatment Planning for the Dental Therapist.** (1.0 cr.; S-N only; fall, every year)

Formal lecture presentations regarding fundamentals of assessment/treatment planning of dental cases. Prepare student to understand University of Minnesota School of Dentistry protocol in development of optimal, alternative, emergency treatment plans.

**DT 5330. Clinical Application I.** (3.0 cr.; A-F only; prereq Accepted into master's dental therapy program; fall, every year)

Assessment principles related to medical/oral health status. Dental therapy clinical procedures, instrumentation skills. Health assessment, parts of periodontium, dental deposits, toothwear, dental disease/prevention, plaque control.

**DT 5331. Provider Patient Relationships.** (2.0 cr.; A-F only; spring, every year)


**DT 5332. Cariology and Applied Nutrition in Dental Therapy Care.** (3.0 cr.; A-F only; spring, every year)

Dental caries etiology, pathology/prevention. Applying principles of diet/nutrition to dental therapy patient care/counseling.

**DT 5333. Dental Public Health and Academic Service Learning I.** (3.0 cr.; A-F only; fall, every year)

Dental therapist as engaged with diverse communities and as professionally responsible and ethical health care provider. Public health approach to disease. Ways in which U.S. oral health care is delivered. Factors impacting supply/demand. Outreach experiences, service learning.

**DT 5334W. Dental Therapy Care Process: Clinical Application II.** (4.0 cr.; A-F only; fall, every year)

Providing dental care for gerodontic patients and patients with disabilities.

**DT 5335. Dental Practice Management.** (2.0 cr.; A-F only; prereq 2nd yr dental therapy student; spring, every year)

Interprofessional course. Organizational, managerial, and financial systems that affect successful dental practice.

**DT 5336. Ethics and Jurisprudence for the Dental Therapist.** (1.0 cr.; A-F only; fall, every year)


**DT 5337. Dental Public Health and Service Learning II.** (2.0 cr.; A-F only; spring, every year)

How to assess, plan, implement, obtain funding for, and evaluate a public health program.

**DT 5338W. Research Methods in Dental Therapy.** (3.0 cr.; A-F only; spring, every year)


**DT 5359. Introduction to Outreach Experiences.** (0.0 cr.; S-N only; spring, every year)

Provide dental care to underserved populations in various clinical settings throughout Minnesota.

**DT 5361. Outreach Experiences II.** (2.0 cr.; S-N only; fall, every year)

Experiences that reinforce principles of delivering dental health care/services to patients, including underserved patient populations, in contemporary off-site clinical settings.

**DT 5410. Applied Dental Biomaterials.** (1.0 cr.; A-F only; spring, every year)

Application of scientific principles to selection/ utilization of dental materials. Prereq-2nd yr DT student.

**DT 5429. Introduction to Psychomotor Skill Development.** (1.0 cr.; S-N only; fall, every year)

Virtual reality based training for psychomotor skills required in prosthodontic/operative courses. Eye-hand/mirror skills, ergonomics used while preparing teeth for restoration. Prereq-Dental therapy program.
DT 5430. Oral Anatomy. (2.0 cr.; A-F only; prereq Accepted into dental therapy masters program; fall, every year) Morphological characteristics of human dentition, associated contiguous structures. Foundational knowledge applied to situations encountered in general dental clinical practice.

DT 5431. Oral Anatomy Laboratory. (3.0 cr.; A-F only; prereq Accepted into masters in dental therapy program; fall, every year) Manual dexterity skills, anatomy of human dentition.


DT 5433. Operative Dentistry I Pre-Clinic Laboratory. (2.0 cr.; A-F only; prereq 2nd yr masters in dental therapy student; summer, every year) How to treat dental caries. Therapeutic treatment of underlying pathology. Surgical treatment of early caries lesion. Hands-on projects working with models simulating teeth and surrounding structures.

DT 5434. Operative Dentistry II Lecture. (1.0 cr.; A-F only; prereq Enrolled in master's in dental therapy program; fall, every year) How to surgically manage more advanced caries lesions. Transition from pre-clinic lab to clinic setting.

DT 5435. Operative Dentistry II for the Dental Therapist, Lab. (1.0 cr.; A-F only; fall, every year) More advanced caries lesions: diagnosis, structural preparation, decay removal and restoration.

DT 5436. Operative Dentistry III. (1.0 cr.; A-F only; fall, every year) Transition of students from the pre-clinic laboratory to the clinic setting. Demonstrate competency in the surgical treatment of dental caries prior to being certified ready for patient care.

DT 5443. Operative Clinic III. (4.0 cr.; A-F only; fall, every year) How to place restorations. Students place single-tooth restorations on patients.

DT 5460. Essentials of Clinical Care I For the Dental Therapist. (1.0-12.0 cr.; S-N only; spring, every year) Students provide comprehensive care under direction of clinical faculty. May include periodontics, operative, pediatric care, and health promotion. Limited care may be given on rotations to oral surgery clinics.

DT 5471. Prosthodontic Topics for Dental Therapy. (2.0 cr.; S-N only; summer, every year) Lectures, lab projects of selected prosthodontic techniques to enable the dental therapist to provide/cement quality pre-fabricated metal or resin provisional crowns and other prosthodontic procedures in the scope of DT practice.

DT 5521. Foundations of Interprofessional Professionalism, Communication, and Collaboration. (1.0 cr.; S-N only; fall, spring, summer, every year) Professionalism, communication/collaboration across health professions. Online independent/group work followed by facilitated interprofessional small group discussions of case narratives.

DT 5541. Principles of Exodontia and Minor Oral Surgery. (1.0 cr.; S-N only; spring, every year) Knowledge/skill for dental therapy student in exodontia/minor oral surgery.

DT 5960. Essentials of Clinical Care II for the Dental Therapist. (5.0-10.0 cr. [max 20.0 cr.]; S-N only; summer, every year) Students provide comprehensive care under direction of clinical faculty. May include periodontics, operative, pediatric care, and health promotion. Limited care may be given on rotations to oral surgery clinics.
of user needs with application to designed products that interact with human body.

**DES 5193. Directed Study in Design.** (1.0-6.0 cr. [max 36.0 cr.]; A-F only; prereq %; fall, spring, summer, every year)

**Directed Study in Design**

**DES 5196. Field Study: National/International.** (1.0-10.0 cr. ; A-F or Audit; [=GDES 5196, APST 5196, HSG 5196, IDES 5196]; fall, spring, summer, every year)

Faculty-directed field study in a national or international setting.

**DES 5201. Career and Job Search Preparation for Graduate Students.** (1.0 cr.; S-N only; prereq Grad student; fall, spring, every year)

Job search/career development tools. Goals, networking, job search, resume/CV, interviewing. Assignments include resume/CV, informational interview, career development plan.

**DES 8101. Philosophical Foundations.** (4.0 cr.; A-F or Audit; fall, every year)
The nature of thought underlying/within professional areas of field.

**DES 8102. Quantitative Research Methods.** (3.0 cr.; A-F only; fall, even years)
Quantitative research methods for issues related to humans, their behaviors, and everyday living in the designed environment.

**DES 8103. Qualitative and Mixed Methods Research.** (3.0 cr.; A-F or Audit; fall, odd years)
A scientific approach to qualitative research. Methods/strategies combined to explore complex research questions.

**DES 8112. Design Theory.** (3.0 cr.; A-F or Audit; spring, odd years)

**DES 8113. Teaching and Assessment.** (2.0 cr.; A-F or Audit; fall, odd years)

**DES 8114. Design Studio.** (4.0 cr.; A-F or Audit; prereq Design grad student or #; spring, odd years)
Advanced problem analysis, design solution.

**DES 8115. Grant Writing.** (2.0 cr.; A-F or Audit; fall, even years)
Interdisciplinary course.

**DES 8151. Product Development.** (3.0 cr.; A-F only; spring, even years)
Product development theories/methods as applied in many design fields. Emphasizes retail setting. Seminar format discussion, case studies, observation/critique of hands-on industry product development project.

**DES 8164. Innovation Theory and Analysis.** (3.0 cr.; A-F or Audit; spring, even years)

Theories and factors that influence adoption and diffusion of designed products. Methodologies used in analysis of diffusion process.

**DES 8166. Material Culture and Design.** (3.0 cr.; A-F or Audit; prereq DHA or DES grad student or #; spring, offered periodically)
Research approaches to material culture study using artifacts from Goldstein Museum of Design.

**DES 8167. Aesthetics of Design.** (3.0 cr.; A-F or Audit; spring, offered periodically)
How we perceive, analyze, value, and evaluate design outcomes/results.

**DES 8170. Topics in Design.** (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, spring, every year)
In-depth investigation of topic announced in advance.

**DES 8181. Research Ethics.** (1.0 cr.; S-N or Audit; prereq Grad student; spring, every year)
Overview of ethical concerns/questions in conducting/disseminating research. Mentoring relationships, use of human subjects, data handling, plagiarism, authorship, publishing, research funding, social responsibility of researchers, code of conduct.

**DES 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**DES 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**DES 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
Doctoral pre-thesis credits.

**DES 8777. Thesis Credits: Master's.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

**DES 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

**Development Studies and Social Change (DSSC)**
Academic Affairs, Senior Vice President

**DSSC 8111. Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change.** (2.0 cr.; S-N or Audit; prereq Grad DSSC minor or #; fall, every year)
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.** (2.0 cr.; S-N only; prereq Grad DSSC minor or #; spring, every year)

**DSSC 8211. Doctoral Research Workshop in Development Studies and Social Change.** (2.0 cr.; S-N or Audit; prereq Grad DSSC minor or #; fall, every year)
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.** (1.0 cr.; S-N or Audit; prereq Grad DSSC minor or #; spring, every year)
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.** (1.0 cr. [max 3.0 cr.]; S-N only; prereq Grad DSSC minor or #; spring, every year)
Seven-week seminar. Topical issues in development and social change.

**Dutch (DTCCH)**
College of Liberal Arts

**DTCCH 5993. Directed Studies.** (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year)
Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

**Early Modern Studies (EMS)**
College of Liberal Arts

**EMS 5500. Topics in Early Modern Studies.** (3.0 cr. [max 6.0 cr.]; prereq Grad student; fall, spring, every year)
Selected topics in early modern studies from various disciplinary perspectives/world regions.

**EMS 8100. Workshop in Early Modern Studies.** (1.0-3.0 cr.; S-N only; prereq #; fall, spring, every year)
Lectures/workshops offered by various centers, departments, institutes, and libraries across disciplines on Twin Cities campus. Online reports/discussion.
ESCI 5093. Directed Studies in Earth Sciences. (1.0-6.0 cr.; A-F or Audit; prereq Grad student; fall, spring, summer, every year) Students work on tutorial basis. Guided individual reading or study.

Earth Sciences (ESCI)
College of Science and Engineering

ESCI 5093. Directed Studies in Earth Sciences. (1.0-4.0 cr.; max 16.0 cr.); fall, spring, every year) Independent, directed study in earth sciences arranged by student/faculty member.

ESCI 5102. Climate Change and Human History. (3.0 cr.; =ESCI 3002; prereq 1001 or equiv or #; spring, odd years) 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.

ESCI 5201. Time-Series Analysis of Geological Phenomena. (3.0 cr.; A-F or Audit; prereq Math 2263 or #; ) Time-series analysis of linear and nonlinear geological and geophysical phenomena. Examples drawn from ice age cycles, earthquakes, climatic fluctuations, volcanic eruptions, atmospheric phenomena, thermal convection and other time-dependent natural phenomena. Modern concepts of nonlinear dynamics and complexity theory applied to geological phenomena.

ESCI 5203. Mineral and Rock Physics. (3.0 cr.; prereq 2201, Phys 1302; spring, offered periodically) Physical properties of minerals and rocks as related to the composition and dynamics of the Earth's crust, mantle, and core.


ESCI 5302. Isotope Geology. (3.0 cr.; A-F or Audit; prereq 3303W or #; fall, every year) Theory and uses of radioactive, radiogenic, and stable isotopes in geology. Radioactive dating, geothermometry, and tracer techniques in geologic processes.

ESCI 5351. Geochemical Modeling of Aquiferous Systems. (3.0 cr.; prereq 4401; spring, even years) Using mass transfer reaction path models to assess chemical evolution of natural fluids, hydrothermal alteration processes, and formation of hydrothermally altered ore deposits.

ESCI 5353. Electron Microprobe Technique and Practice. (3.0 cr.; = [MATS 5353]; prereq [One yr chem, one yr physics; or #; fall, offered periodically) Characterizing solid materials with electron beam instrumentation, including reduction of X-ray data to chemical compositions.


ESCI 5503. Advanced Petrology. (3.0 cr.; prereq 2302, CHEM 1061, CHEM 1065; [MATH 1372 or MATH 1272 or MATH 1572]; fall, odd years) Quantitative approach to modern igneous/metamorphic petrology. Emphasizes thermodynamics of minerals/melts and with applications to phase diagrams, thermobarometry, melting relationships, and energetics of petrogenic mass transfer.

ESCI 5504W. Neotectonics. (3.0 cr.; prereq [2201, 4501] or #; fall, even years) Integration of multidisciplinary elements of geology, geodesy, geodynamics, seismotectonics, tectonophysics to examine recent/active tectonics of Earth's lithosphere. Extensional, compressional, wrench-tectonic regimes with global case studies incorporating mantle to surface processes.

ESCI 5601W. Advanced Sedimentology. (4.0 cr.; prereq 4802 or #; fall, odd years) Principles/processes of sedimentary geology. Interactions among lithosphere, biosphere, atmosphere, hydrosphere. Detrital/carbonate facies of modern/ancient systems, coastal processes, geobiology, tectonics, paleoclimate, structural diagenesis, paleosols, volcanic sedimentation.

ESCI 5705. Limnogeology and Paleoenvironment. (3.0 cr.; 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.

ESCI 5713. Tracers and Karst Hydrogeology. (3.0 cr.; 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.


ESCI 5980. Seminar: Current Topics in Earth Sciences. (1.0-4.0 cr.; max 8.0 cr.; S-N or Audit; fall, spring, offered periodically) Topics in earth sciences investigated in a seminar format.

ESCI 8001. Introductory Graduate Seminar. (2.0 cr.; S-N or Audit; prereq Grad student status in earth sci; fall, every year) Graduate level survey of important research, concepts, and methods in the earth sciences; familiarization with program faculty/facilities and basics of science writing and proposal craft.

ESCI 8204. Geomagnetism and Paleomagnetism. (3.0 cr.; prereq 2201, Phys 1302, [Math 1272 or #]; spring, odd years) Present geomagnetic field at Earth's surface, secular variation, geomagnetic field reversals. Physical/chemical basis of paleomagnetism. Origin of natural remanent magnetization, mineralogy of magnetic minerals, magnetic polarity stratigraphy, apparent polar wander, environmental magnetism.

ESCI 8243. Principles of Rock Magnetism. (1.0-3.0 cr.; prereq 4204 or #; ) Remanent 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.

ESCI 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
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.

ESCI 8602. Stream Restoration Practice. (2.0 cr.; S-N only; =[CE 8602, EEB 8602]; prereq 8601 or CE 8601; summer, every year) 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.

ESCI 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) Doctoral pre-thesis credits.

ESCI 8712. Transport Phenomena and Analytical Hydrogeology. (3.0-4.0 cr.; prerequisites 5701 or CE 3502 or #; fall, every year) 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.

ESCI 8718. Numerical Methods in Hydrogeology. (4.0 cr.; A-F or Audit; prerequisites 5701, CSCI 1107 or #;) Introduction to finite difference and finite element methods in hydrogeology. Students develop one- and two-dimensional models of diffusion and advection-dispersion equations.

ESCI 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 or total required [Plan A only]; fall, spring, summer, every year) (no description)

ESCI 8801. Geomicrobiology. (3.0 cr.; prerequisites One semester college level biology, spring, every year) Geosphere/biosphere interactions over temporal/spatial scales. Global biogeochemical cycling, microbe-metal interactions, microbial paleobiology, environmental geomicrobiology, life detection, habitability of planets.

ESCI 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (no description)

ESCI 8970. Seminar: Current Topics in Earth Sciences. (1.0-4.0 cr. [max 30.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically) Seminar course.

ESCI 8980. Seminar: Current Topics in Earth Sciences. (1.0-4.0 cr. [max 30.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Selected seminar topics.

ESCI 8994. Research in Earth Sciences. (1.0-4.0 cr. [max 30.0 cr.]; prereq #; fall, spring, summer, every year) Independent research under faculty supervision.

Ecology, Evolution, and Behavior (EEB)

College of Biological Sciences

EEB 5042. Quantitative Genetics. (3.0 cr.; A-F only; prereq [BIOL 4003 or GCD 3022] or #; a course in statistics is recommended; fall, every year) 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 5053. Ecology: Theory and Concepts. (4.0 cr.; prerequisites Biol 3407 or #, fall, odd years) 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. (3.0 cr.; Student Option No Audit; =[EEB 4068]; prerequisites BIOL 2022 or BIOL 3002 or BIOL 3407 or BIOL 3408W or #; spring, odd years) Plant function, its plasticity/diversity in 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 5221. Molecular Evolution. (3.0 cr.; A-F or Audit; prerequisites [BIOL 4003 or GCD 3022], grad student[1] or #; fall, offered periodically) Molecular basis of evolutionary change. Selection, neutral evolutionary processes at molecular level. Evolution from gene to genome level: protein structure/function, multigene families, organelle genomes, genome organization. Lectures, current literature, workshops.

EEB 5322. Evolution and Animal Cognition. (3.0 cr.; prerequisites BIOL 3411 or Psy 3061 or #) Animal cognitive abilities. Learning, perception, memory, navigation, and communication
from 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 5323. Neural and Endocrine Mechanisms Underlying Vertebrate Behavior. (2.0 cr.; A-F or Audit; 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 5327. Behavioral Ecology. (3.0 cr.; prereq Biol 3411 or #; spring, odd years)
Evolutionary principles applied to aggressive competition, mate choice, cooperation, and parental investment. Optimization models used to examine foraging strategies, predator/prey interactions, and territoriality. Evolution of sex, sexual selection, dispersal. Evolutionary game theory.

EEB 5371. Principles of Systematics. (3.0 cr.; prereq Grad student or #; spring, even years)

EEB 5601. Limnology. (3.0 cr.; prereq Grad student or #; fall, every year)
Advanced introduction to description/analysis of interaction of physical, chemical, and biological factors that control functioning of life in lakes and other freshwater aquatic environments.

EEB 5605. Limnology Laboratory. (2.0 cr.; A-F or Audit; prereq 3603 or #; fall, every year)
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. (3.0 cr.; prereq [Biol 3407 or Biol 5407] or #; spring, every year)
Regulation of energy and 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. (3.0 cr.; [EEB 3486]; prereq [Math 1281, Math 1292] 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 models.

EEB 8200. Sustainability Science Distributed Graduate Seminar. (3.0 cr.; spring, every year)
Theories of sustainability science. Interactions between human/environmental systems. Improving present/future generations. Presentations/papers. Contemporary research from earth systems science, resource economics, institutional analysis, ecology, geography, development studies, health sciences, engineering.

EEB 8201. Graduate Foundations in Ecology, Evolution and Behavior Semester 1. (4.0 cr.; A-F only; prereq Grad student in Ecology, Evolution and Behavior; fall, every year)
Foundational knowledge in ecology, evolution, behavior.

EEB 8202. Graduate Foundations in Ecology, Evolution and Behavior - Semester 2. (4.0 cr.; A-F only; prereq 8601, EEB grad student; spring, every year)
Foundational knowledge in ecology, evolution, behavior. Second semester of two-semester sequence.

EEB 8301. Prelim Proposal Writing Seminar. (1.0 cr.; S-N only; prereq EEB grad Student; fall, every year)
Learn about structure/format of research proposal under guidance of three faculty members representing fields of Ecology, Evolution/Behavior. Prepare students for writing written preliminary exam.

EEB 8302. EEB Written Prelim Workshop. (1.0 cr.; S-N only; prereq EEB grad student; spring, every year)
Provide time for students to meet/discuss issues associated with written preliminary exam. Workshop sections of written preliminary exam with peers. Exam should be reviewed informally by committee/revised by student before final submission.

EEB 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

EEB 8360. Behavioral Biology Seminar. (1.0 cr. [max 5.0 cr.]; S-N or Audit; prereq #; fall, every year)
Research topics in selected areas.

EEB 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

EEB 8500. NSF GRF Graduate Research Fellowship Proposal Writing Seminar. (1.0 cr. [max 2.0 cr.]; S-N only; prereq EEB grad student only; fall, every year)
Prepare EEB students to submit a competitive fellowship proposal to an external organization (e.g., NSF Graduate Research Fellowship program). In addition to announced meeting time, students meet once a week in small groups to discuss proposals/provide each other with feedback.

EEB 8550. Graduate Research Fellowship Proposal Writing Seminar. (1.0 cr. [max 2.0 cr.]; S-N only; fall, every year)
How to submit competitive fellowship proposal to external organization (e.g., NSF Graduate Research Fellowship program). Besides scheduled class, students meet weekly in small groups to discuss proposals/give feedback.

EEB 8601. Introduction to Stream Restoration. (3.0 cr.; [ESCI 8602]; 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 #; fall, every year)
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. (2.0 cr.; S-N only; [ESCI 8602, CE 8602]; prereq CE 8601 or GEO 8601; fall, odd years)
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.

EEB 8641. Spatial Ecology. (3.0 cr.; prereq [3407, 2 sem calculus] or #; fall, spring, offered periodically)

EEB 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
TBD

EEB 8777. Thesis Credits: Master’s. (1.0-18.0 cr.; [max 30.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

EEB 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

EEB 8890. Seminar on Current Topics. (1.0-3.0 cr.; [max 30.0 cr.]; S-N only; prereq EEB grad student; fall, spring, every year)
Current research in ecology, evolution, behavior.
ECON 5101. Microeconomic Theory. (2.0 cr.; prereq 5100 or equiv, & Math 5615 or Math 5615H; fall, every year) 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 8001. Microeconomic Analysis. (2.0 cr.; prereq 5151 or equiv, Math 2243, Math 2263 or equiv or #; fall, every year) Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics: externalities, economics of information and uncertainty, and game theory. This seven-week course meets with 4161.

ECON 8002. Microeconomic Analysis. (2.0 cr.; prereq 8001; fall, every year) Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics: externalities, economics of information and uncertainty, and game theory. This seven-week course meets with 4162.

ECON 8003. Microeconomic Analysis. (2.0 cr.; prereq 8002; spring, every year) Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics: externalities, economics of information and uncertainty, and game theory. This seven-week course meets with 4163.

ECON 8004. Microeconomic Analysis. (2.0 cr.; prereq 8003; spring, every year) Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics: externalities, economics of information and uncertainty, and game theory. This seven-week course meets with 4164.

ECON 8101. Microeconomic Theory. (2.0 cr.; prereq 5151 or equiv, Math 2243 or equiv, & Math 5615 or concurrent registration in Math 8601, grad econ major or #; fall, every year) 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 8102. Microeconomic Theory. (2.0 cr.; prereq 8101, & Math 5615 or & Math 8601, grad econ major or #; fall, every year) 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 8103. Microeconomic Theory. (2.0 cr.; prereq 8102, & Math 5616 or & Math 8602 or comparable abstract math course, grad econ major or #; spring, every year) 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 8104. Microeconomic Theory. (2.0 cr.; prereq 8103, & Math 5616 or & Math 8602 or comparable abstract math course, grad econ major or #; spring, every year) 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. (2.0 cr.; prereq 5152 or equiv, Math 2243, Math 2263 or equiv or #; fall, every year) 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 8106. Macroeconomic Theory. (2.0 cr.; prereq 8105; fall, every year) 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 4166.

ECON 8107. Macroeconomic Theory. (2.0 cr.; prereq 8106; spring, every year) 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 4167.

ECON 8108. Macroeconomic Theory. (2.0 cr.; prereq 8107; spring, every year) 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 4168.

ECON 8111. Introduction to Mathematical Economics. (2.0 cr.; prereq Math 2243 or equiv, & Econ 8101, & Math 5615 or equiv or #; Math 4242 recommended; fall, spring, every year) Use of mathematical models in economic theory.

ECON 8112. Introduction to Mathematical Economics. (2.0 cr.; prereq 8111, & 8132, & Math 5615 or comparable abstract math course; ) Use of mathematical models in economic theory. Standard techniques.

ECON 8113. Introduction to Mathematical Economics. (2.0 cr.; prereq 8112, Math 5616 or comparable abstract math course, & 8103; ) Use of mathematical models in economic theory. May include special topics.

ECON 8117. Noncooperative Game Theory. (2.0 cr.; prereq Math 5616 or equiv or #; fall, every year) 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 8118. Noncooperative Game Theory.
(2.0 cr.; prereq 8117; fall, spring, every year)
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.
(2.0 cr.; prereq 8104, Math 5616 or equiv or #; spring, every year)
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, consistency, and noncooperative implementation of cooperative solution concepts. Seven-week course.

ECON 8181. Advanced Topics in Microeconomics.
(2.0 cr. [max 4.0 cr.]; prereq 8104 or #; fall, every year)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8182. Advanced Topics in Microeconomics.
(2.0 cr. [max 4.0 cr.]; prereq 8104 or #; spring, every year)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8185. Advanced Topics in Macroeconomics.
(2.0 cr. [max 4.0 cr.]; prereq 8108 or #; fall, spring, every year)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8186. Advanced Topics in Macroeconomics.
(2.0 cr. [max 4.0 cr.]; prereq 8108 or #; spring, offered periodically)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8191. Workshop in Mathematical Economics.
(1.0-3.0 cr. [max 10.0 cr.]; prereq 8104 or #; fall, every year)
Students conduct research and present papers under faculty supervision.

ECON 8192. Workshop in Mathematical Economics.
(1.0-3.0 cr. [max 10.0 cr.]; prereq 8104 or #; spring, every year)
Students work on research and present papers under faculty supervision.

ECON 8201. Econometric Analysis.
(2.0 cr.; prereq [3101 or equiv, Math 1272 or equiv], Stat 5102 or #; fall, every year)
Basic linear regression model, its variants. Panel data, censored/truncated regression, discrete choice models. Time series, simultaneous equation models.

ECON 8203. Econometric Analysis.
(2.0 cr.; prereq 8202; spring, every year)
Basic linear regression model, its variants. Panel data, censored/truncated regression, discrete choice models. Time series, simultaneous equation models.

ECON 8204. Econometric Analysis.
(2.0 cr.; prereq 8203; spring, every year)

ECON 8205. Applied Econometrics.
(2.0 cr.; prereq Math 4242 or equiv, & Econ 8101, & Econ 8105, & Stat 5101 or #; fall, every year)
Application in research, including classical and Bayesian approaches; formulation, comparison, and use of models and hypotheses; inference and prediction in structural models; simulation methods. Seven-week course.

ECON 8206. Applied Econometrics.
(2.0 cr.; prereq 8205, & 8102, & 8106, & Stat 5101 or #; fall, every year)
Application in research, including classical and Bayesian approaches; formulation, comparison, and use of models and hypotheses; inference and prediction in structural models; simulation methods. Seven-week course.

ECON 8207. Applied Econometrics.
(2.0 cr.; prereq 8206, & 8103, & 8107, & Stat 5102 or #; spring, every year)
Application in research, including classical and Bayesian approaches; formulation, comparison, and use of models and hypotheses; inference and prediction in structural models; simulation methods. Seven-week course.

ECON 8208. Applied Econometrics.
(2.0 cr.; prereq 8207, & 8104, & 8108, & Stat 5102 or #; spring, offered periodically)
Application in research, including classical and Bayesian approaches; formulation, comparison, and use of models and hypotheses; inference and prediction in structural models; simulation methods. Seven-week course.

ECON 8211. Econometrics.
(2.0 cr.; prereq 5151, 5152, Math 4242 or equiv, Stat 5102 or #; fall, every year)
Linear regression; general linear hypotheses; Gauss Markov Theorem, generalized least squares and their applications. Decision-theoretic choice among estimators. Simultaneous equations models; identification and estimation. Asymptotic distribution theory. Applications, including multivariate time series models and/or limited dependent variables models. Seven-week course.

ECON 8212. Econometrics.
(2.0 cr.; prereq 8211; fall, every year)
Linear regression; general linear hypotheses; Gauss Markov Theorem, generalized least squares and their applications. Decision-theoretic choice among estimators. Simultaneous equations models; identification and estimation. Asymptotic distribution theory. Applications, including multivariate time series models and/or limited dependent variables models. Seven-week course.

ECON 8213. Econometrics.
(2.0 cr.; prereq 8212; )
Linear regression; general linear hypotheses; Gauss Markov Theorem, generalized least squares and their applications. Decision-theoretic choice among estimators. Simultaneous equations models; identification and estimation. Asymptotic distribution theory. Applications, including multivariate time series models and/or limited dependent variables models. Seven-week course.

ECON 8291. Workshop in Econometrics.
(1.0-3.0 cr. [max 10.0 cr.]; prereq 8213 or #; fall, spring, offered periodically)
Faculty and student presentations based on recent literature. This is a 7-week course.

ECON 8292. Workshop in Econometrics.
(1.0-3.0 cr. [max 10.0 cr.]; prereq 8213 or #; fall, spring, offered periodically)
Workshop in Econometrics

ECON 8311. Economic Growth and Development.
(2.0 cr.; prereq 8104, 8106 or #; fall, every year)
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 8312. Economic Growth and Development.
(2.0 cr.; prereq 8311 or #; fall, spring, every year)
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 8313. Economic Growth and Development.
(2.0 cr.; prereq 8312 or #; spring, every year)
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 8333. FTE: Master's.
(1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ECON 8381. Advanced Topics in Economic Development.
(2.0 cr. [max 4.0 cr.]; prereq 8312 or #; offered when feasible; fall, spring, offered periodically)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8391. Workshop in Economic Growth and Development.
(1.0-3.0 cr. [max 10.0 cr.]; prereq #: fall, every year)
Workshop in Economic Growth and Development

ECON 8392. Workshop in Economic Growth and Development.
(1.0-3.0 cr. [max 10.0 cr.]; prereq #: fall, spring, summer, every year)
tbd
ECON 8401. International Trade and Payments Theory. (2.0 cr.; prereq 8103, 8105 or #; fall, every year)

ECON 8402. International Trade and Payments Theory. (2.0 cr.; prereq 8401 or #; fall, spring, every year)
Tariffs, quotas, and other barriers to trade; gains from trade; trading blocs; increasing returns; growth. This is a 7-week course.

ECON 8403. International Trade and Payments Theory. (2.0 cr.; prereq 8402 or #; spring, every year)
International business cycles; exchange rates; capital movements; international liquidity. This is a 7-week course.

ECON 8404. International Trade and Payments Theory. (2.0 cr.; prereq [8402, 8403] or #)
Theoretical models of international trade. Trade data, empirical work on trade. Seven-week course.

ECON 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ECON 8481. Advanced Topics in International Trade. (2.0 cr. [max 4.0 cr.]; prereq 8403 or #; fall, spring, every year)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8482. Advanced Topics in International Trade. (2.0 cr. [max 4.0 cr.]; prereq 8403 or #; fall, spring, offered periodically)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8491. Workshop in Trade and Development. (1.0-3.0 cr. [max 10.0 cr.]; prereq #; fall, every year)
Workshop in Trade and Development

ECON 8492. Workshop in Trade and Development. (1.0-3.0 cr. [max 10.0 cr.]; prereq #; spring, every year)
tbd

ECON 8501. Wages and Employment. (2.0 cr.; prereq 8102, 8106 or #; fall, every year)
Economic analysis of labor markets and their operation under conditions of both individual and collective bargaining. Implications of labor market operations for resource allocation, wage and price stability, income and employment growth. Wage structures and wage levels. Wage and employment theories and practices. Economic impacts of unions. Seven-week course.

ECON 8502. Wages and Employment. (2.0 cr.; prereq 8501 or #; fall, spring, every year)
Economic analysis of labor markets and their operation under conditions of both individual and collective bargaining. Implications of labor market operations for resource allocation, wage and price stability, income and employment growth. Wage structures and wage levels. Wage and employment theories and practices. Economic impacts of unions. Seven-week course.

ECON 8503. Wages and Employment. (2.0 cr. [max 4.0 cr.]; prereq 8502 or #; spring, every year)
Economic analysis of labor markets and their operation under conditions of both individual and collective bargaining. Implications of labor market operations for resource allocation, wage and price stability, income and employment growth. Wage structures and wage levels. Wage and employment theories and practices. Economic impacts of unions. Seven-week course.

ECON 8504. Workshops in Trade and Development. (2.0 cr.; prereq 8401 or #; fall, spring, offered periodically)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8505. Workshops in Trade and Development. (2.0 cr. [max 4.0 cr.]; prereq 8504 or #; fall, spring, every year)
Economic analysis of labor markets and their operation under conditions of both individual and collective bargaining. Implications of labor market operations for resource allocation, wage and price stability, income and employment growth. Wage structures and wage levels. Wage and employment theories and practices. Economic impacts of unions. Seven-week course.

ECON 8506. Workshops in Trade and Development. (2.0 cr.; prereq 8505 or #; fall, spring, offered periodically)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8507. Microeconomics. (1.0-3.0 cr. [max 10.0 cr.]; prereq #; fall, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8508. Microeconomics. (1.0-3.0 cr. [max 10.0 cr.]; prereq #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary Policy. Seven-week course.

ECON 8509. Microeconomics. (2.0 cr.; prereq 8103, 8106 or #; fall, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8510. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8511. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8512. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8513. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8514. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8515. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8516. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8517. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8518. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8519. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8520. Microeconomics. (2.0 cr.; prereq 8502 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

EDUC 8781. Advanced Topics in Monetary Economics. (2.0 cr. [max 4.0 cr.]; prereq 8702 or #; spring, every year)
Faculty and student presentations based on recent literature. Seven-week course.

EDUC 8791. Workshop in Macroeconomics. (1.0-3.0 cr. [max 10.0 cr.]; prereq #; fall, every year)
Workshop in Macroeconomics

EDUC 8792. Workshop in Macroeconomics. (1.0-3.0 cr. [max 10.0 cr.]; prereq #; spring, every year)

EDUC 8801. Public Economics. (2.0 cr.; prereq 8103, 8106 or #; fall, spring, every year)

EDUC 8802. Public Economics. (2.0 cr.; prereq 8801 or #; fall, spring, every year)

EDUC 8803. Public Economics. (2.0 cr.; prereq 8802 or #; spring, offered periodically) Theories of public choice and role of government in economy. Economic effects of taxes, public debt, and public expenditure. Current problems in economics of public sector, including political economy. Seven-week course.

EDUC 8881. Advanced Topics in Public Economics. (2.0 cr. [max 4.0 cr.]; prereq 8803 or #; fall, every year) Faculty and student presentations based on recent literature. Seven-week course.

EDUC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

EDHD 5000. Cultures, Schools, and Communities (Human Relations). (1.0 cr.; A-F only; [EDHD 5020]; prereq Enrollment in teacher initial licensure program; fall, every year) Addressing social/cultural dimensions of education. Challenges/dilemmas facing contemporary educators. Speakers, simulations, presentations, professional learning communities, field assignments.

EDHD 5001. Learning, Cognition, and Assessment. (3.0 cr.; [EPSY 3119]; prereq ME/initial licensure student or CLA music ed or preteaching major or #; psych course recommended; fall, spring, summer, every year) Principles of learning, cognition, cognitive development, classroom management, motivation, instruction, assessment. Behaviorism, cognitive/social constructivism, human information processing theory. Intelligence, knowledge acquisition, reasoning skills, scholastic achievement, standardized testing, reliability/validity, student evaluation, performance assessment, portfolios, demonstrations. Applications to instruction/organization of curricular materials.

EDHD 5004. Teaching Students With Special Needs in Inclusive Settings. (2.0 cr.; A-F or Audit; prereq Teacher preparation program in [CEHD or music education or agriculture education or DirecTrack] or #; license students must take this course for a grade; fall, spring, summer, every year) Exceptionalities in educational settings as defined in federal/state rules/regulations. Historical perspectives, definitions, etiology, needs, characteristics. Service delivery systems for each exceptionality.

EDHD 5005. School and Society. (2.0 cr.; A-F or Audit; prereq Jr or sr or ME/initial licensure student or CLA music ed major or preteaching major or #; fall, spring, summer, every year) Readings in history, philosophy, social sciences, and law revealing diverse educational values in a pluralistic society. Multiple expectations of schools. Civil liberties, rights, community. Varying cultural backgrounds of students, family circumstances, exceptional needs.

EDHD 5007. Technology for Teaching and Learning. (1.5 cr.; A-F or Audit; prereq [ME/initial licensure or CLA music ed major or preteaching major or #], basic computer skills; fall, spring, summer, every year) Diverse educational technology in K-12 classrooms. Effective use of technology. Computer technologies used to stimulate personal productivity/communication and to enhance teaching/learning processes.

EDHD 5008. Reading in the Content Areas for Initial Licensure Candidates. (1.0-2.0 cr.; A-F only; prereq Concurrent enrollment in licensure area methods course(s), enrolled in Initial Licensure Program, Internet access, basic understanding of [computer use, Web browsers, email, word processing software]; fall, spring, offered periodically) Web-based course. Fostering students’ reading related to learning from text.

EDHD 5009. Human Relations: Applied Skills for School and Society. (1.0 cr.; A-F or Audit; prereq ME/initial licensure or CLA music ed major or preteaching or #; fall, spring, summer, every year) 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.

EDHD 5010. Cultures, Schools, and Communities (Human Relations). (2.0 cr.; A-F only; prereq Enrolled in initial licensure program; fall, every year) Addressing social/cultural dimensions of education. Challenges/dilemmas facing contemporary educators. Speakers, simulation, presentations, professional learning communities, field assignments.

EDHD 5013. Child and Adolescent Development for Teaching and Learning. (1.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; fall, summer, every year) Attending to constant transitions/development in which children and adolescents negotiate their road to adulthood. How to foster learning/positive development.
EDHD 5014. Child and Adolescent Development for Teaching and Learning. (2.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; fall, spring, every year) Transitions/development in which children/adolescents negotiate road to adulthood. How to foster learning/positive development.

EDHD 5015. Teaching Students with Special Needs in Inclusive Settings. (1.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; summer, every year) Areas of exceptionality defined in federal/state regulations. Historical perspectives, definitions, etiology, characteristics, needs, and service delivery systems. Collaborating with special education personnel.

EDHD 5016. Teaching Students with Special Needs in Inclusive Settings. (1.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; fall, every year) Attending to constant transitions/development in which children/adolescents negotiate their road to adulthood. How to foster learning/positive development.

EDHD 5017. Academic Language and English Learners. (1.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; summer, every year) Working with English learners and other linguistically diverse students across content areas to develop academic language proficiency.

EDHD 5018. Academic Language and English Learners. (1.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; spring, every year) Working with English learners and linguistically diverse students across all content areas to develop academic language proficiency.

EDHD 5020. Cultures, Schools, and Communities (Human Relations). (1.0 cr.; A-F only; JEDHD 5000; prereq Enrolled in teacher initial licensure program; spring, every year) Addressing social/cultural dimensions of education. Challenges/dilemmas facing contemporary educators. Speakers, simulation, presentations, professional learning communities, field assignments.

EDHD 5100. International Topics for Graduate Students. (1.0-12.0 cr.; fall, spring, summer, every year) Off-campus study. Topics from research exploration to academic/engagement activities. Delivered in international setting. Course requirements are determined by instructor(s) and reflect graduate-level rigor.

EDHD 5200. Special Topics: Professional Development for Educators. (1.0-3.0 cr. [max 12.0 cr.]; summer, every year) Special topics course that permits offering a variety of research-based and scholarly content to meet the needs of educators from P-12 settings.

EDHD 5300. Special Topics in Education and Human Development. (1.0-6.0 cr. [max 12.0 cr.]; A-F only; prereq Practitioners' graduates who have already completed undergrad coursework; fall, spring, summer, every year) Special topics in education/human development.

Educational Psychology (EPSY) College of Education and Human Development

EPSY 5101. Intelligence and Creativity. (3.0 cr.; A-F or Audit; =EPSY 3101; fall, spring, summer, every year) Contemporary theories of intelligence and intellectual development and contemporary theories of creativity and their implications for educational practices and psychological research.

EPSY 5112. Knowing, Learning, and Thinking. (4.0 cr.; A-F or Audit; spring, summer, every year) Principles of human information processing, memory, and thought; mental operations in comprehension and problem solving; developing expertise and automaticity; emphasis on applied settings.

EPSY 5113. Psychology of Instruction and Technology. (3.0 cr.; spring, offered periodically) 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.

EPSY 5114. Psychology of Student Learning. (3.0 cr.; A-F or Audit; =EPSY 3301; fall, spring, every year) 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.

EPSY 5115. Psychology of Adult Learning and Instruction. (3.0 cr.; fall, every year) Survey of adult learning/instruction. Emphasizes instructional design, learning theories, experience, individual differences, evaluation, tests/measurement, technology. Implications for curricular/instructional design in higher education, continuing education, professional/business related training.

EPSY 5119. Mind, Brain, and Education. (3.0 cr.; Student Option No Audit; prereq 3301 or equiv; spring, every year) How educationally relevant skills/concepts develop in both typical/atypical children.

EPSY 5135. Human Relations Workshop. (4.0 cr.; fall, summer, every year) Experiential course addressing issues of prejudice and discrimination in terms of history, power, and social perception. Includes knowledge and skills acquisition in cooperative learning, multicultural education, group dynamics, social influence, effective leadership, judgment and decision-making, prejudice reduction, conflict resolution.

EPSY 5511. Cooperative Learning. (3.0 cr.; spring, every year) 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 5517. Social Psychology of Education. (3.0 cr.; A-F or Audit; fall, every year) 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 5519. Education of the Gifted and Talented. (3.0 cr.; A-F or Audit; spring, summer, every year) Theories of giftedness, talent development, instructional strategies, diversity and technological issues, implications for educational practices and psychological inquiry, and international considerations.

EPSY 5520. Special Topics: Psychological Foundations. (1.0-4.0 cr. [max 30.0 cr.]; fall, spring, offered periodically) Focus on special topics in psychological and methodological concepts relevant to advanced educational theory, research, and practice not covered in other courses.

EPSY 5526. Introduction to Research in Educational Psychology and Human Development. (3.0 cr.; A-F or Audit; prereq 5261 or intro statistics course; fall, every year) Designing/conducting a research study. Reviewing literature, formulating research problem, using different approaches to gather data, managing/analyzing data, reporting results.

EPSY 5529. Special Topics: Quantitative Methods. (1.0-4.0 cr. [max 30.0 cr.]; fall, spring, summer, offered periodically) Focus on special topics in methodological concepts involving theory, research, and practice in statistics, measurement, evaluation, and statistics education not covered in other courses.

EPSY 5521. Principles of Educational and Psychological Measurement. (3.0 cr.; fall, every year) Concepts, principles, and methods in educational/psychological measurement. Reliability, validity, item analysis, scores, score reports (e.g., grades). Modern measurement theories, including item response theory and generalizability theory. Emphasizes construction, interpretation, use, and evaluation of assessments regarding achievement, aptitude, interests, attitudes, personality, and exceptionality.

EPSY 5524. Principles and Methods of Evaluation. (3.0 cr.; =OLPD 5501; fall, spring, summer, every year)
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. (3.0 cr.; prereq [5221 or 5231 or 5261 or equiv]. [CEHD grad student or MED student]; fall, every year) Survey methods, including mail, phone, and Web-based/e-mail surveys. Principles of measurement, constructing questions/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 5245. Advanced Survey Data Analysis for Categorical and Rating Scale Data. (1.0 cr.; prereq 5244, 5261; spring, every year) Practical course. Specific nature of survey data (typically categorical or ordinal). Appropriate data analytic methods.

EPSY 5246. Evaluation Colloquium: Psychological Foundations. (1.0 cr. [max 8.0 cr.]; S-N or Audit; [OLPD 5524]; prereq 5243 or EdPa 5501; fall, spring, offered periodically) Informal seminar of faculty and advanced students interested in the issues and problems of program evaluation.

EPSY 5247. Qualitative Methods in Educational Psychology. (3.0 cr.; prereq Grad student; fall, every year) 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 5241. Counseling Procedures. (3.0 cr.; prereq Upper div student; fall, spring, summer, every year) 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 5415. Child and Adolescent Development and Counseling. (4.0 cr.; A-F or Audit; prereq Grad student or MED student or K-12 [counseling endorsement or licensure] student; fall, summer, every year) Development, issues, and needs of children, kindergarten through high school ages. Counseling/developmental theory/strategies, family/social environment. Cultural diversity, legal/ethical issues in counseling children/adolescents.

EPSY 5242. Intermediate Statistical Methods. (3.0 cr.; [EPSY 5231, EPSY 3264]; fall, spring, summer, every year) Application of statistical concepts/procedures. Graphs, numerical summaries. Normal distribution, correlation/regression analyses, probability, statistical inferences for one or two samples. Hypothesis tests, Chi-square tests. Conceptual understanding/application of statistics.

EPSY 5251. Introduction to Computer Operations and Data Analysis in Education and Related Fields. (3.0 cr.; prereq Statistics course; fall, odd years) 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. (1.0-8.0 cr.; fall, spring, summer, every year) Current issues in educational psychology or related areas not normally available through regular curriculum offerings.

EPSY 5400. Special Topics in Counseling Psychology. (1.0-4.0 cr. [max 8.0 cr.]; fall, spring, summer, every year) Theory, research, and practice in counseling and student personnel psychology. Topics vary.

EPSY 5240. Introductory Statistical Methods. (3.0 cr.; prereq Lower div student; fall, spring, summer, every year) Supervised teaching experience.

EPSY 5241. Counseling Procedures. (3.0 cr.; prereq Upper div student; fall, spring, summer, every year) 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 5400. Special Topics in Counseling Psychology. (1.0-4.0 cr.; fall, spring, summer, every year) Current issues in educational psychology or related areas not normally available through regular curriculum offerings.

EPSY 5451. College Students Today. (3.0 cr.; =OLPD 5704; fall, spring, summer, every year) 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 5604. Transition From School to Work and Community Living for Persons With Special Needs. (3.0 cr.; fall, every year) Use of strategies/models for improving the 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 5605. Collaborative Practices for the Special Educator. (3.0 cr.; A-F only; fall, every year) Skills/knowledge required to consult/collaborate with school personnel, families, other professionals to maintain effective educational support.


EPSY 5611W. Research-based Practices in Academic and Behavior Disabilities. (3.0 cr.; A-F only; fall, every year) Research that provides conceptual basis to aid in understanding of students with academic difficulties. Develop critical thinking skills through examination of research-based practices.

EPSY 5612. Understanding of Academic Disabilities. (3.0 cr.; A-F or Audit; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; fall, spring, summer, every year)
Organization of educational programs/services for people with disabilities. First course for students seeking to become licensed in special education.

EPSY 5614. Assessment and Due Process in Special Education. (4.0 cr.; A-F or Audit; prerequisite 5613 or equiv or #; fall, spring, summer, every year)
Assessment, planning, implementing educational programs for people with disabilities.

EPSY 5615. Advanced Academic Interventions. (3.0 cr.; A-F or Audit; prerequisite 5612; spring, every year)
Designing, implementing, and evaluating individual educational plans (IEPs) for special education service in learning disabilities, emotional/behavioral disorders, and mild mental/intellectual disabilities.

EPSY 5616. Classroom Management and Behavior Analytic Problem Solving. (3.0 cr.; fall, spring, summer, every year)
Assumptions, principles, procedures of problem solving approach to analyzing behavior programs for classroom management. Conducting observations, intervening, evaluating behavioral change.

EPSY 5617. Academic and Social Interventions for Students with Mild to Moderate Disabilities. (3.0 cr.; A-F only; prerequisite 5611 and 5613 or #; fall, every year)
Use problem solving model to make data-based decisions regarding implementation/evaluation of instruction for students with academic/behavioral difficulties.

EPSY 5618. Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language. (3.0 cr.; A-F or Audit; spring, every year)
Historical/contemporary perspectives, empirical evidence relating to reading/written language instruction/assessment designed to improve outcomes of students with disabilities. Field work in tutoring.

EPSY 5619. Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities. (3.0 cr.; A-F only; spring, every year)

EPSY 5621. Assessment and Instructional Design for Students with Developmental Disabilities. (3.0 cr.; A-F or Audit; prerequisite 5613; fall, spring, every year)
Methods/materials course. Functional/standards-based approaches to promoting academic learning in students with developmental disabilities.

EPSY 5622. Programs and Curricula for Students with Developmental Disabilities. (3.0 cr.; prerequisite 5621 or [5661 and 5662]; summer, every year)
Developing programs/curricula for students with moderate, severe, profound developmental delays, as well as severe multihandicapped conditions. Special consideration given to preparing children/youth for integrated community environments.

EPSY 5624. Biomedical and Physical Impairments of Students with Developmental Disabilities. (2.0 cr.; A-F or Audit; fall, summer, every year)

EPSY 5625. Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction. (2.0 cr.; A-F or Audit; fall, every year)
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. (3.0 cr.; prerequisite [5621, 5622] or #; fall, summer, every year)
Data-based strategies for school and non-school instruction of learners with developmental disabilities including assessment, design, implementation, and evaluation of curriculum and instruction: curriculum content, concept and task analysis, classroom arrangements, natural and instructional cues, corrections, and consequences.

EPSY 5627. Seminar: Advanced issues in Learning Disabilities. (3.0 cr.; A-F only; prerequisite Special Education graduate or licensure student or #; fall, summer, every year)
Read, reflect, discuss issues in field of LD. Topics examined through relevant research in field of LD.

EPSY 5628. Characteristics of Moderate to Severe Learning Disabilities. (3.0 cr.; A-F only; prerequisite Special Education graduate or licensure student or #; fall, summer, every year)
Characteristics of moderate/severe learning disabilities including (but not limited to) cognitive processing, language, attention/memory, co-existing conditions. Dyslexia, dysgraphia, dyscalculia.

EPSY 5629. Strategic Instructional Methods for Students Academically At-Risk. (3.0 cr.; A-F only; prerequisite Special Education graduate or licensure student or #; fall, summer, every year)
Knowledge/skills needed to teach KU-CRL research-based learning strategies for students considered academically at-risk. Content relevant to basic skills/content instruction for students in K-12 settings will be included.

EPSY 5631. Module 1: Introduction to Augmentative and Alternative Communication. (1.0 cr.; A-F only; fall, spring, summer, every year)
Terms/concepts related to augmentative/alternative communication. Myths/facts regarding AAC.

EPSY 5632. Module 2: Evidence-based Methods for AAC Assessment and Intervention. (2.0 cr.; A-F only; prerequisite 5631 or #; fall, spring, summer, every year)
Evidence-based tools to conduct augmentative/alternative communication (AAC) assessments. AAC intervention plans. Data-driven strategies to evaluate progress.

EPSY 5633. Module 3: Speech-generating Devices and High-Tech AAC. (1.0 cr.; A-F only; prerequisite 5631 or #; fall, spring, summer, every year)
Identifying, funding, customizing high-tech augmentative/alternative communication (AAC) interventions. Manufacturer/community resources. Data-driven strategies to evaluate progress.

EPSY 5634. Module 4: Assistive technology with Deaf/Hard of Hearing Students. (1.0 cr.; A-F only; prerequisite Special Education licensure student or #; spring, summer, every year)
Theoretical/applied study communication modalities for children/adults who are Deaf or Hard of Hearing. Assessment/development of models including gestures, speech reading, Cued Speech, sign language, Picture Exchange Communication Systems, high/low tech devices.

EPSY 5636. Sensory Impairments of Students With Developmental Disabilities. (2.0 cr.; prerequisite 5613, 5614; fall, every year)
Characteristics of learners with visual/auditory impairments. Design of instructional programs to remediate or circumvent disabilities, including use of prosthetic devices.

EPSY 5641. Foundations of Education for Individuals Who Are Deaf/Hard of Hearing. (2.0 cr. [max 3.0 cr.]; A-F only; fall, summer, every year)

EPSY 5642. Early Childhood Intervention for Infants, Toddlers, and Preschoolers Who Are Deaf/Hard of Hearing. (3.0 cr.; prerequisite Preservice teacher in deaf education licensing program or #; summer, every year)

EPSY 5644. Language Development and Programming for Deaf/Hard of Hearing Children. (3.0 cr.; fall, summer, every year)
Comparative study of the development of functional language in communicatively disabled and nondisabled individuals. Philosophies, programs, and practices focusing on the development of language with deaf

EPSY 5646. Reading and Writing Practices with Deaf/Hard of Hearing Children. (2.0 cr.; A-F only; spring, summer, every year) Language reading connection/best practices for instruction with deaf/hard of hearing/students with co-occurring disabilities. Final project includes balanced literacy unit of instruction implemented with DHH student. Ions. Effective instructional approaches.

EPSY 5647. Aural and Speech Programming for Persons Who Are Deaf/Hard of Hearing. (3.0 cr.; fall, summer, every year) 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 5649. Models of Instructional Programming With Deaf and Hard of Hearing Students. (3.0 cr.; prereq [5641, 5644] or #; spring, summer, every year) 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 5651. Evident-Based Practices in Deaf Education. (2.0 cr.; A-F only; prereq Special Education licensure student or #; fall, spring, every year) Problem solving related to individual needs of students including educational policies/educational procedures in variety of educational settings.


EPSY 5657. Interventions for Behavioral Problems in School Settings. (3.0 cr.; A-F or Audit; prereq 5616, 5611; spring, summer, every year) Comprehensive behavioral programs for students with social/emotional disabilities. Instructing students with social/emotional disabilities.

EPSY 5658. Characteristics of Moderate to Severe Emotional/Behavioral Disorders. (3.0 cr.; A-F only; prereq Special Education graduate or licensure student; fall, summer, every year) Applying principles of assessment/individualized intervention for students with severe emotional behavior disorders (EBD).


EPSY 5662. Assessment and Identification of Autism Spectrum Disorders. (2.0 cr.; A-F only; prereq 5661, Spec Ed grad or licensure student or #; summer, every year) Selection/use of assessment procedures that may be used to screen/identify children with autism spectrum disorders.

EPSY 5663. Assessment and Intervention for Individuals with Autism Spectrum Disorders. (3.0 cr.; A-F only; prereq 5661, Special Ed grad or licensure student or #; spring, every year) Selection/use of range of procedures, including non-biased, specific assessments to screen/identify children with autism spectrum disorders. Specific intervention strategies designed to teach beginning communication/social skills to children with Autism Spectrum Disorders (ASD).

EPSY 5664. Transitions for Individuals with Autism Spectrum Disorders. (2.0 cr.; A-F only; prereq 5661, Spec Ed grad or licensure student or #; spring, every year) Legal/practical aspects of transition planning, specifically for students with ASD.

EPSY 5681. Education of Preschool Children With Disabilities: Methods and Materials. (3.0 cr.; A-F only; prereq [5616, 5625] or #; spring, every year) Methods and materials available to maximize developmental and educational outcomes for young children with disabilities, age 3 to 5, and their families in home, community, and school-based settings. Develop, implement, and evaluate individualized education and family service plans.

EPSY 5682. Education of Infants and Toddlers with Disabilities: Methods and Materials. (3.0 cr.; [max 6.0 cr.; A-F only; prereq [5616, 5625] or #; spring, every year) Methods/materials available to maximize developmental and educational outcomes for young children with disabilities, birth to age 3, and their families in home, community, and school-based settings. Students develop, implement, and evaluate individualized education/family service plans.

EPSY 5690. Experimental Teaching Seminar: MED Culminating Project. (2.0 cr.; A-F only; =EPSY 5991; prereq #; fall, spring, every year) Experimental teaching utilizing data based instruction for affecting student growth. Conduct experimental teaching project during student teaching year. Guided through formal writing process for submitting short literature review or research report for M.Ed.

EPSY 5701. Practicum: Field Experience in Special Education. (2.0 cr.; [max 24.0 cr.; A-F or Audit =EPSY 3701; prereq [5614, [FOE or SpEd grad or licensure student]] or #; fall, spring, summer, every year) 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. (3.0 cr.; A-F only; prereq 5616, 5661, 5609, one of [5622 or 5644 or SLHS 5606], enrolled in Autism Spectrum Disorder certificate program, #; fall, spring, every year) 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. (3.0 cr.; A-F only; prereq 5616, 5657, Psy 4011, Applied Behavior Analysis Certificate student, #; spring, every year) 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 5704. Practicum in Middle/Secondary Settings. (1.0 cr.; S-N only; fall, every year) Preparation for practicing principles required for successful inclusion. Address model for best practices/requirements specified by Minnesota Board of Teaching.

EPSY 5705. Practicum in ECSE/Elementary Settings. (1.0 cr.; S-N only; fall, spring, every year) Principles for successful inclusion of students with moderate disabilities. Address model for best practices.

EPSY 5706. Practicum in Moderate to Severe Developmental Disabilities. (2.0 cr.; S-N only; prereq Special Education licensure program or #; fall, spring, every year) Practicing principles required for successful inclusion. Address model for best practices/requirements specified by Minnesota Board of Teaching.

EPSY 5707. Practicum in Moderate to Severe Learning Disabilities. (3.0 cr.; S-N only; prereq [Special Education graduate or licensure student], #; fall, spring, every year) Moderate/severe learning disabilities. Transfer of theoretical knowledge to practical application. Role of LD teacher in variety of settings.

EPSY 5708. Practicum in Moderate to Severe Emotional/Behavioral Disorders. (3.0 cr.; S-N only; prereq [Special Education grad or licensure student], #; fall, spring, every year) Moderate/severe emotional behavior disorders. Transfer of theoretical knowledge to practical
application. Role of EBD teacher in variety of settings.

**EPSY 5720. Special Topics: Special Education.** (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Lab/fieldwork approach. Generating action plan. Creating set of observation field notes. Collecting data. Specific problems/possibilities related to special education.

**EPSY 5741. Student Teaching: Academic and Behavioral Strategist.** (6.0 cr.; S-N only; spring, every year) Transfer of theoretical knowledge to practical application. Responsibilities of special education teacher in variety of settings.

**EPSY 5742. Student Teaching: Autism Spectrum Disorders.** (6.0 cr.; S-N only; prereq Special Education licensure program or #; fall, every year) Transfer of theoretical knowledge to practical application. Role/responsibilities of special education teacher in settings of elementary/secondary age.

**EPSY 5751. Student Teaching: Deaf and Hard of Hearing.** (1.0-6.0 cr. [max 10.0 cr.]; prereq #; fall, spring, every year) 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.** (1.0-6.0 cr. [max 10.0 cr.]; S-N or Audit; prereq #; fall, spring, summer, every year) 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.** (1.0-6.0 cr. [max 8.0 cr.]; S-N or Audit; prereq #, completion of all course requirements for license in ECSE; fall, spring, summer, every year) 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.** (1.0-6.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Completion of licensure courses for social and emotional disorders; #; fall, spring, summer, every year) 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.** (1.0-6.0 cr.; A-F or Audit; prereq Completion of all licensure coursework; #; fall, spring, every year) 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.** (1.0-6.0 cr.; A-F or Audit; prereq Completion of all licensure coursework; #; fall, spring, every year) 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 5761. Student Teaching in Early Childhood Special Education Settings for Children Aged Three to Five Years.** (3.0 cr. [max 6.0 cr.]; S-N only; prereq Licensure candidate in Early Childhood/Early Childhood Licensure Program, completion of all other licensure requirements for ECSE; #; completion of Birth-3 student teaching should be completed after age 3-5 student teaching when possible; fall, spring, every year) Students work closely with their cooperating teacher and University supervisor to design/implement programming for children in classrooms. Course includes a seminar with discussion, cooperative learning experiences, and some lectures.

**EPSY 5762. Student Teaching in Early Childhood Special Education for Children Aged Birth to Three Years.** (3.0 cr. [max 6.0 cr.]; S-N only; prereq Licensure candidate in Early Childhood/Early Childhood Licensure Program, completion of all other licensure requirements for ECSE; #; completion of Birth-3 student teaching should be completed after age 3-5 student teaching when possible; fall, spring, every year) Students work closely with cooperating teacher and University supervisor to design/implement programming for families with children aged birth to three in their homes. Course includes seminar with discussion, cooperative learning experiences, and some lectures.

**EPSY 5800. Special Topics in School Psychology.** (1.0-9.0 cr.; fall, spring, every year) 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.** (3.0 cr.; A-F or Audit; fall, spring) 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 5802. Foundations of Developmental Psychology Across the Lifespan.** (3.0 cr.; A-F only; fall, every year) Theories/research regarding human development across lifespan focusing on different contexts that shape development. Theoretical frameworks applied to study of human development. Cognitive, social, emotional development. Research methods in developmental psychology.

**EPSY 5849. Observation and Assessment of the Preschool Child.** (3.0 cr.; spring, summer, every year) Introduction to assessment principles and practices, including observational assessment methods, for 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 5851. Engaging Diverse Students and Families.** (3.0 cr.; prereq Honors senior or grad student; fall, spring, every year) Theoretical, practical, scientific issues involved in school psychological practice/training/research. Theoretical/empirical bases for developing appropriate dispositions, practices, strategies. Illustrative lectures, discussions, group activities, case studies, presentations.

**EPSY 5853. Biological Bases of Behavior.** (3.0 cr.; A-F only; fall, every year) Biological basis of behavior with emphasis on relationship between functions/structures of brain.

**EPSY 5991. Independent Study in Educational Psychology.** (1.0-8.0 cr. [max 20.0 cr.]; A-F or Audit; #; spring, summer, every year) Self-directed study in areas not covered by regular courses. Specific program of study is jointly determined by student and advising faculty member.

**EPSY 8112. Mathematical Cognition.** (3.0 cr.; prereq 5114 or equiv; fall, even years) Cognitive science research. Papers investigating how adults/children understand fundamental mathematical concepts. Papers drawn from psychology, neuroscience, education literatures.

**EPSY 8113. The Psychology of Scientific Reasoning.** (3.0 cr.; prereq 5114 or equivalent; fall, even years) Research at intersection of cognitive science, educational psychology, science education. What psychology tells us about how people think, reason, make decisions. Read empirical research that explores psychological processes that underlie scientific reasoning.

**EPSY 8114. Seminar: Cognition and Learning.** (3.0 cr. [max 9.0 cr.]; fall, every year) 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.** (3.0 cr.; spring, odd years) Seminar including, but not limited to, learning and instructional theories, advanced and emerging technologies, and measurement and evaluation.

**EPSY 8116. Reading for Meaning: Cognitive Processes in the Comprehension of Texts.** (3.0 cr.; prereq #; fall, every year)
EPSY 8171. Writing Empirical Paper and Research/Grant Proposals in Education and Psychology. (3.0 cr.; prereq #; spring, every year)

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. (3.0 cr.; prereq Personality or child psych course; spring, every year)

Major research and theoretical work. Developmental and educational influences on personality.

EPSY 8215. Advanced Research Methodologies in Education. (3.0 cr.; prereq 5221, 5247, [8252 or equiv]; #; fall, every year)


EPSY 8216. Seminar: Research Processes in Psychological Foundations of Education. (3.0 cr.; A-F or Audit; prereq [5216, admitted to doctoral program in psych foundations] or #; spring, odd years)

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 8220. Special Topics: Seminar in Quantitative Methods. (1.0-6.0 cr.; max 15.0 cr.; fall, spring, summer, offered periodically)

Seminars focus on specialized current topics in methodology in statistics, measurement, evaluation, and statistics education, including primary-source readings and in-depth exploration of advanced methodologies.

EPSY 8221. Psychological Scaling. (3.0 cr.; prereq [5221 or equiv], [8252 or equiv]; spring, odd years)


EPSY 8222. Advanced Measurement: Theory and Application. (4.0 cr.; #PSY 5865; prereq [5221 or PSY 5862 or equiv], [8252 or equiv]; spring, even years)

Generalizability theory, item response theory, factor models for test items, binomial model. Application to problems of designing, linking assessments. Includes computer lab.

EPSY 8224. Performance Assessment Design and Analysis. (3.0 cr.; prereq 5221, [5262 or 8261 or 8251 or equiv]; spring, odd years)

Conceptualization, design, implementation, analysis of performance assessments as employed in both small-scale (e.g., classrooms), large-scale (e.g., statewide, national testing programs), professional (e.g., teacher assessment, professional certification) settings.

EPSY 8225. Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating. (3.0 cr.; prereq 5221, [8252 or equiv]; spring, odd years)

Principles/practices of test score quality assurance, standard setting/equating. Operational testing programs. Focus on achievement tests.

EPSY 8226. Item Response Models: Theory and Applications. (3.0 cr.; prereq [5221 or Psy 5862 or equiv], [8252 or equiv]; spring, odd years)

Item response theory. Application in education/psychology/social science. 1-, 2-, 3-parameter models for dichotomous/graded response models. Partial credit models for polytomous data.

EPSY 8247. Advanced Interviewing and NVIVO. (3.0 cr.; prereq 5247 or qualitative course or #; spring, every year)

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 8251. Methods in Data Analysis for Educational Research I. (3.0 cr.; prereq [5261 or equiv] or undergraduate statistics course; fall, every year)

Entry-level doctoral course. Two-semester sequence. In-depth coverage of widely used statistical methods and models. Prepares students for advanced statistical coursework including HLM and SEM.

EPSY 8252. Methods in Data Analysis for Educational Research II. (3.0 cr.; prereq [8251 or equiv or #]; spring, every year)

Second in two-semester sequence of entry-level doctoral coursework for students in education. In-depth coverage of widely used statistical methods/models. Prepares students for advanced statistical coursework including HLM/SEM.

EPSY 8261. Statistical Methods I: Probability and Inference. (3.0 cr.; prereq 3264 or 5261 or equiv; fall, spring, summer, every year)

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. (3.0 cr.; prereq [8261 or equiv]; fall, spring, every year)

Analysis of variance designs (two-/three-way), repeated measures, correlation, simple/multiple regression methods, non-parametric procedures, multivariate analyses.

EPSY 8264. Advanced Multiple Regression Analysis. (3.0 cr.; prereq [8252 or equiv], regression/ANOVA course, familiarity with statistical analysis package; fall, every year)

General linear model used as context for regression. Matrix algebra, multiple regression, path analysis, polynomial regression, standardized regression, stepwise solutions, analysis of variance, weighted least squares, logistic regression.

EPSY 8265. Factor Analysis. (3.0 cr.; prereq [8252 or equiv or #]; spring, even years)

Factor analytic techniques/applications. Component, common factor, confirmatory analysis. Factor extraction, estimating number of dimensions. Rotation, factor scores, hierarchical factor analysis.

EPSY 8266. Statistical Analysis Using Structural Equation Methods. (3.0 cr.; prereq 8264, [8252 or equiv]; spring, offered periodically)

Quantitative techniques using manifest/latent variable approaches for analysis of educational/social science data. Introduction to structural equation modeling approaches to multiple regression, factor analysis, path modeling. Developing, estimating, interpreting structural equation models.

EPSY 8267. Applied Multivariate Analysis. (3.0 cr.; prereq [8252 or equiv], familiarity with matrix algebra, knowledge of a computerized statistics package; spring, odd years)

Use/interpretation of results from several multivariate statistical techniques. Matrix algebra, variance/covariance, Hotelling’s T2, GLM, MANOVA, MANCOVA, discriminant analysis, canonical correlations, dimensionality, principal components, latent composites, distance, hierarchical clustering.

EPSY 8268. Hierarchical Linear Modeling in Educational Research. (3.0 cr.; prereq [8252 or equiv]; fall, every year)

Conceptual framework of hierarchical linear models for nested data, their application in educational research. Nature/effects of nested data, logic of hierarchical models, mixed-effects models. Estimation/hypothesis testing in these models, model-checking, nonlinear models.

EPSY 8269. Matrix Algebra for Statistical Modeling. (2.0 cr.; prereq [8252 or 8262 or equiv]; fall, spring, offered periodically)


EPSY 8271. Statistics Education Research Seminar: Studies on Teaching and Learning Statistics. (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically)

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 8272. Nonparametric Statistics in Education. (3.0 cr.; prereq [8252 or equiv]; spring, odd years)
Estimation/inferential techniques outside normal-theory tests. One-, two-, K-sample procedures for between-within-subject differences, including factorial analysis of variance/covariance. Contingency table analysis (tests of independence, homogeneity).

EPSY 8281. Advanced Statistical Computing and Data Analysis. (3.0 cr.; prereq [5261 or equiv]; fall, even years)
Cross-disciplinary course. Use SAS statistical package to perform data management, data analysis, report writing.

EPSY 8282. Statistical Analysis of Longitudinal Data. (3.0 cr.; prereq [8252 or equiv]; spring, every year)
Traditional/modern approaches to analyzing longitudinal data. Dependent t-test, repeated measures ANOVA/MANOVA. Linear mixed models, multilevel models, generalized models. Required labs using SAS computer program.

EPSY 8290. Special Topics: Seminar in Psychological Foundations. (1.0-6.0 cr. [max 15.0 cr.]; prereq #; fall, spring, summer, offered periodically)
Students formulate research designs. Learning and cognition, social psychology, measurement, and statistics.

EPSY 8299. Quantitative Methods in Education Internship. (1.0-3.0 cr.; S-N only; prereq EAPy MA or PhD student, QME track; fall, spring, every year)
Practical experience in applying concepts and skills in measurement, statistics, and evaluation in a real-world setting under supervision of a research professional.

EPSY 8300. Special Topics in Educational Psychology. (1.0-4.0 cr. [max 9.0 cr.]; fall, spring, every year)
Issues or related coursework in areas not normally available through regular curriculum offerings.

EPSY 8311. Education Sciences Proseminar. (1.0 cr. [max 3.0 cr.; A-F only; prereq Doctoral student, #; fall, every year)

EPSY 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

EPSY 8400. Topics: Counseling and Student Personnel Psychology. (1.0-3.0 cr. [max 9.0 cr.]; fall, spring, every year)
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. (3.0 cr.; A-F or Audit; prereq Grad ed psy major with CSPP subprog or #; fall, every year)
Traditional and contemporary theories of counseling and psychotherapy. Applications to various settings and populations.

EPSY 8403. Social/Cultural Contexts: Counseling and Skills. (3.0 cr.; A-F or Audit; prereq Grad ed psy major with CSPP subprog or #; spring, every year)
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. (3.0 cr.; A-F or Audit; prereq Ed psy MA or PhD student with CSPP subprog or #; spring, every year)
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 8405. Career Development: Theory, Skills, and Counseling Applications. (3.0 cr.; A-F or Audit; prereq CSPP grad student; fall, every year)
Career development theory/practice over life span. Emphasizes career counseling for individuals/organizations, systems approaches to career programs in education/business. Traditional/contemporary theories/practices.

EPSY 8406. Professional Ethics for Counselors and Psychologists. (3.0 cr.; A-F only; prereq CSPP grad student; fall, every year)
Theory, research, and practice in counseling ethics. Scope/impact of professional ethics. Ethical decision making. Ethics and the law. Ethical practice in special settings. Scholarship/research in counseling ethics. Lectures, discussions, case studies, individual/group examination of original research.

EPSY 8407. Assessing and Counseling Clients With Psychological Disorders. (4.0 cr.; A-F only; prereq CSPP PhD or MA student or #; spring, every year)

EPSY 8411. Advanced Counseling Research. (4.0 cr.; A-F or Audit; prereq Ed psy PhD student with CSPP subprog or #; fall, every year)
Focus on critically reviewing counseling research, qualitatively and quantitatively integrating research, and designing valid research.

EPSY 8412. Seminar: Advanced Counseling Theory and Ethics. (4.0 cr.; A-F or Audit; prereq Ed psy PhD student with CSPP subprog or #; spring, every year)
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. (3.0 cr.; A-F only; prereq [8407 or PSY 5604H or PSY 8111 or PSY 8112]; doctoral student, #; spring, every year)
Assessment interviews, objective personality assessments (e.g., MMPI-2), projective tests (e.g., Thematic Apperception Test), and assessment report writing.

EPSY 8431. Master's Research Seminar: CSPP. (3.0 cr. [max 4.0 cr.]; A-F or Audit; prereq 5261 or equiv, 5221 or equiv, EPAP MA student with CSPP subprog or #; spring, every year)
Survey of research methods, data-based decision making, basic research design skills, and research simulation.

EPSY 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

EPSY 8452. Psychological Aspects of Counseling Supervision. (3.0 cr.; prereq Ed psy PhD student with CSPP subprog or #; fall, every year)
Theories, review of relevant research, demonstration, and in-class practice of supervision skills.

EPSY 8501. Counseling Pre-Practicum. (3.0 cr.; A-F or Audit; prereq [CSPP or genetic counseling] grad student; fall, every year)
Overview of basic helping skills through demonstration, in-class practice.

EPSY 8502. Field Placement in Counseling and Student Personnel Psychology. (2.0 cr.; S-N or Audit; prereq 8501 or #; fall, spring, every year)
Students participate under supervision in practitioner activities within a counseling work environment.

EPSY 8503. Counseling Practicum I. (1.0-4.0 cr.; A-F or Audit; prereq 8502 or #; fall, every year)
Beginning-level supervised practice in counseling with individuals and groups; emphasizes systematic evaluation of student's counseling practice through direct observations, video, and audio tapes.

EPSY 8504. Counseling Practicum II. (1.0-4.0 cr.; A-F or Audit; prereq 8503 or #; spring, every year)
Intermediate supervised practice in counseling with individuals and groups; emphasizes ethical issues with systematic evaluation of student's practice through direct observations, video, and audio tapes.

EPSY 8509. Supervision Practicum: CSPP. (1.0-2.0 cr. [max 6.0 cr.]; prereq [Ed psy PhD student with CSPP subprog] or #; fall, spring, every year)
Doctoral students meet weekly with master's prepracticum or practicum students for didactic supervision activities. Specific activities determined by master's prepracticum or practicum instructor. Doctoral students meet weekly with master's prepracticum or practicum instructor and other doctoral student supervisors for consultation/supervision.

EPSY 8512. Internship: CSPP. (1.0-12.0 cr.; S-N only; prereq EdPsy PhD student with CSPP subprog; fall, spring, summer, every year) Supervised internship in counseling psychology.

EPSY 8521. Practicum in Student Affairs and Student Development. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq EdPsy MA or PhD student with CSPP subprog or #; fall, spring, every year) Supervised practice in university and college student development offices.

EPSY 8522. Counseling Practicum: Advanced. (3.0 cr. [max 12.0 cr.]; A-F only; prereq [Grad EdPsy PhD student with CSPP subprog] or #; instructor consent required after 2 repeats; fall, spring, every year) Advanced skills practicum in counseling, counseling psychology, or student development.

EPSY 8600. Special Topics: Special Education Issues. (1.0-3.0 cr. [max 9.0 cr.]; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; fall, spring, every year) 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. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) Doctoral Pre-Thesis Credits

EPSY 8694. Research in Special Education. (3.0 cr.; fall, spring, every year) Design and implementation of research related to the unique developmental characteristics of exceptional learners.

EPSY 8701. Doctoral Core Seminar: Special Education I. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq EdPsy PhD student with spec ed subprog or #; fall, every year) Required for students with a family/life span focus on social development, behavioral interaction, and cultural interactions.

EPSY 8702. Doctoral Core Seminar: Special Education II. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq 8701 or #; spring, every year) Required for students focusing on communication/language/academics.

EPSY 8706. Single Case Designs in Intervention Research. (3.0 cr.; spring, offered periodically) 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. (3.0 cr.; A-F only; prereq [Grad student, foundational course in [learning or psychology]] or #; fall, every year) Historical development of behavioral science. Thinking about learning/behavior, applying principles to common human experiences. Scholarly leadership skills.


EPSY 8772. Seminar in Early Intervention. (2.0 cr.; fall, spring, every year) 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. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

EPSY 8800. Special Topics in School Psychology. (1.0-4.0 cr. [max 9.0 cr.]; spring, summer, every year) Issues or related coursework in areas not normally available through regular curriculum offerings.

EPSY 8811. Assessment in School Psychology I: Foundations of Academic Assessment. (3.0 cr.; A-F or Audit; prereq Grad ed psy major with school psy subprog or #; fall, every year) Theories and models of psychoeducational 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 8812. Assessment in School Psychology II: Intellectual and Social-Emotional Domains. (3.0 cr.; A-F or Audit; prereq Grad ed psy major with school psy subprog or #; spring, every year) Builds on EPSY 8811. Emphasizes gathering data on a child's intellectual and social-emotional functioning and educational progress.

EPSY 8813. Assessment Practicum in School Psychology. (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq 8821, grad ed psy major with school psy subprog or #, & 8811 or & 8812; fall, spring, every year) 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. Individual and System Socio-Emotional Interventions. (3.0 cr.; A-F or Audit; prereq 8811, 8812, 8813; fall, spring, offered periodically) Theories, research, and practice underlying socio-emotional interventions for students. Systems consultation/organizational change.

EPSY 8816. Individual and Systems Academic Interventions. (3.0 cr.; A-F or Audit; prereq 8811, 8812, 8813; fall, spring, every year) Theories, research, and practice underlying instructional/academic interventions for students. Systems consultation, organizational change.

EPSY 8817. School Psychological Consultation. (3.0 cr.; A-F or Audit; prereq EPSY 8811; spring, every year) Practical application of applied behavioral theory guided by system ecological perspectives in problem-solving with school staff, parents, and students. Theories, stages, and issues of providing indirect services through consultation. Critical analysis of theory and research. Applied project in 8813 practicum placements.

EPSY 8818. Intervention Practicum in School Psychology. (1.0 cr. [max 2.0 cr.]; A-F or Audit; prereq Grad ed psy major with school psy subprog, & 8815 or & 8816; fall, spring, every year) 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.

EPSY 8821. Issues in School Psychology. (3.0 cr.; A-F or Audit; prereq EPSY grad student with SchlPsy subprog; fall, spring, every year) 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. (1.0-3.0 cr. [max 6.0 cr.]; A-F...
only; prereq [8860, 8861, 5616] or equiv. [grad ed psy major with school psy subprog] or #; fall, spring, every year)

Integrative, developmental series of discussions/activities about research in school psychology. Instruction/discussion regarding consumption, synthesis, conduct, dissemination of school psychology research.

EPSY 8823. Ethics and Professional Standards in School Psychology. (3.0 cr.; A-F or Audit; prereq 8821; fall, spring, every year)

Ethics, law, and current educational 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. (1.0-3.0 cr. [max 6.0 cr.]; prereq Grad ed psy major with school psy subprog; fall, spring, every year)

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.

EPSY 8832. Clinical/Community Practice in School Psychology. (1.0-3.0 cr. [max 6.0 cr.]; prereq Grad ed psy major with school psy subprog; fall, spring, summer, every year)

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. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Grad ed psy major with school psy subprog or #; fall, spring, summer, every year)

Didactic teaching/supervised experience teaching. Knowledge/skills in strategies for effective classroom instruction/supervision in individual/small group instruction. Construct teaching portfolio.

EPSY 8842. Internship: School Psychological Services. (1.0-10.0 cr.; S-N or Audit; prereq Grad ed psy major with school psy subprog or #; fall, spring, summer, every year)

Advanced field placement. Full-time supervised experience for one year or part-time for no more than two years.

EPSY 8849. Assessment in Early Childhood. (3.0 cr.; A-F or Audit; prereq [8811, 8812] or equivalent in related programs; spring, odd years)

Training psychologists/researchers in use of various assessment tools, including observational/assumptions strategies, for children birth-age 7. Intended primarily for graduate level practitioners-in-training interested in applied information on assessment/intervention services.

EPSY 8850. Doctoral Seminar in School Psychology: Research, Training, Practice, Policy Issues, and Action Plans. (3.0 cr.; A-F only; prereq [[Grad student in school psychology, coursework in school psychology] or advanced PhD student from related department]; #; fall, spring, every year)

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. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

(No description)

EPSY 8905. History and Systems of Psychology: Landmark Issues in Educational Psychology. (3.0 cr.; prereq Ed psy PhD student; spring, every year)

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. (1.0-10.0 cr. [max 20.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)

Arranged independently with individual faculty members.

EPSY 8994. Research Problems: Educational Psychology. (1.0-6.0 cr. [max 18.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)

Research methodology, techniques, and literature. Students participate in formulating/executing research proposal.

EE 5121. Transistor Device Modeling for Circuit Simulation. (3.0 cr.; prereq [3115, 3161, CSE grad student] or %; fall, spring, offered periodically)

Basics of MOS, bipolar theory. Evolution of popular device models from early SPICE models to current industry standards.

EE 5141. Introduction to Microsystem Technology. (4.0 cr.; prereq [3161, 3601, CSE grad student] or %; fall, every year)

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 5164. Semiconductor Properties and Devices II. (3.0 cr.; prereq 5163 or #; spring, every year)

Principles/properties of semiconductor devices. Charge control in different FETs, transport, modeling, Bipolar transistor models (Ebers-Moll, Gummel-Poon), heterostructure bipolar transistors. Special devices.

EE 5171. Microelectronic Fabrication. (4.0 cr.; prereq CSE grad student or %; fall, every year)

Fabrication of microelectronic devices. Silicon integrated circuits, GaAs devices. Lithography, oxidation, diffusion. Process integration of various technologies, including CMOS, double poly bipolar, and GaAs MESFET.

EE 5173. Basic Microelectronics Laboratory. (1.0 cr.; prereq [5171 or 5171]; CSE grad student) or %; fall, every year)

Students fabricate a polysilicon or 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. (4.0 cr.; prereq [3161, 3601, CSE grad student] or %; fall, every year)


EE 5231. Linear Systems and Optimal Control. (3.0 cr.; prereq [3015, CSE grad student] or %; fall, every year)


EE 5235. Robust Control System Design. (3.0 cr.; prereq CSE grad, 3015, 5231 or #; spring, every year)

Development of control system design ideas; frequency response techniques in design of single-input/single-output (and MIMO) systems. Robust control concepts. CAD tools.

EE 5239. Introduction to Nonlinear Optimization. (3.0 cr.; prereq [3025, Math 2373, Math 2374, CSE grad student] or %; fall, spring, offered periodically)


EE 5251. Optimal Filtering and Estimation. (3.0 cr.; [AEM 5451]; prereq [[MATH 2243, STAT 3021] or equiv]; CSE grad student) or %; 3025, 4231 recommended; fall, every year)

Basic probability theory, stochastic processes. Gauss-Markov model. Batch/recursive least


EE 5323. VLSI Design I. (3.0 cr.; prereq [2301, 3115, CSE grad student] or %; fall, every year) Combinational static CMOS circuits. Transmission gate networks. Clocking strategies, sequential circuits. CMOS process flows, design rules, structured layout techniques. Dynamic circuits, including Domino CMOS and DCVS. Performance analysis, design optimization, device sizing.

EE 5324. VLSI Design II. (3.0 cr.; prereq [5323, CSE grad student] or %; spring, every year) 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. (3.0 cr.; prereq [4301, 5323 or 85323], CSE grad student] or %; spring, every year) Complete design of an integrated circuit. Designs evaluated by computer simulation.


EE 5333. Analog Integrated Circuit Design. (3.0 cr.; prereq [3115, CSE grad student] or %; fall, every year) 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 circuit filter).

EE 5351. Applied Parallel Programming. (3.0 cr.; prereq [4363 or equivalent], programming experience (C/C++ preferred); fall, every year) Parallel programming/architecture. Application development for many-core processors.

Computational thinking, types of parallelism, programming models, mapping computations effectively to parallel hardware, efficient data structures, paradigms for efficient parallel algorithms, application case studies.

EE 5364. Advanced Computer Architecture. (3.0 cr.; [CSCI 5204]; prereq [4363 or CSci 4203], CSE grad student] or %; fall, every year) 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. (3.0 cr.; =EE 5863; [CSE 5363 or 5361 or CSci 4203 or 5201], CSE grad student] or %; fall, spring, offered periodically) Tools/techniques for analyzing computer hardware, software, system performance. Benchmark programs, measurement tools, performance metrics. Deterministic/probabilistic simulation techniques, random number generation/testing. Bottleneck analysis.

EE 5381. Telecommunications Networks. (3.0 cr.; prereq [4501, 5531, CSE grad student] or %; fall, spring, offered periodically) 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 5581. Information Theory and Coding. (3.0 cr.; prereq [5531, CSE grad student] or %; fall, even years) Source/channel models, codes for sources/ channels. Entropy, mutual information, capacity, rate-distortion functions. Coding theorems.
EE 5583. Error Control Coding. (3.0 cr.; prereq [3025, Math 2373] or equiv; [CSE grad student or %]; spring, offered periodically) Error-correcting codes. Concepts, properties, polynomial representation, BCH, Golay, Reed-Muller/Reed-Solomon codes. Convolutional codes. Iterative codes.


EE 5602. RF/Microwave Circuit Design. (3.0 cr.; prereq [5601 or equiv]; [CSE grad student or #]; fall, spring, offered periodically) 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. (4.0 cr.; A-F or Audit; [ME 5361]; prereq [[[[ME 3321, ME 3322] or equiv], [upper div CSE or grad student]] or %; fall, spring, offered periodically) Manufacturing using plasma processes. Plasma properties as a processing medium. Plasma spraying, welding 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. (2.0 cr.; A-F only; prereq [5601 or &5601], CSE grad student or %; spring, every year) 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. (3.0 cr.; prereq [5601 or &5601], CSE grad student or %; fall, spring, offered periodically) Antenna performance parameters, vector potential/radiation integral, wire antenna structures, broadband antenna structures, microstrip/aperture theory, antenna measurements.

EE 5621. Physical Optics. (3.0 cr.; prereq [3015, CSE grad student] or %; spring, every year) Physical optics principles, including Fourier analysis of optical systems/images, scalar diffraction theory, interferometry, and coherence theory. Diffractive optical elements, holography, astronomical imaging, optical information processing, microoptics.


EE 5624. Optical Electronics. (4.0 cr.; prereq [[3601 or Phys 3002], CSE grad student] or %; fall, every year) 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. (1.0 cr.; prereq [[5627 or &5627], CSE grad student] or %; spring, even years) Experiments in fiber optics. Dielectric waveguides, modes in optical fibers, fiber dispersion/attenuation, properties of light sources/detectors, optical communication systems.


EE 5655. Magnetic Recording. (3.0 cr.; prereq CSE grad student or %; spring, offered periodically) Magnetic fundamentals, recording materials, idealized models of magnetic records/reproduction, analytic models of magnetic record heads, sinusoidal magnetic recording, digital magnetic recording, magnetic recording heads/media, digital recording systems.

EE 5657W. Physical Principles of Thin Film Technology. (4.0 cr.; prereq CSE grad student or %; fall, every year) Fabrication, characterization, and application of thin film and nanostructured materials/devices. Focuses on vacuum deposition. Materials science. Hands-on, team-based labs.


EE 5707. Electric Drives in Sustainable Energy Systems Laboratory. (1.0 cr.; prereq 5705 or &5705; spring, offered periodically) Lab to accompany 5705.

EE 5721. Power Generation Operation and Control. (3.0 cr.; prereq [4721, CSE grad student] or %; spring, even years) Engineering aspects of power system operation. Economic analysis of generation plants & scheduling to minimize total cost of operation. Scheduling of hydro resources and thermal plants with limited fuel supplies. Loss analysis, secure operation. State estimation, optimal power flow. Power system organizations.


EE 5940. Special Topics in Electrical Engineering I. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Special topics in electrical and computer engineering. Topics vary.

EE 5950. Special Topics in Electrical Engineering II. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, every year)
Special topics in electrical and computer engineering. Topics vary.

EE 5960. Special Topics in Electrical Engineering III. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, every year)
Special topics in electrical and computer engineering. Topics vary.

EE 5970. Special Topics in Electrical Engineering IV. (1.0-4.0 cr. [max 12.0 cr.];
prereq EE or CompE grad student or #; only available for Rochester Campus; fall, spring, offered periodically)
Special topics in electrical and computer engineering. Topics vary.

EE 5990. Curricular Practical Training. (1.0-2.0 cr. [max 6.0 cr.]; S-N or Audit; prereq
Grad student; #; fall, spring, summer, every year)
Industrial work assignment involving advanced electrical engineering technology. Review by faculty member. Final report covering work assignment.

EE 8100. Advanced Topics in Electronics. (1.0-3.0 cr. [max 12.0 cr.]; #; Prereq
Topics vary according to needs and staff availability.)

EE 8141. Advanced Heterojunction Transistors. (3.0 cr.; prereq 5664 or #;)
Recent developments in device modeling with emphasis on bipolar junction transistors. High-level effects in base and collector regions and their interrelationship.

EE 8161. Physics of Semiconductors. (3.0 cr.; prereq #; fall, spring, offered periodically)

EE 8163. Quantum Electronics. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically)

EE 8190. Electronics Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq #; fall, spring, offered periodically)
Current literature, individual assignments.

EE 8210. System Theory Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, offered periodically)
Current literature, individual assignments.

EE 8213. Advanced System Theory. (3.0 cr.; prereq IT grad student; #; Generalized linear systems; applications, structural properties, computational approaches, classification, functional behavior, and synthesis.

EE 8215. Nonlinear Systems. (3.0 cr.; prereq #; fall, spring, offered periodically)
Current topics in stability analysis of nonlinear systems, design of controllers for nonlinear systems, discrete-time and stochastic nonlinear systems.

EE 8230. Control Theory Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, offered periodically)
Current literature, individual assignments.

EE 8231. Optimization Theory. (3.0 cr.;
prereq #; fall, offered periodically)
Introduction to optimization in engineering; approximation theory. Least squares estimation, optimal control theory, and computational approaches.

EE 8235. Advanced Control Topics. (3.0 cr.;
spring, offered periodically)

EE 8300. Advanced Topics in Computers. (1.0-3.0 cr. [max 12.0 cr.];
Topics vary according to needs and staff availability.)

EE 8310. Advanced Topics in VLSI. (1.0-3.0 cr. [max 12.0 cr.]; #; Topics vary according to needs and staff availability.)

EE 8320. Advanced Topics in Design Automation. (1.0-3.0 cr. [max 12.0 cr.];
A-F or Audit; prereq Grad student or #; fall, offered periodically)
State-of-the-art automated design tools for electronic system design. Topics vary.

EE 8331. CMOS Data Converters: A/D and D/A. (3.0 cr.; prereq 5333 or #; fall, spring, every year)
Data converters, low power low voltage analog circuits. Basic background in design of CMOS analog-to-digital and digital-to-analog converters. Special circuit design techniques for low power design. Students design/test several design problems.

EE 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser
and DGS consent; fall, spring, summer, every year)

EE 8337. Analog Circuits for Wire/Wireless Communications. (3.0 cr.; A-F or Audit;
prereq 5333; spring, every year)
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. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, every year)
Current literature, individual assignments.

EE 8367. Parallel Computer Organization. (3.0 cr.; =CSCI 8205; prereq 5364 or CSci 5204; spring, every year)

EE 8370. Computer Aided Design Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq [EE or CompE or CSci] grad major; #; fall, spring, every year)
Current literature, individual assignments.

EE 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

EE 8500. Seminar: Communications. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, every year)
Current literature, individual assignments.

EE 8510. Advanced Topics in Communications. (1.0-3.0 cr. [max 12.0 cr.];
prereq #; Topics vary according to needs and staff availability.)

EE 8520. Advanced Topics in Signal Processing. (1.0-3.0 cr. [max 12.0 cr.];
prereq #; spring, every year)
Topics vary according to needs and staff availability.

EE 8581. Detection and Estimation Theory. (3.0 cr.; prereq 5531 or #; spring, offered periodically)
Risk theory approach to detection and estimation, random process representation, signal parameter estimation. Waveform estimation; detection of phase, frequency, and delay in signals. Applications to communications and radar-sonar signal design and processing.

EE 8591. Predictive Learning from Data. (3.0 cr.; prereq CSE grad student or #; fall, every year)
Basic elements and application areas of artificial intelligence (AI) related to design and implementation of expert systems (ES). Knowledge representation, reasoning under uncertainty, ES and their environment, planning, natural language processing (NLP), intelligent computer-aided instruction (ICAI), and AI tools (software and hardware).

EE 8601. Advanced Electromagnetic Theory. (3.0 cr.; A-F or Audit; prereq 4601 or equiv.)

EE 8610. Seminar: Electronics, Fields, and Photonics. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq EE grad major or #; fall, spring, every year)
Students are assigned readings from current literature and make individual presentations.
to class. From time to time outside speakers present research papers.


EE 8620. Advanced Topics in Magnetics. (1.0-3.0 cr. [max 12.0 cr.]; prereq 5653 or #; fall, offered periodically) Topics vary according to needs and staff availability.

EE 8630. Advanced Topics in Electromagnetics. (1.0-3.0 cr. [max 12.0 cr.]; ) Topics vary according to needs and staff availability.

EE 8660. Seminar: Magnetics. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, every year) Current literature, individual assignments.

EE 8866. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

EE 8725. Advanced Power System Analysis and Economics. (3.0 cr.; prereq 4721, CSE grad student or #; fall, offered periodically) Solving sets of equations that involve large sparse matrices. Sparse matrix storage, ordering schemes, application to power flow, short circuit calculation, optimal power flow, and state estimation.


EE 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

EE 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; fall, spring, summer, every year) Thesis credit.

EE 8920. Teaching Experience in Electrical and Computer Engineering. (1.0 cr. [max 3.0 cr.]; S-N only; prereq PhD candidate in electrical engineering, passed written preliminary exam; spring, every year) Coteach class under guidance of faculty mentor. Students directly teach approximately half of the classes. Feedback to improve teaching effectiveness. Meet regularly with peers and instructor to discuss teaching concerns/issues.

EE 8925. Ethics in Electrical and Computer Engineering. (1.0 cr.; S-N only; prereq Grad student in electrical engineering; fall, every year) Topics on issues such as data integrity, professional conduct, authorship, plagiarism, patents, copyrights, conflicts, and disclosures. Students study cases, present findings, and write report.

EE 8940. Special Investigations. (1.0-3.0 cr. ; prereq 1-3 cr [may be repeated for cr]; IT grad student or #; fall, spring, summer, every year) Studies of approved theoretical or experimental topics.

EE 8950. Advanced Topics in Electrical and Computer Engineering. (1.0-3.0 cr. [max 12.0 cr.]; prereq Grad Cr or [may be repeated for cr]; #; fall, spring, summer, every year) Topics vary according to needs and staff availability.

EE 8965. Plan C Project I. (3.0 cr.; prereq Grad EE major; fall, spring, summer, every year) Project topics arranged between student and adviser. Written reports.

EE 8967. Plan C Project II. (1.0-3.0 cr. ; prereq EE grad student; fall, spring, summer, every year) Project topics arranged between student and adviser. Written reports.

EE 8970. Graduate Seminar I. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq Grad student; fall, every year) Recent developments in electrical engineering, related disciplines.

EE 8980. Graduate Seminar II. (1.0 cr. [max 3.0 cr.]; S-N or Audit; spring, every year) Recent developments in electrical engineering, related disciplines.

Endodontics (ENDO)
School of Dentistry


ENDO 5304. Advanced Clinical Endodontics. (1.0-6.0 cr. ; A-F or Audit; fall, summer, every year) Diagnosis/treatment of clinical cases. Complex cases, new/unique techniques.

ENDO 5305. Advanced Clinical Endodontics. (1.0-6.0 cr. ; A-F or Audit; prereq 5304; fall, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5306. Advanced Clinical Endodontics. (1.0-6.0 cr. ; A-F or Audit; spring, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5307. Advanced Clinical Endodontics. (1.0-6.0 cr. ; A-F or Audit; prereq 5306; summer, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5308. Advanced Clinical Endodontics. (1.0-6.0 cr. ; A-F or Audit; prereq 5307; %; fall, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5309. Advanced Clinical Endodontics. (1.0-6.0 cr. ; A-F or Audit; prereq 5308; spring, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5310. Advanced Clinical Endodontics. (1.0-6.0 cr. ; A-F or Audit; prereq 5309; summer, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5311. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq %; summer, every year) Each student is assigned weekly periods (8 hours/week) and is responsible for all emergencies in the endodontic clinic during this time.

ENDO 5312. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5311; fall, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.

ENDO 5313. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5312; spring, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.

ENDO 5314. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5313; summer, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.

ENDO 5315. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5314; %; fall, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.

ENDO 5316. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5315; spring, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.

ENDO 5317. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5316; summer, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.
ENDO 5320. Advanced Endodontic Lecture. (1.0 cr.; A-F or Audit; prereq %; fall, every year) Pulpal and periapical pathology, diagnosis, and treatment planning.

ENDO 5322. Advanced Endodontic Lecture. (1.0 cr.; A-F or Audit; prereq 8321; fall, every year) Pulpal/periapical pathology, diagnosis, treatment planning.

ENDO 8311. Literature Review. (2.0 cr.; A-F or Audit; prereq 8311; fall, every year) Critical review of classic/current endodontic literature.

ENDO 8312. Literature Review. (2.0 cr.; A-F or Audit; prereq 8311; fall, every year) Critical review of classic/current endodontic literature.

ENGL 5030. Review of Cases. (1.0-2.0 cr.; A-F or Audit; prereq 5320; spring, summer, every year) Oral/visual presentation of endodontic cases with follow up. Presentation of cases before surgery.

ENDO 5330. Review of Cases. (1.0 cr.; A-F or Audit; prereq 5330; fall, every year) Oral/visual presentation of endodontic cases with follow up. Presentation of cases before surgery.

ENDO 5331. Review of Cases. (1.0 cr.; A-F or Audit; prereq 5330; fall, every year) Oral/visual presentation of endodontic cases with follow up. Presentation of cases before surgery.
ENGL 5711. Introduction to Editing. (4.0 cr.; fall, spring, summer, every year)
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 5712. Advanced Editing. (4.0 cr.; prereq [5401, 5711] or grad student in English; spring, odd years)
Editing long text. Fiction, children's literature, translations, indexes. Workshop/seminar.

ENGL 5743. History of Rhetoric and Writing. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Assumptions of classical/contemporary rhetorical theory, especially as they influence interdisciplinary field of composition studies.

ENGL 5790. Topics in Rhetoric, Composition, and Language. (3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically)
Topics specified in Class Schedule.

ENGL 5800. Practicum in the Teaching of English. (1.0-3.0 cr.; prereq Grad student or #; fall, every year)
Discussion of and practice in recitation, lecture, small-groups, tutoring, individual conferences, and evaluation of writing/reading. Emphasizes theory informing effective course design/teaching for different disciplinary goals. Topics vary. See Class Schedule.

ENGL 5805. Writing for Publication. (3.0 cr.; prereq Grad student or #; fall, even years)

ENGL 5992. Directed Readings, Study, or Research. (1.0-3.0 cr. [max 45.0 cr.]; fall, spring, summer, every year)
TBD Prereq-Grad student or instr consent.

ENGL 8090. Seminar in Special Subjects. (3.0 cr. [max 12.0 cr.]; fall, every year)
Sample topics: literature of World War II, writings of the Holocaust, literature of English Civil War, advanced versification.

ENGL 8110. Seminar: Medieval Literature and Culture. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)
Sample topics: Chaucer, "Piers Plowman"; Middle English literature, 1300-1475; medieval literary theory; literature/class in 14th-century; texts/heresies in late Middle Ages.

ENGL 8120. Seminar in Early Modern Literature and Culture. (3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, every year)
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.

ENGL 8150. Seminar in Shakespeare. (3.0 cr. [max 9.0 cr.]; fall, spring, every year)
Perspectives/work vary with offering and instructor. Text, performance, interpretation, criticism, feminism, intellectual history. Recent topics: Shakespeare at comedy, "Elegy by W.S." (is it Shakespeare's?), Roman political tragedies. Topics specified in Class Schedule.

ENGL 8170. Seminar in 19th-Century British Literature and Culture. (3.0 cr. [max 12.0 cr.]; fall, spring, every year)

ENGL 8180. Seminar in 20th-Century Anglophone Literatures and Cultures. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)
Topics in Anglophone literatures of Canada, Africa, the Caribbean, India and Pakistan, and the Pacific. Sample topics: Stuart Hall and Black Britain; Salman Rushdie and cosmopolitan literatures; national literatures and partitioned states. Topics specified in Class Schedule.

ENGL 8190. Seminar in 20th-Century Anglophone Literatures and Cultures. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)
Topics in Anglophone literatures of Canada, Africa, the Caribbean, India and Pakistan, and the Pacific. Sample topics: Stuart Hall and Black Britain; Salman Rushdie and cosmopolitan literatures; national literatures and partitioned states. Topics specified in Class Schedule.

ENGL 8200. Seminar in American Literature. (3.0 cr. [max 12.0 cr.]; fall, spring, every year)

ENGL 8290. Topics, Figures, and Themes in American Literature. (3.0 cr. [max 12.0 cr.]; fall, spring, every year)
Sample topics: Dickens, 19th-century imperialism, Faulkner, San Francisco poets, humor, Chaplin, Hitchcock, and popular culture. Topics specified in Class Schedule.

ENGL 8300. Seminar in American Minority Literature. (3.0 cr. [max 12.0 cr.]; fall, offered periodically)
Sample topics: Harlem Renaissance, ethnic autobiographies, Black Arts movement. Topics specified in Class Schedule.

ENGL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ENGL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ENGL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ENGL 8510. Studies in Criticism and Theory. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)
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.

ENGL 8520. Seminar: Cultural Theory and Practice. (3.0 cr. [max 12.0 cr.]; fall, spring, every year)
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.

ENGL 8530. Seminar in Feminist Criticism. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)
Brief history of feminist criticism, in-depth treatment of contemporary perspectives/issues. Topics specified in Class Schedule.

ENGL 8600. Seminar in Language, Rhetoric, Literacy, and Composition. (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically)
Students read/conduct research on theories/literature relevant to cross-disciplinary fields committed to writing and to teaching writing.

ENGL 8610. Seminar in Language and Discourse Studies. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)

ENGL 8625. Dissertation Seminar: Preparing the Book List and Prospectus. (2.0 cr.; prereq Eng PhD student in [3rd or 4th yr], at least 12 cr completed; spring, every year)
Assembling book list, defining field of study, and articulating a rationale for list. How to conceptualize/develop dissertation prospectus. Students work with faculty advisor, assisting committee, and peer writing group.

ENGL 8626. Dissertation Seminar: Writing the Dissertation. (2.0 cr.; prereq English PhD student, passed prelim exam; spring, every year)
Conceptualizing dissertation (using model of Graduate School doctoral Dissertation Fellowship application). Producing dissertation draft chapter/proposal. Students work with instructor, advising committees, and peer writing groups.

ENGL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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
English: Creative Writing (ENGW)
College of Liberal Arts

ENGW 5102. Advanced Fiction Writing. (4.0 cr. [max 8.0 cr.]; Student Option No Audit; prereq Students may not audit this course; fall, spring, every year) Advanced workshop for graduate students with considerable experience in writing fiction.

ENGW 5104. Advanced Poetry Writing. (4.0 cr. [max 8.0 cr.]; Student Option No Audit; prereq Students may not audit this course; fall, every year) Advanced workshop for graduate students with considerable experience in writing poetry. Explore new poetic possibilities/read contemporary poetry/poetics.

ENGW 5106. Advanced Literary Nonfiction Writing. (4.0 cr. [max 8.0 cr.]; Student Option No Audit; prereq Students may not audit this course; fall, every year) Advanced workshop for graduate students with considerable experience in writing literary nonfiction.

ENGW 5110. Topics in Advanced Fiction Writing. (4.0 cr. [max 16.0 cr.]; prereq %; fall, spring, offered periodically) Special topics in fiction writing. Topics specified in Class Schedule.

ENGW 5120. Topics in Advanced Poetry. (4.0 cr. [max 16.0 cr.]; prereq %; spring, every year) Special topics in poetry writing. Topics specified in Class Schedule.

ENGW 5130. Topics in Advanced Creative Writing. (4.0 cr. [max 16.0 cr.]; prereq %; fall, spring, every year) Workshop. Might include work in more than one genre.

ENGW 5202. Journal and Memoir Writing. (3.0 cr.; fall, spring, summer, every year) Using memory in writing, from brainstorming to drafting to revision, in several genres (poems, traditional memoir essays, fiction). How diverse cultures shape memory differently.

ENGW 5205. Screenwriting. (4.0 cr.; Student Option No Audit; prereq [Jr or sr], one EngW 3xxx course, [permission number available in creative writing office], students may not audit this course.; fall, spring, every year) Advanced workshop. Contact creative writing program for specific description.

ENGW 5210. Topics in Advanced Literary Nonfiction. (4.0 cr. [max 16.0 cr.]; prereq %; fall, spring, offered periodically) Special topics in essay writing (e.g., arts writing, writing about public affairs, writing in personal voice). Topics specified in Class Schedule.

ENGW 5310. Reading as Writers. (4.0 cr. [max 8.0 cr.;]; Student Option No Audit; prereq Students may not audit course.; fall, every year) Special topics in reading fiction, literary nonfiction, poetry. Topics specified in Class Schedule.

ENGW 5993. Directed Study in Writing. (1.0-4.0 cr. [max 18.0 cr.;]; spring, summer, every year) Projects in writing poetry, fiction, drama, and nonfiction, or study of ways to improve writing. Prereq-instr consent, dept consent, college consent.

ENGW 8101. Reading Across Genres. (4.0 cr.; Student Option No Audit; prereq Students may not audit this course; fall, every year) Contemporary writing in fiction, poetry, drama, and nonfiction. Primarily reading course rather than writing course.

ENGW 8110. Seminar: Writing of Fiction. (4.0 cr. [max 16.0 cr.]; prereq %; spring, every year) Focuses on full-length book (e.g., novel, short story collection). Assignments in common, individual project.

ENGW 8120. Seminar: Writing of Poetry. (4.0 cr. [max 8.0 cr.;]; prereq %; spring, every year) Focuses on exploration and practice of various styles. Assignments in common and individual project.

ENGW 8130. Seminar: Writing of Literary Nonfiction. (4.0 cr. [max 8.0 cr.;]; prereq %; fall, spring, every year) Advanced workshop. Assignments in common and individual projects.

ENGW 8140. Thesis Seminar: Poetry. (4.0 cr. [max 8.0 cr.;]; prereq Creative writing MFA student, #; fall, every year) For students working on their creative project.

ENGW 8150. Thesis Seminar: Fiction. (4.0 cr. [max 8.0 cr.;]; prereq Creative writing MFA student, #; fall, every year) Students work on creative project.

ENGW 8160. Thesis Seminar: Nonfiction. (4.0 cr. [max 8.0 cr.;]; prereq Creative writing MFA student, #; fall, every year) Students work on their creative project.

ENGW 8170. MFA Practicum: EngW 1101W. (3.0 cr.; S-N only; prereq Creative writing MFA student, #; fall, spring, every year) Teaching Practicum for Teaching Assistants assigned to EngW 1101W.

ENGW 8180. Thesis Seminar: Multi-Genre. (4.0 cr.; A-F only; prereq MFA creative writing program grad student; fall, every year) Thesis preparation course for advanced graduate students in the creative writing MFA program.

ENGW 8310. Topics in Creative Writing. (4.0 cr. [max 8.0 cr.;]; prereq [English or creative writing] grad major or %; fall, spring, offered periodically) Special topics in fiction, literary nonfiction, poetry. Topics specified in Class Schedule.

ENGW 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) For students working on their creative project.

Entomology (ENT)
College of Food, Agricultural and Natural Resource Sciences

ENT 5009. Pesticides in Horticulture: Their Use and Abuse. (3.0 cr.; A-F or Audit; prereq [[4015 or 4251], PlPA 2001] or #; spring, every year) History of pesticide use. Case studies on specific pesticide issues, such as DDT, atrazine, Temik, and imidacloprid. Pesticides use, application methods, environmental concerns. Training for pesticide certification license for Minnesota. Test given near campus during course.

ENT 5011. Insect Structure and Function. (4.0 cr.; A-F or Audit; prereq 3005 or #; fall, spring, every year) Comparative study of insect structures/functions from evolutionary perspective. Introduction to physiology of digestion, respiration, other organ systems.


ENT 5041. Insect Ecology. (3.0 cr.; prereq Biol 5041 or EBB 5122 or #;) Synthetic analysis of the causes of insect diversity and of fluctuations in insect abundance. Focus on abiotic, biotic, and evolutionary mechanisms influencing insect populations and communities.


ENT 5121. Applied Experimental Design. (4.0 cr.; =[AGRO 5121]; prereq Stat 5021 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. Offered with AGRO 5121.

ENT 5241. Ecological Risk Assessment. (3.0 cr.; prereq #; spring, every year) Evaluating current/potential impact of physical, chemical, biological agents on ecosystems. Identifying ecological stressors, assessing level of exposure, measuring ecological responses, communicating/managing risks. Class participation, two reaction papers, final exam, small-group project.

ENT 5275. Medical Entomology. (3.0 cr.; prereq #; fall, even years) Biology of arthropod vectors of human disease. Emphasizes disease transmission and host, vector, and pathogen interactions.

ENT 5341. Biological Control of Insects and Weeds. (3.0-4.0 cr.; prereq 3001, Biol 1009, EEB 3001 or grad; spring, offered periodically) 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. (4.0 cr.; A-F or Audit; prereq #; spring, every year) 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 5371. Principles of Systematics. (3.0 cr.; prereq #; offered all yrs; spring, every year) Theoretical/practical procedures of biological systematics. Phylogeny reconstruction, including computer assisted analyses, morphological/molecular approaches, species concepts, specification, comparative methods, classification, historical biogeography, nomenclature. Use/value of museums.

ENT 5900. Basic Entomology. (1.0-6.0 cr. [max 12.0 cr.;] prereq #; fall, spring, every year) For graduate students who need to make up certain deficiencies in their biological science background.

ENT 5910. Special Lectures in Entomology. (1.0-6.0 cr. [max 10.0 cr.;] prereq #; spring, every year) Individual field, lab, or library studies in various aspects of entomology.

ENT 5920. Special Lectures in Entomology. (2.0-4.0 cr. [max 12.0 cr.;] fall, spring, every year) 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. (1.0-3.0 cr.; A-F or Audit; prereq 3005 or equiv or #; fall, spring, every year) 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.

ENT 8041. Advanced Insect Genetics. (2.0 cr.; prereq [5011, basic genetics course] or #; offered all yrs; fall, spring, offered periodically) Molecular genetic techniques and their applications. Emphasizes insect species other than Drosophila. Application of genetic techniques to physiological processes.

ENT 8051. Toxicology. (2.0 cr.; prereq [5011, organic, inorganic] chem courses, biochem course) or #; ) Chemistry, mode of action of conventional insecticides. Insect growth regulators, microbial pesticides. Transgenic viruses, genetically modified plants. Offered alternate years.

ENT 8061. Scientific Communication and Ethics. (1.0 cr.; S-N or Audit; ) 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.

ENT 8200. Colloquium in Social Insects. (1.0-3.0 cr.; prereq 3020 or 3200; pre auditing) Current research on bees, wasps, ants, and termites. Students critique and research reports.

ENT 8210. Colloquium in Insect Evolution. (1.0-3.0 cr.; 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.

ENT 8240. Colloquium in Insect Ecology. (1.0-2.0 cr.; prereq 5041 or 5045 or #; fall, spring, every year) Advanced topics.

ENT 8300. Graduate Seminar. (1.0 cr.; S-N or Audit; prereq #; fall, spring, every year) Oral and written reports on and discussion by students of selected topics from current literature.

ENT 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ENT 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ENT 8594. Research in Entomology. (1.0-16.0 cr. [max 36.0 cr.;] S-N or Audit; fall, spring, every year) Directed research.

ENT 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.;] No Grade Associated; 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; fall, spring, summer, every year) TBD

ENT 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

ENT 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)
ESPM 5019. Business, Natural Environment, and Global Economy. (2.0 cr.; A-F only; [MCGMT 5019]; fall, every year) Business strategies that affect natural environment. Ways business strategies/practices can produce win-win outcomes for the environment and business.

ESPM 5031. Applied Global Positioning Systems for Geographic Information Systems. (3.0 cr.; A-F or Audit; [ESPM 3031]; prereq Grad student or #; spring, every year) GPS principles, operations, techniques to improve accuracy. Datum, projections, and coordinate systems. Differential correction, accuracy assessments discussed/applied in lab exercises. Code/correlate 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.

ESPM 5061. Water Quality and Natural Resources. (3.0 cr.; prereq Grad student or #; fall, spring, every year) 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.

ESPM 5071. Ecological Restoration. (4.0 cr.; prereq [one college course in ecology, one college course in [plant science or botany]] or #; fall, every year) Ecological/physiological concepts for revegetation of grasslands, wetlands, forests, and landscapes. Plant selection, stand establishment/evaluation. State/federal programs that administer restoration/reclamation. Field trips.

ESPM 5101. Conservation of Plant Biodiversity. (3.0 cr.; A-F or Audit; [ESPM 3101]; prereq Grad student or #; fall, every year) 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 5102. Managing International Natural Resources Programs and Projects: Forests, Water and Land Use. (3.0 cr.; A-F only; fall, every year) Global hot spots where biodiversity is threatened by multiple stressors (zoonotic disease, rapid growth, opening of new frontiers, climate change). Strategies to address complex situations. Emphasis on learning interdisciplinary applied skills, management practices, hands-on techniques.

ESPM 5108. Ecology of Managed Systems. (4.0 cr.; A-F or Audit; [ESPM 3108]; prereq Sr or grad student; fall, every year) Analysis of functioning of ecosystems primarily structured by managed plant communities. Managed forests, field-crop agroecosystems, rangelands, aquatic systems. Structure-function relations. Roles of biodiversity in productivity, resource-use efficiency, nutrient cycling, resilience. Emerging principles for design of sustainable managed ecosystems, provision of ecological services.

ESPM 5111. Hydrology and Water Quality Field Methods. (3.0 cr.; A-F or Audit; [ESPM 3111]; prereq Grad student or #; spring, every year) Integrates water quality, surface/groundwater hydrology. Case studies, hands-on field data collection, calculations of hydrological/water quality parameters. Meteorological data, snow hydrology, stream gauging, well monitoring, automatic water samplers. Designing water quality sampling program. Geomorphology, interception, infiltration.

ESPM 5202. Environmental Conflict Management, Leadership, and Planning. (3.0 cr.; A-F or Audit; [ESPM 3202W]; prereq Grad or #; spring, every year) 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, and skills.

ESPM 5204. Sustainable Community Based Natural Resource Management. (3.0 cr.; A-F only; spring, every year) Part of Nepal Semester Abroad Program in spring 2014. Principles of natural resource based sustainable development in developing country setting. International perspectives on sustainable resource use/management in developed/developing countries.

ESPM 5211. Survey, Measurement, and Modeling for Environmental Analysis. (3.0 cr.; [ESPM 3211]; prereq Grad student or #; spring, every year) 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. (3.0 cr.; [ESPM 3241W]; prereq Grad student or #; spring, every year) Introductions to public policy and natural resources. Role of policy analysis principles/concepts to critically evaluate environment/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. (3.0 cr.; A-F or Audit; [ESPM 3245]; prereq Grad student or #; fall, every year) Planning theories, concepts, and constructs. Policies, processes, and tools for sustainable land use planning. Scientific/technical literature related to land use planning. Skills needed to participate in sustainable land use planning.

ESPM 5251. Natural Resources in Sustainable International Development. (3.0 cr.; A-F or Audit; [LAS 3251, ESPM 3251]; prereq Grad student or #; fall, every year) 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 5295. GIS in Environmental Science and Management. (4.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year) Application of spatial data inventory/analysis in complex environmental planning problems. Spatial data collection. Database development methods, including GPS, DLG, TIGER, NDI data, and spatial analysis. Topics identified by non-University partners.

ESPM 5402. Biometry. (3.0 cr.; prereq MATH 1271, PHYS 1201, STAT 3011, [Grad or #]; fall, even years) Calculus-based introduction to atmospheric boundary layer (ABL), interface between earth's surface and the atmosphere. ABL development/turbulence, surface energy.
balance, ABL clouds, air quality, microclimate, observational/modeling methods.

ESPM 5480. Topics in Natural Resources. (1.0-4.0 cr. [max 6.0 cr.; prereq Sr or grad student; fall, spring, summer, every year] Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule.

ESPM 5555. Wetland Soils. (3.0 cr.; A-F or Audit; =SOIL 5555; prereq 1125 or 2125 or equiv or #; & 4511 recommended; fall, every year) 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.

ESPM 5575. Wetlands. (3.0 cr.; =ESPM 3575; prereq 3575, [sr or grad student or #]; spring, every year) Freshwater wetland classification, wetland biota, current/historic status of wetlands, value of wetlands. National, regional, Minnesota wetlands conservation strategies. Ecological principles used in wetland management.


ESPM 5602. Regulations and Corporate Environmental Management. (3.0 cr.; A-F only; =MGMT 3602, ESPM 3602; prereq APEC 1101 or Econ 1101; spring, every year) Concepts, major issues relating to industrial ecology and industry as they are influenced by current standards/regulations at local, state, and national levels.

ESPM 5603. Environmental Life Cycle Analysis. (3.0 cr.; A-F only; prereq Math 1142 or Math 1271, Math 1282), [Econ 1101 or ApEc 1101; fall, every year] 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. (3.0 cr.; A-F only; =ESPM 3604); fall, every year) Environmental problems such as climate change, ozone depletion, and loss of biodiversity.


ESPM 5606. Pollution Prevention: Principles, Technologies, and Practices. (3.0 cr.; A-F only; =ESPM 3606W; prereq CHEM 1011 or [CHEM 1015, CHEM 1017] or #; fall, every year) Pollution prevention, green chemistry, cleaner production, Design for the Environment (DfE), life cycle management. Pollution prevention practices and technologies that reduce industrial emissions/costs by preventing pollution.

ESPM 5607. Industrial Biotechnology and the Environment. (3.0 cr.; A-F only; =ESPM 4607); prereq BIOL 1009, CHEM 1021, grad student; spring, every year) Biotechnology pertaining to biobased products development and their environmental impact.

ESPM 5609. Air Pollution Impacts, Management, and Ethical Challenges. (3.0 cr.; A-F or Audit; =ESPM 4609); prereq [CHEM 1021 or CHEM 1015], [BIOL 1001 or BIOL 1009 or CHEM 1017]; spring, every year) Air pollutants, sources, and impacts. Humans, plants, animals, soil, water, atmosphere, and planet. Emission rates, measurement, control technologies, air pollution laws/regulations. EPerspectives and personal ethics related to air pollution, how they impact professional/civic life.

ESPM 5703. Agroforestry in Watershed Management. (3.0 cr.; =ESPM 3703); prereq Grad student or #; spring, every year) 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.


ESPM 5820. Clinical Therapeutics. (3.0 cr.; 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 5290. Clinical Clerkship. (1.0-8.0 cr. [max 16.0 cr.; prereq Grad experimental and clinical pharmacology; fall, every year) Supervised study of pharmaceutical services at University of Minnesota Medical Center, Fairview or affiliated institutions.

ECP 5620. Drug Metabolism and Disposition. (3.0 cr.; A-F or Audit; prereq Grad student or #; spring, odd years) 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 5993. Directed Study in Experimental and Clinical Pharmacology. (1.0-4.0 cr.; [max 8.0 cr.;] fall, spring, every year) Student working with faculty member designs a directed study course, including a complete syllabus, appropriate time commitment, and workload for number of credits.

ECP 5994. Directed Research in Experimental and Clinical Pharmacology. (1.0-4.0 cr.; fall, spring, every year) Student works with faculty adviser to design a scientific research project.

ECP 8100. Seminar. (1.0 cr. [max 8.0 cr.;] prereq ECP grad student or #; fall, spring, every year) Selected topics in experimental/clinical pharmacology.

ECP 8200. Research Problems. (1.0-8.0 cr. [max 16.0 cr.; prereq Grad SACP major (ECP Track) or #; fall, spring, summer, every year) Individually designed research experience directed at contemporary problems related to drug use.

ECP 8210. Clinical Therapeutics. (3.0 cr.; 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. (3.0 cr.; prereq SACP grad major (ECP track) or #; fall, every year) Theory of advanced methodologies, applications, and evaluation techniques used to determine efficacy/toxicity of new drug therapies. Techniques for collecting/evaluating data.

ECP 8230. Principles of Clinical Pharmacology. (2.0 cr.; A-F only; prereq Grad student in Experimental and Clinical Pharmacology or #; fall, every year) Factors determining drug exposure, drug-receptor pharmacology, drug response. Personalized medicine including drug interactions, obesity, age (geriatrics/pediatrics), critical illness, therapeutic evaluation, drug development.

ECP 8290. Clinical Clerkship. (2.0 cr.; prereq Grad SACP major in ECP track or #; fall, spring, offered periodically)
Supervised study of pharmaceutical services at Fairview-University Medical Center or affiliated institutions.

ECP 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; fall, spring, summer, every year) FTE: master’s. Prereq: Master’s student, adviser and DGS consent.

ECP 8400. Pharmacometrics. (3.0 cr.; prereq ECP grad major or #; fall, every year) Theory/application of contemporary methods for analysis of concentration-time data and exposure-response relationships.

ECP 8410. Population Pharmacokinetic Modeling. (2.0 cr.; A-F or Audit; spring, summer, every year) 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. (2.0 cr.; prereq ECP grad or #; spring, every year) Theory/application of contemporary methods of using simulations to design more efficient/informative clinical trials.

ECP 8430. Advances in Pharmacometrics Modeling and Simulation. (1.0 cr. [max 6.0 cr.]; S-N only; prereq Grad student in ECP or PHM or #; fall, spring, every year) Modeling/simulation at interface between physiological/pharmacological processes. Current literature, discussion groups. Computer applications using relevant software programs.

ECP 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; fall, spring, summer, every year) FTE: doctoral. Prereq: Doctoral student, adviser and DGS consent.

ECP 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) Doctoral pre-thesis credits.

ECP 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) Thesis credits: master’s.

ECP 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) Thesis credit: doctoral.

ECP 8900. Advanced Topics in Experimental and Clinical Pharmacology. (1.0-4.0 cr.; [max 8.0 cr.; prereq ECP grad program or #; fall, spring, every year) Topic varies depending on faculty teaching course.

ECP 8992. Directed Readings in Experimental and Clinical Pharmacology. (1.0-2.0 cr. [max 4.0 cr.; fall, spring, every year) TBD

ECP 8993. Directed Study in Experimental and Clinical Pharmacology. (1.0-4.0 cr.; fall, spring, every year) ECP 8994. Directed Research in Experimental and Clinical Pharmacology. (2.0 cr.; spring, every year) Directed research in experimental and clinical pharmacology.

Family Medicine and Community Health (FMCH)

FMCH 5345. Curriculum Design and Teaching Strategies for Medical Education I. (3.0 cr.; A-F or Audit; prereq concurrent entitlement in 5346, #; spring, every year) 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. (1.0 cr.; A-F or Audit; prereq 85345, #; summer, odd years) 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. (1.0 cr.; [max 9.0 cr.]; O-N or Audit; prereq MD or DO degree; fall, spring, every year) 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 5650. Principles of Geriatrics I. (1.0 cr. [max 5.0 cr.]; P-N or Audit; prereq Medical School or dental school or GNP School graduate; fall, every year) First in two-course sequence. Survey of major topics in geriatric medicine. Epidemiology, etiology, diagnosis, and treatment of major geriatric syndromes and illnesses.

FMCH 5651. Principles of Geriatrics II. (1.0 cr. [max 5.0 cr.]; P-N or Audit; prereq Medical School or dental school or GNP School graduate; fall, every year) 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. (2.0 cr.; O-N or Audit; prereq Enrollment in health sci grad programs in CSPP, Pay, PubH, SW or FSOS or #; fall, spring, every year) Assessment and treatment techniques pertaining to common sexual problems.

FMCH 5955. Directed Study. (1.0-10.0 cr.; O-N or Audit; prereq #; qualified students may arrange for work on a tutorial basis; fall, spring, summer, every year) Studies on special topics as arranged between student and faculty.

Family Policy Minor (FPOL)

College of Education and Human Development

FPOL 8000. Family Policy Perspectives. (3.0 cr.; A-F or Audit; spring, every year) Policies that affect 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)

College of Education and Human Development

FSOS 5014. Quantitative Family Research Methods I. (3.0 cr.; prereq Grad student or #; fall, every year) 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. (1.0 cr.; S-N or Audit; prereq Grad student or #; fall, every year) 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. (3.0 cr.; prereq Grad student or #; fall, offered periodically) 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 5101. Family Systems. (3.0 cr.; =FSOS 3102; prereq grad student; ) Family systems and other family theories focusing on the dynamics and processes relevant to family life. Diversity issues related to gender, ethnicity, sexual orientation, and disability. Issues related to divorce, single parenthood, and remarriage are covered. Family strengths and family problems are integrated.
FSOS 5150. Special Topics in Family Social Science. (1.0-4.0 cr. [max 24.0 cr.]; prereq #: fall, summer, every year) Review of research/scholarly thought. Topics specified in Class Schedule.

FSOS 5193. Directed Study in Family Social Science. (1.0-6.0 cr. ; prereq FSOS or grad student in related field; fall, spring, summer, every year) TBD

FSOS 5426. Alcohol and Drugs: Families and Culture. (3.0 cr.; [FSOS 3428]; fall, spring, summer, offered periodically) Overview of psychology/sociology of drug use/abuse. Life-span, epidemiological, familial, cultural data regarding use. Fundamentals of licit/illicit drug use behavior. Gender, ethnicity, social class, sexuality, sexual orientation, disability.

FSOS 5429. Counseling Skills Practicum I. (3.0 cr.; [FSOS 3429]; fall, spring, summer, offered periodically) Basic counseling skills. Counselor needs/motivations, non-verbal communication, basic/advanced empathy, identifying strengths, maintaining focus, challenging discrepancies, use of self. Emphasizes building from client strengths, learning through role-playing.

FSOS 5900. Special Topics in Family, Youth, and Community. (1.0-4.0 cr. [max 20.0 cr.]; fall, spring, summer, every year) Topics not dealt with in regular courses. Topics vary by offering.

FSOS 5902. Family Education Perspectives. (3.0 cr.; A-F or Audit; fall, summer, every year) Origins, evolution, and critique of alternative perspectives on family education. Implications for educators, programs, and participants.

FSOS 5904. Contemporary Family Education. (3.0 cr.; A-F or Audit; fall, offered periodically) Contemporary conditions of and transitions in family life. Emphasizes implications for educators and educational programs.

FSOS 5906. Program Planning in Family Education. (3.0 cr.; A-F or Audit; spring, every year) Curriculum research/theory. Alternative perspectives, their concomitant implications for families. Development of and evaluation of family education curriculum/programs.

FSOS 5908. Family and Work Relationships. (3.0 cr.; A-F only; summer, every year) Interactions of work/family roles, responsibilities, and aspirations. Resources, legal aspects, gender.

FSOS 5912. Sexuality Education. (3.0 cr.; A-F only; fall, offered periodically) Development, delivery, and evaluation of sexuality education curriculums/programs.

FSOS 5914. Education for Family Communication. (3.0 cr.; A-F only; spring, every year) Development, delivery, and evaluation of curriculum/programs related to family communication.

FSOS 5932. Introduction to Parent Education. (1.0 cr.; A-F only; fall, summer, every year) Philosophy, history, and models of parent education. Ethical, critically reflective professional practice.

FSOS 5936. Advanced Practice of Parent Education. (3.0 cr.; prereq 5935 or FE 5702 or 60; fall, offered periodically) Evolving perspectives of parent education. Emphasizes psycho-dynamic, conceptual-change approaches. Reflective/dialogic approaches for working with parents in understanding beliefs and examining their origins/consequences. Issues related to diversity, self-awareness, ethics, and evaluation.


FSOS 5942. Everyday Experiences of Families. (2.0 cr.; A-F only; summer, every year) 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.

FSOS 5943. Parent Learning and Development: Implications for Parent Education. (2.0 cr.; A-F only; fall, every year) Research/theoretical perspectives critiqued. Challenging assumptions, examining competencies.

FSOS 5944. Parent Education Curriculum. (2.0 cr.; A-F only; prereq 5943 or #; fall, every year) How parent learning/development, child development, and family systems theories influence curriculum approaches/materials in parent education. Study develop construct, critique, and select curriculum.

FSOS 5945. Teaching and Learning in Parent Education. (2.0 cr.; A-F only; prereq 5943 or #; spring, every year) Students select/use parent education teaching strategies/processes to meet needs of various populations of adult learners. Critical reflection, ethical practices, parent educator competencies.

FSOS 5946. Assessment and Evaluation in Parent Education. (2.0 cr.; A-F only; prereq 5943 or #; spring, every year) Theory, terminology, issues, and approaches in assessment/evaluation. Application to monitoring parent education program performance, assessing program quality, and measuring parent learning/development.

FSOS 5949. Student Teaching in Parent Education. (2.0 cr.; A-F only; prereq #; spring, every year) Supervised parent education practice to meet individual student needs/interests. Online discussion, reflection, cooperative learning.

FSOS 8001. Conceptual Frameworks in the Family. (3.0 cr.; A-F only; fall, every year) Major theoretical models about families, emphasizing sociohistorical context.

FSOS 8002. Advanced Family Conceptual Frameworks. (3.0 cr.; A-F only; prereq 8001 or #; spring, every year) Builds on FSOS 8001 by focusing specifically on family level research questions. Family development/critical theoretical perspectives that can be used to understand/study family processes/contemporary ecological issues.

FSOS 8003. Current Issues in Family Science. (3.0 cr.; spring, every year) 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 8007. Ethical Issues and Moral Dilemmas in Family Life. (3.0 cr.; fall, offered periodically) 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. (3.0 cr.; A-F only; fall, spring, offered periodically) Approaches to qualitative family research evaluation. Phenomenological, feminist, grounded theory, content analytic, ethnemethodological, ethnographic, program evaluation. Theory, research examples, student projects.

FSOS 8014. Quantitative Family Research Methods II. (3.0 cr.; A-F only; prereq [5014 or equiv]; [8001 or equiv]; [two stat courses or #]; spring, every year) Quantitative research process, from developing research question to putting findings to use. Major course project basis for class discussion.
Family research. Applying research knowledge to study of families.

FSOS 8015. Advanced Qualitative Family Research Methods. (3.0 cr.; A-F only; prereq 8013 or #; fall, every year)
Applying qualitative research methods to understand individual/collective meaning, experience within/across diverse family systems.

FSOS 8031. Family of Origin. (3.0 cr.; S-N or Audit; prereq Preference given to marriage and fam therapy students; fall, spring, offered periodically)
In-depth study of each student's family of origin in a group of other students and a clinical faculty therapy supervisor.

FSOS 8033. Problems in Families. (3.0 cr.; prereq [8032 or equiv], #; spring, offered periodically)
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. (3.0 cr.; prereq FSOS doctoral student enrolled in Couple Family Therapy (CFT) or #; fall, offered periodically)
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. (3.0 cr.; A-F or Audit; prereq 8014 or equiv or #; )

FSOS 8036. Couple/Marriage and Family Therapy Research. (3.0 cr.; A-F only; prereq FSOS doctoral student enrolled in Couple Family Therapy (CFT) or #; fall, spring, offered periodically)
Historic/contemporary approaches to C/ MFT research with emphasis on prevention, intervention, dissemination from variety of perspectives.

FSOS 8037. Ethical, Legal, and Professional Issues in Mental Health Practice: Issues with Couples and Families. (2.0-10.0 cr.; A-F or Audit; prereq [8032, practicum or internship exper] or [grad student in cooperating mental hth practice prog who has completed 1 course on therapy with children; fall, spring, offered periodically)
Boundaries and triangles, gender inequities, family law, confidentiality and reporting requirements, dual roles, client diversity, and value clashes.

FSOS 8039. Clinical Interventions for Couples. (3.0 cr.; A-F or Audit; prereq 8032 or equiv or #; fall, offered periodically)
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 Theory Development: A Systemic Perspective. (3.0 cr.; prereq 8001 or equiv or #, FSOS PhD student beyond 1st yr; fall, spring, offered periodically)
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. (3.0 cr.; prereq 8001 or equiv, 8013 or equiv, 8014 or equiv; spring, every year)
For advanced doctoral students primarily in family social science who are working on independent research projects. Giving and receiving of 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 8101. Family Stress, Coping, and Adaptation. (3.0 cr.; prereq 8001 or equiv, research methods course; fall, spring, offered periodically)
Helping families become more resilient to stress by decreasing vulnerability to crises and traumatic stress disorders. Students develop research or intervention proposal on family stress, coping, adaptation, crisis, trauma, or resilience.

FSOS 8104. Family Policy Seminar. (3.0 cr.; spring, offered periodically)
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. (3.0 cr.; prereq 4154 or equiv or #; spring, offered periodically)
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 8106. Seminar: Families From an Economic Perspective. (3.0 cr.; fall, offered periodically)

FSOS 8107. Family Values Research: Theories and Critical Methods. (3.0 cr.; prereq 8013 or equiv, 8014 or equiv or #; WCSE 8920 recommended; )
Interdisciplinary seminar on critical modes of inquiry in the family domain that require designing studies using normative theories, examining values as units of observation, and solving practical problems by collaborative strategies designed to encourage change.

FSOS 8150. Topics in Family Social Science. (1.0-6.0 cr.; prereq FSOS grad student or #; fall, spring, summer, every year)
Special seminars on timely topics.

FSOS 8151. Preparation for Independent Teaching in Family Studies. (1.0 cr.; [max 3.0 cr.; S-N only; prereq #; spring, every year) Practicum. Skills to independently teach family sciences courses to undergrads.

FSOS 8160. Topics in Marriage and Family Therapy. (1.0-6.0 cr.; prereq MFT grad student or #; fall, offered periodically)
Special seminars on timely topics.

FSOS 8193. Directed Study in Family Social Science. (1.0-6.0 cr.; [max 12.0 cr.; prereq Doctoral student in FSOS or related field; fall, spring, summer, every year) Directed study.

FSOS 8200. Orientation for Family Social Science. (1.0 cr.; S-N or Audit; fall, every year)

FSOS 8201. Teaching Family Courses in Higher Education I. (3.0 cr.; S-N or Audit; prereq 12 FSOS grad cr; teaching assistant exper recommended; fall, spring, offered periodically)
Students cooperatively plan, administer, and evaluate (with a graduate faculty supervisor) an undergraduate core course. Improvement of teaching and evaluation methods, and conceptualization and presentation of research-based course in family studies.

FSOS 8202. Teaching Family Courses in Higher Education II. (3.0 cr.; S-N or Audit; prereq 8201 or equiv; fall, spring, offered periodically)
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. (3.0 cr.; S-N or Audit; prereq #; required for grad FSOS majors in marriage and family therapy prog; fall, spring, offered periodically)
Supervised students serve as a consultation group working with community clinicians and their clients, utilizing a one-way window and observation room; opportunities for cotherapy.

FSOS 8295. Couple/Marriage Family Therapy Practicum. (1.5-12.0 cr.; S-N only; prereq FSOS doctoral student enrolled in Couple Family Therapy (CFT) or #; fall, spring, summer, every year) Clinical placement doing marriage/family clinical practice. Supervision of couple/marriage. Family therapy in community setting.

FSOS 8296. Couple/ Marriage Family Therapy Internship. (1.0-12.0 cr.; S-N only; prereq FSOS doctoral student enrolled in Couple Family Therapy (CFT) or #; fall, spring, summer, every year)
FINA 8802. Theory of Capital Markets I: Discrete Time. (2.0 cr.; prereq [Econ 8101, Econ 8102, business admin PhD student] or #; spring, every year)
Modern asset pricing theory. Static/discrete time frameworks. Fundamental asset pricing equation. Classical finance models: CAPM, consumption-based CAPM, APT. Complete markets, representative agent, Pareto optimality. Challenges to theories. Approaches such as habit formation, heterogeneous agents (incomplete markets) model.

FINA 8803. Theory of Capital Markets II: Continuous Time. (2.0 cr.; prereq [Econ 8101, Econ 8102, Business admin PhD student] or #; spring, every year)

FINA 8804. Advanced Continuous Time Finance. (2.0 cr.; prereq 8802, 8803; fall, every year)
Priming of fixed income securities, optimal capital structure, general equilibrium. Classic/current papers in continuous-time literature.

FINA 8810. Topics in Asset Pricing. (2.0 cr.; [max 4.0 cr.;] A-F or Audit; prereq Business admin PhD student or #; fall, every year)
Current topics in asset pricing literature. Students read papers on these topics, derive the main results, identify the main assumptions and thus identify ideas on how to improve upon the current literature.

FINA 8812. Corporate Finance I. (2.0 cr.; prereq [Econ 8103, Econ 8104, Business admin PhD student] or #; fall, spring, every year)

FINA 8813. Corporate Finance II. (2.0 cr.; prereq [8812, business admin PhD student] or #; fall, spring, every year)

FINA 8820. Topics in Corporate Finance. (2.0 cr.; [max 4.0 cr.;] A-F or Audit; prereq Business admin PhD student or #; fall, odd years)
Current topics in corporate finance literature. Students read current papers, derive the main results, identify the main assumptions and thus identify ideas on how to improve on the current literature.

FINA 8822. Empirical Methods in Finance. (2.0 cr.; prereq 8802, 8803; spring, every year)
Empirical techniques in analysis of financial markets, how they are applied to actual market data. Statistical properties of asset returns, efficient markets hypothesis. Empirical tests of asset pricing models (CAPM, APT, Intertemporal CAPM, Consumption CAPM).

FINA 8823. Empirical Corporate Finance. (2.0 cr.; prereq 8802, 8803; spring, every year)
Current empirical research on corporate finance. Mergers/acquisitions, equity offerings, event studies, tests of market efficiency, impact of corporate governance, compensation policies, initial public offerings.

FINA 8890. Seminar: Finance Topics. (2.0-4.0 cr. [max 16.0 cr.;] A-F only; fall, spring, every year)
Current topics/problems of interest considered in depth. Topics vary. Prereq=[8802, 8812, 8822, 8823] or equiv, Business admin student or #; or instr consent.

FINA 8892. Independent Study in Finance. (1.0-6.0 cr. [max 16.0 cr.;] prereq Business admin PhD student or #; fall, spring, summer, every year)
Problems or developments of special interest to the student.

FINA 8894. Directed Research in Finance. (1.0-8.0 cr. [max 16.0 cr.;] prereq Business admin PhD student specializing in finance or #; fall, spring, every year)
Individualized directed research on a project of interest to the student, approved and advised by faculty.

Financial Mathematics (FM)
Institute of Technology

FM 5001. Preparation for Financial Mathematics I. (3.0 cr.; prereq Grad MFM major or MFM program director approval; fall, every year)
Mathematics needed for MFM program.

FM 5002. Preparation for Financial Mathematics II. (3.0 cr.; prereq 5001, program director approval; spring, every year)
Mathematics needed for MFM program.

FM 5011. Mathematical Background for Finance I. (4.0 cr.; prereq [5001, 5002] with grade of at least B or [MFM program director approval, grad MFM major]; fall, every year)
Mathematics needed for MFM program. Focuses on finance.

FM 5012. Mathematical Background for Finance II. (4.0 cr.; prereq 5011, grad MFM major, program director approval; spring, every year)
Mathematics needed for MFM program. Focuses on finance.

FM 5021. Mathematical Theory Applied to Finance I. (4.0 cr.; prereq [5011 or 5011], grad MFM major, program director approval; fall, every year)
Bridge between theory and application.

FM 5022. Mathematical Theory Applied to Finance II. (4.0 cr.; prereq 5021, [5012 or 5012], grad MFM major, program director approval; spring, every year)
Bridge between theory and application.

Curtis L. Carlson School of Management
FM 5031. A Practitioner's Course in Finance I. (4.0 cr.; prereq [5021 or &5021], grad MFM major, program director approval; fall, every year) Practical course taught by industry professionals. Focuses on hands-on real-world problem solving.

FM 5032. A Practitioner's Course in Finance II. (4.0 cr.; prereq 5031, [5022 or &5022], grad MFM major, program director approval; spring, every year) Taught by industry professionals. Focuses on hands-on real-world problem solving.

FM 5091. Computation, Algorithms, and Coding in Finance I. (4.0 cr.; prereq Grad MFM major, program director approval; fall, every year) Implements popular finance models and numerical techniques using mainstream computational tools/languages.

FM 5092. Computation, Algorithms, and Coding in Finance II. (4.0 cr.; prereq 5091, grad MFM major, program director approval; spring, every year) Implements popular finance models and numerical techniques using mainstream computational tools/languages.

FIN 5670. Topics in Finnish Studies. (3.0 cr. [max 9.0 cr.]; ) Interdisciplinary social science topics on Finnish people, culture, and society. Taught in English.

Fisheries and Wildlife (FW)

College of Food, Agricultural and Natural Resource Sciences

FW 5003. Human Dimensions of Biological Conservation. (3.0 cr.; prereq [Biol 1001 or Biol 1009], Biol 3407; fall, every year) Survey of social, psychological, economic, policy aspects of managing/conerving wildlife, fisheries, and related resources.

FW 5051. Analysis of Populations. (4.0 cr.; prereq [4001 or STAT 3011 or ESPM 3012], [Biol 3407 or Biol 3408W or Biol 3807]. Senior or grad student; spring, every year) Regulation, growth, general dynamics of populations. Data needed to describe populations, population growth, population models, regulatory mechanisms.

FW 5292. Special Lectures: Fisheries. (1.0-5.0 cr. [max 15.0 cr.]; =FW 4292; prereq Grad student or #; fall, spring, every year) Lectures in special fields of fisheries given by visiting scholar or regular staff member.

FW 5392. Special Lectures: Wildlife. (1.0-5.0 cr. [max 15.0 cr.]; =FW 4392; prereq Grad student or #; fall, spring, every year) Lectures given by visiting scholar or staff member.

FW 5401. Fish Physiology and Behavior. (3.0 cr.; prereq &FW 4136, CHEM 1021, BIOL 2012; fall, odd years) Fish physiology/beavior. Links between fish biology, fisheries ecology, management, aquaculture. How to write a research proposal. Homeostasis, neurobiology, bioenergetics, reproduction, movement.

FW 5601. Fisheries Population Analysis. (3.0 cr.; A-F or Audit; prereq [4001 or Stat 5021], Biol 3407, [Math 1142 or Math 1271]; fall, every year) Introduction to theory/methods for estimating vital statistics of fish populations. Using microcomputers/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. (3.0 cr.; A-F or Audit; prereq [4102 or 4103], [BIOL 3407 or BIOL 3408 or BIOL 3807]; fall, every year) Environmental interactions of wildlife at population/community levels. Environmental threats from human activities. Habitat management practices. Objectives, polices, regulation in population management.

FW 5604W. Fisheries Ecology and Management. (3.0 cr.; prereq EEB 3603 or EEB 4601 or EEB 5601; spring, every year) Managed species/systems. Applied aquatic/fish ecology related to fisheries. Role of planning in fisheries management. Application of management tools, assessment of their efficacy.

FW 5625. Wildlife Handling and Immobilization for Research and Management. (2.0 cr.; S-N or Audit; prereq General biology, [grad student or vet med student or FW sr]; spring, every year) Practical techniques to maximize human/animal safety and encourage 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 8051. Statistical Modeling of Ecological Data using R and WinBugs/JAGS. (4.0 cr.; A-F only; prereq Graduate-level statistics class, [working knowledge of program R or #]; spring, every year) Regression methods for modeling ecological data. Real world examples from ecology, as well as environmental/natural resource sciences/management. Computer-based solutions using R/Bayesian modeling software.

FW 8200. Seminar. (1.0-4.0 cr. [max 8.0 cr.]; S-N or Audit; fall, spring, every year) 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. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

FW 8394. Research in Fisheries. (1.0-4.0 cr.; fall, spring, summer, every year) Directed research.

FW 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

FW 8448. Fishery Science. (3.0 cr.; prereq Grad student [in fisheries or wildlife conserv or biol or ecology] or #; ) Applying ecological theory to study/management of fish populations. Dynamics of growth, mortality, and yield of fish stocks. Field assessment methodology. Simulation applied to management problems. Web-assisted course. Students produce a publishable (print or electronic) project.

FW 8450. Data Analysis. (4.0 cr.; A-F or Audit; 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. (3.0 cr.; A-F or Audit; fall, every year) Seminar examining population- and 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. (3.0 cr.; prereq Limnology course or #; fall, even years) 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. (1.0 cr.; prereq Vertebrate physiology course or #; ) Lectures, discussion, current literature. Complements 5459.

FW 8462. Advanced Topics in Fish Behavior. (1.0 cr.; prereq 5459 or behavior course or #; fall, spring, offered periodically) Current literature. Complements 5459.

FW 8465. Fish Habitats and Restoration. (3.0 cr.; prereq Intro ecology course or #; fall, odd years) Mechanisms underlying physiology/behavior that shape fish community structure in specific north temperate habitats. Techniques and planning procedures for restoring lakes/streams.

FW 8494. Research in Wildlife. (1.0-4.0 cr. ; prereq #; fall, every year) Directed research.

FW 8576. Biology and Management of Large Mammals. (2.0 cr.; A-F or Audit; prereq

FW 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

FW 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

FW 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

**Food Science and Nutrition (FSCN)**

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

FSCN 5101. Food Regulation in the United States. (2.0 cr. [A-F or Audit; prereq [[Grad or sr] food science or nutrition major] or #; spring, every year) U.S. system of regulation of food product formulation, manufacturing, labeling and advertising, including insight into the manner in which regulation and the underlying food laws are affected by scientific developments and changing societal values and concerns.

FSCN 5122. Food Fermentations and Biotechnology. (2.0 cr. [A-F only; prereq MICB 3301, BIOL 4003; fall, every year) Major food fermentations important for today’s food industry, with particular focus on microbiological components. Fermentations cover all major commodity food groups of dairy, cereal, meat, vegetables, fruits.

FSCN 5123. Molecular Biology for Applied Scientists. (1.0 cr. [A-F only; prereq MICB 3301 or FSCN 2021 or #; fall, every year) Half semester course. Two hours per week for 8 weeks. Basics of molecular biology/ how it has been used for biotechnological applications. Origins of molecular biology from discovery of DNA as inheritance material within cells to advent of gene cloning/sequencing technologies.

FSCN 5131. Food Quality for Graduate Credit. (3.0 cr. [A-F only; prereq Food Science grad student; fall, every year) Management systems, statistical procedures, regulatory requirements involved with producing quality food/ingredients. Risk assessment/management, good manufacturing practices, hazard analysis critical control point (HACCP), statistical methods for process control, total quality management, food/drug laws.

FSCN 5312. Food Analysis. (4.0 cr.; A-F only; prereq 4112, STAT 3011; fall, every year) Analytical tools needed for investigation in Food Science/Technology, whether by food industry, governmental agencies, or universities. Application of quantitative/qualitative physical, chemical/instrumental methods used for analysis/examination of food constituents. Sensory evaluation techniques, evaluation of methods/interpretation of results.

FSCN 5441. Introduction to New Product Development. (2.0 cr.; prereq 4111, 4331; fall, spring, even years) Interactive course that introduces students to the principles of new product development, from identification and testing of new product concepts, through prototype testing, to basic process design using examples from industry.

FSCN 5461. Food Packaging. (2.0 cr.; prereq 1102, 5102, Phys 1102 or Phys 1302; fall, odd years) Materials, principles, and procedures of packaging as they apply to food products. Emphasis is on consumer products, but the principles also apply to bulk and institutional foods and ingredients.


FSCN 5521. Flavor Technology. (2.0 cr.; prereq 4112; spring, odd years) Overview of flavor chemistry/related technology. Analytical techniques, mechanisms of flavor development (chemical/biogenesis), off-flavors, industrial production/application of food flavorings.

FSCN 5531. Grains: Introduction to Cereal Chemistry and Technology. (2.0 cr.; prereq Biol 1009, Chem 1022; ) Origins, structure, biochemistry, and cellular properties of major cereal grains as they relate to primary processing (milling) and secondary processing (production of cereal products).

FSCN 5541. Dairy Product Chemistry and Technology. (2.0 cr.; prereq 3102, 4112, Food Science major, upper division undergraduate or graduate student; fall, odd years) Designed for upper division Food Science undergraduate/graduate students. Physiology of milk production in ruminants. Resulting composition, chemical, physical, microbiological properties of milk components. How milk products are manufactured.

FSCN 5601. Management of Eating Disorders. (3.0 cr.; prereq Sr or grad student in Nutrition or health related program or #; fall, spring, every year) Etiology, occurrence, course, treatment, prevention of eating disorders from multidisciplinary perspective. Roles/ responsibilities of eating disorder treatment team members of varying types across various treatment milieus.

FSCN 8310. General Seminar. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Presentations by faculty, graduate students, and outside speakers.

FSCN 8318. Current Issues in Food Science. (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq 4111, 4121; %, spring, every year) Current issues, how they impact food industry.

FSCN 8320. Advanced Topics in Food Science. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Recent research or special topics.

FSCN 8330. Research Topics. (1.0, max 6.0 cr.; fall, spring, summer, every year) Seminar in which faculty member or group of faculty/graduate students discusses research progress or review/discuss current research literature.

FSCN 8331. Food Proteins. (2.0 cr.; prereq 4112, 4312; spring, odd years) Protein biochemistry as applied to food systems/processing. Forces that determine protein structure. Isolation/characterization of food proteins. Structure/function relationships in handling/processing food protein systems.

FSCN 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

FSCN 8334. Reaction Kinetics of Food Deterioration. (2.0 cr.; 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 biologics.

FSCN 8335. Carbohydrate Chemistry in Food and Nutrition. (2.0 cr.; prereq 4112; spring, every year) Carbohydrates as food components, their use as food ingredients. Reactions of mono/di/polysaccharides during food processing. Biosynthesis of carbohydrates, their metabolism. Methods in carbohydrate analysis.


FSCN 8337. Flavor Chemistry. (2.0 cr.; prereq 4111; ) Chemistry involved in formation, analysis, and release of flavoring materials in foods.

FSCN 8338. Antioxidants in Food: Practical Applications. (2.0 cr.; prereq 4111, Bioc 3021, food chemistry, organic chemistry, biochemistry; spring, every year)
Mechanisms of antioxidant activities in food systems. Free radical scavengers, hydroperoxide stabilizers, synergists, metal chelators, singlet oxygen quenchers, substance reducing hydroperoxides. Practical applications of antioxidants in various food systems, effect of antioxidants on health/diseases.

FSCN 9391. Independent Study: Food Science. (1.0-4.0 cr.; max 6.0 cr.; preq #: fall, spring, summer, every year) Includes written reports.

FSCN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; preq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

FSCN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; preq 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; fall, spring, summer, every year) (No description)

FSCN 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; preq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

FSCN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; preq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Foreign Study - SPAN (FSSP) College of Liberal Arts

FSSP 5960. Preparatory Seminar for SPAN Overseas Research. (4.0 cr.; A-F or Audit; =FSSP 3960; preq %; summer, every year) Preparatory seminar for SPAN overseas research.

FSSP 5970W. Seminar for SPAN Overseas Research. (4.0 cr.; A-F or Audit; =FSSP 3970, FSSP 5980; preq %; summer, every year) Seminar for SPAN overseas research.

Forest and Natural Resource Management (FNRM) College of Food, Agricultural and Natural Resource Sciences

FNRM 5101. Park and Protected Area Tourism. (3.0 cr.; A-F or Audit; =FNRM 3101; preq Grad student or #; fall, odd years) Interaction of resource based tourism with cultural/natural environments. Impacts of tourism on environment.

FNRM 5104. Forest Ecology. (4.0 cr.; A-F or Audit; =FNRM 3104; preq [Biol 1001 or 1009], grad student) or #: 1 semester college chemistry recommended; fall, every year) 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.

FNRM 5114. Hydrology and Watershed Management. (3.0 cr.; =FNRM 3114; preq Grad student or #: fall, every year) Introduction to hydrologic cycle and water processes in upland/riparian systems. Applications of hydrological concepts to evaluate impacts of forest management and other land use patterns/activities on water yield, stormflow, erosion, sedimentation, and water quality. Concepts, principles, and applications of riparian/watershed management. Economic/social factors. National/global examples. Emphasizes forest ecosystems.

FNRM 5131. Geographical Information Systems (GIS) for Natural Resources. (4.0 cr.; A-F or Audit; =FNRM 3131; preq Grad student or #: fall, every year) Geographic information systems (GIS), focusing on spatial data development and analysis in the science and management of natural resources. Basic data structures, sources, collection, and quality; geodesy and map projections; spatial and tabular data analyses; digital elevation data and terrain analyses; cartographic modeling and layout. Lab exercises provide practical experiences complementing theory covered in lecture.

FNRM 5146. Science and Policy of Global Environmental Change. (3.0 cr.; =EEB 5146; preq 3104 or Biol 3407 or equiv; spring, offered periodically) Intro to critical issues underpinning global change and its biological implications. Current scientific literature on evidence for global change and potential effects on a wide range of biological processes. Economic/political impact on global change.

FNRM 5153. Forest and Wetland Hydrology. (3.0 cr.; preq [Basic hydrology course, upper div or grad student]) or #: spring, odd years) Current topics, methods/models in forest/wetland hydrology. Hydrologic role of forests, wetlands, riparian systems in snowfall/rainfall regimes. How activities such as deforestation, wetland drainage, and stream channel alterations, affect hydrologic response of watersheds. Runoff/streamflow response from undisturbed/forested wetland/wetland watersheds. Problem-solving exercises.

FNRM 5161. Northern Forest Field Course. (2.0 cr.; A-F or Audit; preq #: summer, every year) 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-environment relationships, stand development, succession, and regeneration ecology. Land survey, tree/forest stand measurement, forest sampling techniques. Taught at Cloquet Forestry Center.

FNRM 5201. Introduction to Travel and Tourism. (3.0 cr.; A-F only; =FNRM 3201; preq Grad student or #: spring, every year) Nature, structure and complexity of tourism industry. Overview of travel/tourism: definition, evolution, magnitude globally. Types/functions of various sectors, tourism distribution system, role of various stakeholders in creation/delivery of tourism. Motivations for travel as means of understanding demand for tourism.

FNRM 5203. Forest Fire and Disturbance Ecology. (3.0 cr.; A-F or Audit; =FNRM 3203; preq Grad student or #: spring, every year) Ecology, history, management, control of fire, wind, insect infestation, deer browsing, other disturbances in forests, including disturbance regimes of boreal, northern hardwood, savannas of North America. Influence of disturbance on wildlife habitat, urban/wildland interfaces, forest management, stand/landscape dynamics. Tree mortality in fires, successional patterns created by fires, interactions of life history traits of plants with disturbances.

FNRM 5204. Landscape Ecology and Management. (3.0 cr.; A-F or Audit; =FNRM 3204; preq Grad student or #: fall, every year) Introduction to landscape ecology at different scales in time/space. Development/implications of broad-scale patterns of ecological phenomena, role of disturbance in ecosystems. Characteristic spatial/temporal scales of ecological events. Principles of landscape ecology as framework for landscape research, analysis, conservation, and management.

FNRM 5206. Park and Protected Area Management Field Studies. (2.0 cr.; max 3.0 cr.; A-F only; preq Junior status or higher; summer, every year) Directed field study of park/protected areas. Recreation planning/visitor management, cultural/natural resource management, nature-based tourism management, resource interpretation/communication across local, state, federal tribal park/protected areas in northern Minnesota.

FNRM 5208. Tropical Forest Ecology, Natural History and Measurements. (3.0 cr.; A-F only; spring, every year) Nepal Semester Abroad course. Forest ecology/forest measurement skills applicable in variety of settings from forests of Minnesota to community forests of Nepal. Participatory approach. Students work directly with members of Community Forest User Groups.

FNRM 5218. Measuring and Modeling Forests. (3.0 cr.; A-F or Audit; =FNRM 3218; preq Grad student or #: spring, every year) General sampling design and site techniques to assess current forest conditions. Application of metrics/sampling methods to forest vegetation. Calculation of tree/stand volume, selection of modeling
approaches. Case studies of modeling to project future growth. Landscape processes, characterization, and modeling.

FNRM 5228. Advanced Assessment and Modeling. (3.0 cr.; A-F or Audit; prereq 3218, Math 1272, Stat 5021; fall, even years) Application of recently developed mathematics, computer science, and statistics methodologies to natural resource functioning, management, and use problems. Specific topics, software, and methodologies vary.


FNRM 5259. Visitor Behavior Analysis. (3.0 cr.; prereq Major or ESPM major or grad student or #; fall, even years) Social science theory/methods to behavioral research. Recreation/nature-based tourism/environmental management. Analysis of surveys/observations/focus groups/interviews. Implications for sustainable resource management, visitor experiences, and environmental stewardship. Course is online or in-person, depending on semester.

FNRM 5262. Remote Sensing of Natural Resources and Environment. (3.0 cr.; =FNRM 3262; prereq Grad student or #; fall, spring, every year) Principles/techniques of remote sensing. Mapping/monitoring land/water resources from local to global scales. Forest and natural resource inventory. Forest cover and soil mapping. Landuse/global change analysis. Lab provides hands-on experience working with aerial photography and digital sensing imagery.

FNRM 5264. Advanced Forest Management Planning. (3.0 cr.; prereq 3471 or #; fall, every year) Applied models for forest planning to integrate forest resource conditions/uses. Stand-level management. Forest-wide/landscape-level planning. Regional forest supply analysis. Optimization models and heuristic techniques as tools. Integrating sustainable timber production with desirable future conditions and spatial structure for biodiversity. Problems, case studies involving recent large-scale applications.

FNRM 5411. Managing Forest Ecosystems: Silviculture. (3.0 cr.; =FNRM 3411; prereq Grad student or #; spring, every year) Management of forest ecosystems for sustaining ecological integrity, soil productivity, water quality, wildlife habitat, biological diversity, commodity production in landscape context. Silvics, forest dynamics, disturbances, regeneration, restoration, silvicultural systems. Ramifications of management choices. Weekend field trip.

FNRM 5412. Digital Remote Sensing. (3.0 cr.; prereq 3262 or grad student or #; spring, every year) Physical basis and practical applications of digital remote sensing. Energy-matter interactions. Measurements and sensors. Digital image processing/analysis. Experience working with remote sensing data, image processing, and models.

FNRM 5413. Managing Forest Ecosystems: Silviculture Lab. (1.0 cr.; prereq FNRM [major or minor] or grad student; spring, every year) Development of silvicultural prescriptions to achieve various landowner objectives. Timber cruise, growth/yield simulations, stand density management diagrams, thinning schedules, use of forest vegetation simulator. Field trips, computer labs, lectures.

FNRM 5431. timber Harvesting and Road Planning. (2.0 cr.; =FNRM 3431; prereq Grad student or #; spring, every year) Forest operations. Terminology, engineering, equipment/harvesting system options, productivity/costs. Relationship to forest management and silviculture. Road planning, forest management guidelines. Mitigating potential impacts to soil/water resources. Environmental implications of method/equipment choices. Selling timber. Sale design, layout, and administration. Two all-day field trips.

FNRM 5471. Forest Planning and Management. (3.0 cr.; A-F or Audit; =FNRM 3471; prereq Grad student or #; spring, every year) Processes/techniques for scheduling forest management. Goals of landowners, industry, government, and society. Issues/policies/regulations that influence management. Predicting outcomes, financial analysis, regulation, mathematical models, linear programming, economic analysis. Landscape-level management, historical range of variability, wildlife management, carbon sequestration, resource monitoring, certification, adaptive management.

FNRM 5480. Topics in Natural Resources. (1.0-3.0 cr.; =FNRM 3480; prereq Sr or grad student; fall, spring, offered periodically) Lectures in special fields of natural resources given by visiting scholar or faculty member. Topics specified in Class Schedule.

FNRM 5501. Urban Forest Management: Managing Green Spaces for People. (3.0 cr.; =FNRM 4501; prereq Grad student or #; spring, every year) Management concepts for green infrastructure of cities, towns, and communities. Urban forest as social/biological resource. Emphasizes management of urban forest ecosystem to maximize benefits. Tree selection, risk assessment, cost-benefit analysis, landscape planning, values, perceptions. How urban forestry can be a tool to improve community infrastructure.

FNRM 5611. Field Silviculture. (1.0 cr.; prereq Grad student; summer, every year) Collection of field data to prepare/write silvicultural prescriptions for regeneration, thinning, and harvesting in context of landscape, watershed, and wildlife habitat issues. Field exercises in forest entomology, pathology, tree improvement, and non-timber forest products. Tree planting. Marking stands for harvest. Taught at Cloquet Forestry Center. Field trips to forests managed by state/industry.

FNRM 5615. Field Remote Sensing and Resource Survey. (1.0 cr.; prereq Grad student; summer, every year) Field applications of remote sensing, sampling/measurement methods to inventory/mapping of forest and other natural resources. Offered at Cloquet Forestry Center.

FNRM 5621. Field Timber Harvesting and Road Planning. (1.0 cr.; prereq Grad student; summer, every year) Design, layout, and administration of timber sales. Forest road planning and design. Protecting residual trees during harvesting operations. Timber appraisal, forest management guidelines. Road location and profiling. Planning/layout considerations. Field trips to visit timber harvesting and road planning sites with public and private organizations. Taught at Cloquet Forestry Center.

FNRM 8101. Research Problems: Physiological Ecology. (1.0-5.0 cr.; max 10.0 cr.; prereq #; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8102. Research Problems: Forest-Tree Genetics. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8103. Research Problems: Forest Hydrology. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8104. Research Problems: Forest Ecology. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8105. Research Problems: Silviculture. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8106. Research Problems: Urban Forestry—Biology and Management. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8107. Seminar: Forest Resources. (1.0 cr.; fall, spring, every year) Assigned topics, problem analyses, and research reports.

FNRM 8201. Research Problems: Forest Economics. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8202. Research Problems: Forest Biometry and Measurements. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8203. Research Problems: Forest Recreation. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>FREN 8110</td>
<td>Topics in Early Medieval French Literature</td>
<td>3.0 cr.</td>
<td>A-F or Audit; prereq #; fall, every year</td>
<td>Directed teaching.</td>
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<tr>
<td>FREN 8111</td>
<td>Introduction to Old French</td>
<td>3.0 cr.</td>
<td>fall, spring, offered periodically</td>
<td>Studies in medieval French: instruction in reading Old French, sources of bibliography, and topics in medieval studies (language and literature). Taught in French.</td>
</tr>
<tr>
<td>FREN 8114</td>
<td>Old Provençal Language and Literature</td>
<td>3.0 cr.</td>
<td>fall, spring, offered periodically</td>
<td>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 &quot;courtly love.&quot; Knowledge of French, Spanish, or Italian desirable. Taught in English.</td>
</tr>
<tr>
<td>FREN 8120</td>
<td>Topics in Later Medieval French Literature</td>
<td>3.0 cr.</td>
<td>fall, offered periodically</td>
<td>Problems presented by texts written in France ca. 1300-1500. Evolution of Middle French language. Specific topics/txts vary. Taught in French.</td>
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<tr>
<td>FREN 8125</td>
<td>Short Narrative in the Middle Ages</td>
<td>3.0 cr.</td>
<td>A-F only; prereq grad student; fall, odd years</td>
<td>Short forms of medieval narrative. Examples from French literary production within context of socioeconomic history from ca. 1100 to ca. 1550.</td>
</tr>
<tr>
<td>FREN 8190</td>
<td>Old French Workshop</td>
<td>1.0 cr.</td>
<td>[max 2.0 cr.]; S-N only; prereq [[&amp;8110 or &amp;8250 or &amp;8260 or &amp;8270 or &amp;8290]</td>
<td>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.</td>
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</table>

Old French syntax, semantics and phonetics. Students read portions of texts and prepare an original translation.

FREN 8210: Narrative, History, and Memory: Topics | 3.0 cr. | fall, offered periodically | Significance of narrative paradigm in literature, history, and cultural memory. Specific topics/texts treated vary. Taught in French. |


FREN 8230: Critical Issues: Criticism and Thought | 3.0-9.0 cr. | A-F only; fall, odd years | Critical issues relating to works in criticism/thought related to French/Francophone literature, philosophy or culture. |


FREN 8250: Critical Issues: Poetry | 3.0 cr. | fall, spring, offered periodically | Significant critical issues relating to poetic writing of selected authors or periods. |

FREN 8260: Critical Issues: Theatre | 3.0 cr. | fall, spring, offered periodically | Significant critical issues relating to dramatic writing of selected authors or periods. |

FREN 8270: Critical Issues: Prose | 3.0 cr. | fall, spring, every year | Significant critical issues relating to prose writing of selected authors or periods. |

FREN 8271: The Novel of the Ancien Regime | 3.0 cr. | fall, spring, offered periodically | 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 | 3.0 cr. | fall, spring, offered periodically | 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 | 3.0 cr. | fall, spring, offered periodically | 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 | 1.0 cr. | No Grade Associated; prereq Master's student, |
adviser and DGS consent; fall, spring, summer, every year)
(No description)

FREN 8371. The Rule of Reason, The Reign of Madness: Readings in Early Modern France. (3.0 cr.; fall, spring, offered periodically)
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. (3.0 cr. [max 9.0 cr.]; spring, offered periodically)
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 8420. Critical Issues: Francophone Literature. (3.0 cr. [max 9.0 cr.]; fall, offered periodically)
Critical issues relating to literature of Francophone world. Specific topics/texts vary. Taught in French.

FREN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

FREN 8521. History of the French Language. (3.0 cr.; fall, spring, offered periodically)
History of French from its origins in Latin to the present day. Aspects of diachronic phonology (sound change), morphology, syntax. Taught in French.

FREN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed oral prelim; 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.; fall, spring, summer, every year)
tbd

FREN 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

FREN 8812. Seminar: Dissertation Preparation and Writing. (3.0 cr.; prereq Completion of doctoral prelims; fall, spring, every year)

FREN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq max 18 cr per semester or summer, 24 cr required; fall, spring, every year)
(No description)

FREN 8888W. Thesis Credit Dissertation Seminar. (1.0-3.0 cr. [max 24.0 cr.]; No Grade Associated; prereq Doctoral student who has passed oral prelims; fall, spring, every year)
A means for students to make progress on the dissertation in a structured setting. Brings together students writing on related topics. Credits are applied to doctoral thesis credits. Contact instructor for description.

FREN 8980. Directed Teaching. (1.0-5.0 cr. [max 25.0 cr.]; fall, spring, every year)
tbd

FREN 8992. Directed Readings for Graduate Students. (1.0-5.0 cr. [max 25.0 cr.]; prereq #; fall, spring, every year)
tbd

FREN 8994. Directed Research. (1.0-5.0 cr. [max 25.0 cr.]; prereq #; may be taken as tutorial with #; fall, spring, every year)
tbd

French and Italian (FRIT)

FRIT 5257. Passionate Beings: Literary and Medical Problematics in Italy and France from 1800 to the Present. (4.0 cr.;)
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 subjection, responsibility, order. Taught in English.

FRIT 5850. Topics in French and Italian Cinema. (3.0 cr.; prereq Knowledge of [French or Italian] helpful but not required; fall, offered periodically)
Focuses on a theme, period, genre, filmmaker, or other topic of interest in French or Italian cinema. See Class Schedule. Taught in English.

FRIT 5999. Teaching of French and Italian: Theory and Practice. (3.0 cr.; fall, every year)
Theoretical and practical aspects of language learning and teaching applied to French and Italian. Includes history of foreign language teaching in 20th-century United States. Taught in English.

Gay, Lesbian, Bisexual, and Transgender Studies (GLBT)

GLBT 5993. Directed Study. (1.0-12.0 cr.; fall, spring, every year)
 Directed Study

Gender, Women, and Sexuality Studies (GWSS)

GWSS 5101. Feminist Approaches to Ethnography. (3.0 cr.;)
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. (3.0 cr.; 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. (3.0 cr.; prereq grad or #; fall, spring, every year)
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. (3.0 cr.; fall, odd years)
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 5107. Gender, Culture, and Science. (3.0 cr.; fall, spring, offered periodically)
Critical study of some of the major papers concerning the relations of gender and scientific inquiry produced in the past 20 years.

GWSS 5122. Philosophy and Feminist Theory. (3.0 cr.; =PHIL 5622, PHIL 4622, GWSS 4122; prereq 8 crs 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. (3.0 cr.; fall, spring, odd years)
Topics specified in Class Schedule.

GWSS 5201. Global Processes and the Politics of Sexuality. (3.0 cr.; 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. (3.0 cr.; fall, spring, offered periodically)
Topics specified in Class Schedule.

GWSS 5300. Communication and Gender. (3.0 cr.; A-F or Audit; =COM 5406; prereq one women's studies course or #; fall, spring, every year)
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. (3.0 cr. [max 6.0 cr.]; fall, odd years) Topics specified in Class Schedule.

GWSS 5404. Working Class Women's Cultures. (3.0 cr.; 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 to hear their own voices.

GWSS 5405. Chicanas: Women and Work. (3.0 cr.; prereq #; ) Chicanas, their various relationships to family/community. Local, national, and global work forces. Questions/issues related to growing integration of world's systems of production.

GWSS 5406. Black Feminist Thought in the American and African Diasporas. (3.0 cr.; =GWSS 4406; spring, offered periodically) Critically examines spatiality of African descendant women in America/larger black diaspora. Writings from black feminist/queer geographies, history, contemporary cultural criticism. Recent black feminist theorizing.

GWSS 5490. Topics: Political Economy and Global Studies. (3.0 cr. [max 12.0 cr.]; spring, every year) Topics specified in Class Schedule.

GWSS 5590. Topics: Social Change, Activism, Law, and Policy Studies. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Topics specified in Class Schedule.

GWSS 5690. Topics: Women, Society, and Race in the United States. (3.0 cr. [max 6.0 cr.]; spring, odd years) Topics specified in Class Schedule.

GWSS 5790. Topics: Sexuality Studies. (3.0 cr. [max 6.0 cr.]; spring, odd years) Topics specified in Class Schedule.

GWSS 5993. Directed Study. (1.0-12.0 cr.; fall, spring, summer, every year) TBD

GWSS 5994. Directed Instruction. (1.0-12.0 cr. [max 36.0 cr.]; fall, spring, summer, every year) TBD

GWSS 5995. Directed Research. (1.0-8.0 cr. [max 36.0 cr.]; fall, spring, every year) TBD

GWSS 8101. Intellectual History of Feminism. (3.0 cr.; fall, spring, offered periodically) 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. (3.0 cr.; prereq Priority given to feminist studies grad students; fall, odd years) Contemporary theoretical scholarship/research on selected issues related to sexuality, gender, and the body.

GWSS 8103. Feminist Theories of Knowledge. (3.0 cr.; fall, offered periodically) 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 8107. Feminist Pedagogies. (3.0 cr.; prereq Feminist Studies grad student [Ma or Minor] or #; spring, even years) Explore feminist theories/critical approaches to pedagogy. Develop teaching philosophy statement, design syllabus, practice teach/learn problem-solving strategies for classroom.

GWSS 8108. Genealogies of Feminist Theory. (3.0 cr.; prereq Feminist studies PhD or grad minor student or #; fall, every year) Two-semester seminar. First term: debates in gender theory; intersections of gender theory with critical race theory, post-colonial theory, sexuality theory, social class analysis. Second term: inter-/multi-disciplinary feminist research methodologies from humanities/social sciences.

GWSS 8109. Feminist Knowledge Production. (3.0 cr.; prereq Feminist studies PhD or grad minor student or #; spring, every year) Two-semester interdisciplinary seminar. First term: debates in gender theory; gender theory, critical race theory, post-colonial theory, sexuality theory, social class analysis. Second term: inter-/multi-disciplinary feminist research methods from humanities/social sciences.

GWSS 8201. Feminist Theory and Methods in the Social Sciences. (3.0 cr.; fall, spring, offered periodically) 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 8210. Seminar: Feminist Theory & Praxis. (3.0 cr. [max 9.0 cr.]; fall, spring, every year) Topics in feminist theory.

GWSS 8220. Seminar: Science, Technology & Environmental Justice. (3.0 cr. [max 6.0 cr.]; spring, offered periodically) Topics related to science, technology, environmental justice.

GWSS 8230. Seminar: Cultural Criticism and Media Studies. (3.0 cr. [max 6.0 cr.]; spring, offered periodically) Topics in literature, film, art.

GWSS 8250. Seminar: Nation, State, and Citizenship. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Topics related to nation, state, citizenship.

GWSS 8260. Seminar: Race, Representation and Resistance. (3.0 cr. [max 6.0 cr.]; prereq Grad student; spring, every year) Race, racialization, racial justice as related to representation/struggles for social/economic justice. Intersectional analysis of power, politics, ideology/identity. Queer of color critique, women of color feminisms, critical sex/body positive approaches.

GWSS 8270. Seminar: Theories of Body. (3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) How body is configured in many social arenas. Legal decisions, public policy, medical research, cultural customs. Examine how attitudes toward male/female bodies influence social myths/discourses about social policy/change.

GWSS 8301. Feminist Literary Criticism. (3.0 cr.; fall, spring, offered periodically) 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 textual analysis taking place in various University departments.

GWSS 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

GWSS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

GWSS 8490. Seminar: Transnational, Postcolonial, Diaspora. (3.0 cr. [max 6.0 cr.]; fall, spring, every year) Graduate topics in comparative/global studies.

GWSS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

GWSS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. ; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

GWSS 8993. Directed Study. (1.0-6.0 cr. [max 9.0 cr.]; fall, spring, summer, every year) TBD

GWSS 8994. Directed Instruction. (1.0-8.0 cr. [max 36.0 cr.]; fall, spring, summer, every year) TBD

GWSS 8995. Directed Research. (1.0-8.0 cr. [max 36.0 cr.]; fall, spring, every year) TBD

GWSS 8996. Feminist Studies Colloquium. (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq Grad major or minor in feminist studies; fall, spring, every year) TBD
Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GEND 5261. Advanced General Dentistry Clinical Administration I. (5.0-10.0 cr. ; S-N or Audit; fall, spring, offered periodically) Field experience in community dental clinic practice and administration.

GEND 5262. Advanced General Dentistry Clinical Administration II. (5.0-10.0 cr. ; S-N or Audit; fall, every year) Field experience in community dental clinic practice and administration.

GEND 5263. Advanced General Dentistry Clinical Administration III. (1.0-10.0 cr. ; S-N or Audit; fall, spring, every year) Field experience in community dental clinic practice and administration.

GEND 5264. Advanced General Dentistry Clinic IV. (1.0-15.0 cr. ; S-N or Audit; summer, every year) Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GEND 5265. Advanced General Dentistry Clinic V. (1.0-15.0 cr. ; S-N or Audit; fall, every year) Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GEND 5266. Advanced General Dentistry Clinic VI. (1.0-15.0 cr. ; S-N or Audit; fall, spring, every year) Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

General Dentistry (GEND)
School of Dentistry

GEND 5151. Advanced General Dentistry Seminar I. (5.0-10.0 cr. ; S-N or Audit; fall, summer, every year) Clinical seminars with emphasis on treatment planning, case presentation, techniques and materials, comprehensive oral healthcare and maintenance, and issues in practice management. Correlated with concurrent clinical experiences.

GEND 5152. Advanced General Dentistry Seminar II. (5.0-10.0 cr. ; S-N or Audit; fall, every year) Clinical seminars with emphasis on treatment planning, case presentation, techniques and materials, comprehensive oral healthcare and maintenance, and issues in practice management. Correlated with concurrent clinical experiences.

GEND 5153. Advanced General Dentistry Seminar III. (2.0-10.0 cr. ; S-N or Audit; fall, spring, every year) Clinical seminars with emphasis on treatment planning, case presentation, techniques and materials, comprehensive oral healthcare and maintenance, and issues in practice management. Correlated with concurrent clinical experiences.

GEND 5254. Advanced General Dentistry Clinic I. (5.0-15.0 cr. ; S-N or Audit; fall, summer, every year) Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GEND 5255. Advanced General Dentistry Clinic II. (5.0-15.0 cr. ; S-N or Audit; fall, every year) Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GEND 5256. Advanced General Dentistry Clinic III. (5.0-15.0 cr. ; S-N or Audit; fall, spring, every year) Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.
GIS 8913. Psychosocial Issues in Genetic Counseling. (3.0 cr.; A-F or Audit; prereq MCDG MS student with genetic counseling specialization or #; fall, every year)
Interviewing skills, supportive counseling, and case-study analysis specific to genetic counseling.

GIS 8914. Ethical and Legal Issues in Genetic Counseling. (3.0 cr.; A-F or Audit; prereq MCDG MS student with genetic counseling specialization or #; spring, every year)
Professional ethics; ethical and legal concerns with new genetic technologies.

GIS 8920. Special Topics: Introduction to topics in genetic counseling. (2.0 cr.; A-F only; prereq Grad student or #; fall, spring, every year)
Special topics. Introduction to topics in genetic counseling.

GIS 8990. Research Problems in GIS. (1.0-6.0 cr.; A-F only; prereq MGIS student or #; fall, every year)
Project of sufficient scope/complexity to complete the M.S. degree program.

GIS 8991. Introduction to GIS. (3.0 cr.; A-F only; prereq for GIS majors) 1.5 cr. (GIS 5400)
This course is intended for GIS majors.

GIS 8991. Introduction to GIS and Surveying. (3.0 cr.; A-F only; prereq for GIS majors) 1.5 cr.
This course is intended for GIS majors.

GIS 8992. GIS Project Management and Application. (3.0 cr.; A-F only; prereq MGIS student or #; fall, every year)
Advanced practical experience in GIS project management.

GIS 8993. Directed Studies. (1.0-5.0 cr.; fall, spring, summer, every year)
Independent research determined by student's interests, in consultation with faculty mentor.

GIS 8994. Research. (1.0-5.0 cr.; fall, spring, summer, every year)
Research topics in GIS.

GIS 8994. Research. (1.0-5.0 cr.; fall, spring, summer, every year)
Research topics in GIS.

GIS 5350. GIS Internship. (1.0-3.0 cr.; fall, spring, summer, every year)
Field experience in GIS.

GIS 5530. GIS Internship. (1.0-3.0 cr.; fall, spring, summer, every year)
Field experience in GIS.

GIS 5555. Practical Surveying for GIS. (1.0 cr.; No Grade Allowed; prereq MCDG student or #; fall, spring, every year)
Surveying techniques/relationship of GPS to GIS professionals.

GIS 5561. ArcGIS Basics. (1.5 cr.; prereq [GEOG 5561 or equiv, in MGIS program] or #; fall, every year)
Desktop mapping functions using ArcGIS software. Application of systems to display/analysis of geographical data.

GIS 5574. Web GIS and Services. (3.0 cr.; prereq [GEOG 5561 or equiv, in MGIS program] or #; fall, every year)
Plan, design, develop, publish web-based GIS solution. Build websites, prepare data for web. Commercial software, Open Source software, volunteer geographic information, open GIS standards/developing web GIS applications.

GIS 5575. Practical Surveying for GIS. (2.0 cr.; prereq GEOG 5561 or equiv in MGIS program or #; #; fall, spring, every year)
Surveying techniques/relationship of GPS to GIS professionals.

GIS 5577. Spatial Database Design and Administration. (3.0 cr.; prereq MGIS student or #; fall, every year)
Spatial database design, development planning/management, maintenance, security, access/distribution, and documentation.

GIS 5578. GIS Programming. (3.0 cr.; prereq MGIS student or #; fall, spring, every year)
Programming techniques using Python and other languages specifically relating to GIS technologies.

GIS 5590. Special Topics in GIS. (1.0-3.0 cr.; fall, spring, every year)
Topics vary according to curricular needs, technological developments, field applications.

GIS 5591. Basic Spatial Analysis. (3.0 cr.; prereq [STAT 3001 or equiv, MGIS student or #; fall, every year)
How to use spatial data to answer questions on a wide array of social, natural, and information science issues. Exploratory data analysis/visualization. Spatial autocorrelation analysis/regression.

GIS 5571. ArcGIS I. (3.0 cr.; prereq [GEOG 5561 or equiv, status in MGIS program, or #; fall, every year)
First of a two-course series focusing on ArcGIS Desktop. Overview of ArcGIS system and its use for spatial data processing. Data capture, editing, geometric transformations, map projections, topology, Python scripting, and map production.

GIS 5572. ArcGIS II. (3.0 cr.; prereq [GEOG 5561 or equiv], in MGIS program or #; spring, every year)
Continued GIS 5571. Raster analysis, dynamic segmentation, geometric networks, geocoding, Python scripting, and data interoperability.

GIS 5573. Introduction to Digital Mapping: ArcGIS Basics. (1.5 cr.; prereq [GEOG 5561 or equiv, in MGIS program] or #; fall, every year)
Desktop mapping functions using ArcGIS software. Application of systems to display/analysis of geographical data.

GIS 5574. Web GIS and Services. (3.0 cr.; prereq [GEOG 5561 or equiv, in MGIS program] or #; fall, every year)
Plan, design, develop, publish web-based GIS solution. Build websites, prepare data for web. Commercial software, Open Source software, volunteer geographic information, open GIS standards/developing web GIS applications.

GIS 5575. Practical Surveying for GIS. (2.0 cr.; prereq GEOG 5561 or equiv in MGIS program or #; fall, spring, every year)
Surveying techniques/relationship of GPS to GIS professionals. Geodesy, data adjustment, datums, ellipsoids, coordinate systems, transformations.
GEOG 5374W. The City in Film. (4.0 cr.; =GEOG 3374W, GEOG 3374V; prereq grad student or #; spring, every year)
Cinematic portrayal of changes in 20th-century cities worldwide. Social/cultural conflict, political/economic processes, changing gender relationships, rural versus urban areas, population/development issues (especially as they affect women/children). Meets concurrently with 3374. Additional weekly meeting discusses films, readings. Project on a topic selected in consultation with instructor.

GEOG 5385. Globalization and Development: Political Economy. (4.0 cr.; prereq Sr or grad or #; fall, spring, offered periodically)
Nature/scope of modern world system (capitalism), its impact on regional development processes. Roles of state and of international financial institutions.

GEOG 5393. Rural Landscapes and Environments. (4.0 cr.; spring, every year)
Analysis of three principal components of rural landscape (form of land surface, plant life that cloaks it, structures that people have placed upon it). Structures associated with agriculture, including mining, forestry, resort areas, and small towns.

GEOG 5401. Geography of Environmental Systems and Global Change. (4.0 cr.; =GEOG 3401; prereq grad student or #; )
Processes that create/change the spatial patterns of climate, vegetation, and soils. Potential of humans to alter climate, vegetation, and soil processes. Possible impacts of human-altered environmental conditions.

GEOG 5411. Geography of Health and Health Care. (4.0 cr.; =GEOG 3411W; fall, every year)
Application of human ecology, 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. (3.0 cr.; =ES 5421; )
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. (3.0 cr.; prereq 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. (3.0 cr.; prereq 1425 or 3401 or #; )
Theories of climatic fluctuations 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. (3.0 cr.; =GEOG 3431; fall, offered periodically)
Introduction to biogeography. Focuses on patterns of plant/animal distributions at different scales over time/space. Evolutionary, ecological, and applied biogeography. Paleobiogeography, vegetation-environment relationships, vegetation dynamics/disturbance ecology, human impact on plants/animals, nature conservation. Discussions, group/individual projects, local field trips.

GEOG 5511. Principles of Cartography. (3.0 cr.; spring, offered periodically)

GEOG 5512. Cartography: Topics. (3.0 cr.; prereq 3511 or 5531 or #; )
Selected topics include the system of cartographic communication, map design, map reading, map analysis, history of cartography.

GEOG 5530. Cartography Internship. (2.0-7.0 cr. [max 10.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Provides intensive hands-on experience in contemporary map production and design, ranging from GIS applications to digital prepress. Strong computer skills essential.

GEOG 5531. Numerical Spatial Analysis. (4.0 cr.; =GEOG 3531; fall, every year)
Applied/theoretical aspects of geographical quantitative methods for spatial analysis. Emphasizes analysis of geographical data for spatial problem solving in human/physical areas.

GEOG 5560. Introduction to GIS and Spatial Analysis. (3.0 cr.; prereq 3511 or 3531 or #; )
Introduction to the study of geographic information systems (GIS) for geography and non-geography students. Topics include GIS application domains, data models and sources, analysis methods and output techniques. Lectures, reading, and hands-on experience with GIS software.

GEOG 5561. Principles of Geographic Information Science. (4.0 cr.; prereq grad; fall, spring, every year)
Introduction to the study of geographic information systems (GIS) for geography and non-geo-science students. Topics include GIS application domains, data models and sources, analysis methods and output techniques. Lectures, reading, and hands-on experience with GIS software.

GEOG 5562. Geographic Information Science and Analytical Cartography. (3.0 cr.; prereq GIS 5571 or #; fall, spring, offered periodically)

GEOG 5563. Advanced Geographic Information Science. (3.0 cr.; prereq B or better in 3561 or 5561 or #; fall, spring, every year)
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 5564. Urban Geographic Information Science and Analysis. (3.0 cr.; prereq 3561 or 5561; )
Core concepts in urban geographic information science including sources for urban geographical and attribute data (including census data), urban data structures (focusing on the TIGER data structure), urban spatial analyses (including location-allocation models), geodemographic analysis, network analysis, and the display of urban data.

GEOG 5565. Geographical Analysis of Human-Environment Systems. (3.0 cr.; prereq 3561 or 5561 or FR 4131 or LA 5573 or one intro GIS course or grad student or #; spring, offered periodically)
Applications of geographic information systems and other spatial analysis tools to analysis of environmental systems patterns, dynamics, and interactions. Focuses on global to landscape databases developed to analyze atmospheric, hydrospHERIC, geomorphic, pedologic, biologic, and human landuse systems.

GEOG 5589. Introduction to Dendrochronology. (3.0 cr.; prereq 1403, [Biol 1001 or BIOL 1009 or equiv] or #; fall, every year)
Historical development, operational techniques, biological background, and principles of tree ring analysis. Applications of tree-ring data to investigate environmental change and past cultures.

GEOG 5900. Topics in Geography. (3.0 cr. [max 9.0 cr.]; prereq sr or grad, #; fall, spring, every year)
Special topics and regions. Course offered by visiting professors in their research fields.

GEOG 8001. Problems in Geographic Thought. (3.0 cr.; A-F or Audit; fall, offered periodically)
Currents of geographic thought in biophysical, GIS, human, cultural, and human-environment subfields. Focuses on concepts/paradigms through which geographers have attempted to unify/identify the discipline, around which debate has flourished, and about which interdisciplinary histories can be traced.

GEOG 8002. Research Methods in Geography. (3.0 cr.; spring, every year)
Seminar. Overview of research designs/methods in geography. Relationships between different research paradigms (modes of inquiry), research designs, and methods. Critical readings. Analyses of research projects.
GEOG 8005. Proseminar: Population Geography. (3.0 cr.; prereq #; fall, spring, offered periodically) Conceptual literature and empirical studies on fertility, mortality, and migrations in different parts of the world.

GEOG 8006. Proseminar: Research Methods in Geography. (3.0 cr.; prereq #; fall, spring, offered periodically) 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. (3.0 cr.; prereq #; fall, spring, offered periodically) 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 8200. Seminar: Urban Geography. (2.0-3.0 cr.; A-F or Audit; spring, offered periodically) Contemporary research. Topics vary with the interests of faculty.

GEOG 8201. Explorations in the Geography of Minnesota. (3.0 cr.; S-N or Audit; prereq #; fall, spring, offered periodically) Physical environment, agriculture, forestry, mining, land survey, population, recreation, cities/towns, transportation. Sources of information about the state. Students make short oral/write reports. Might provide springboard for a Plan B paper, thesis, or dissertation. Two or three Saturday field trips.

GEOG 8211. Environmental Policy. (3.0 cr.; prereq #; fall, every year) U.S. environmental policies at federal/state level. Policy formulation, implementation, and evaluation.

GEOG 8212. Africa. (3.0 cr.; prereq #; fall, spring, offered periodically) Advanced topics. Topics vary with interests of faculty offering course.

GEOG 8213. East Asia and China. (3.0 cr.; prereq #; fall, spring, offered periodically) Contemporary research, advanced topics. Topics vary with interests of faculty offering course.

GEOG 8214. South Asia. (3.0 cr.; ) Advanced topics. Topics vary with interests of faculty offering course.


GEOG 8230. Theoretical Geography. (3.0 cr.; prereq #; fall, spring, offered periodically) Advanced topics. Topics vary with interests of faculty offering course. Contemporary theoretical/philosophical themes transcending subdisciplines of human/physical geography.

GEOG 8240. Medical Geography. (3.0 cr.; prereq #; spring, offered periodically) Geographic inquiry concerning selected problems of health and health care.

GEOG 8260. Seminar: Physical Geography. (2.0 cr. [max 3.0 cr.]; prereq #; spring, every year) Topics of contemporary research. Topics vary with interests of faculty offering course.

GEOG 8270. Seminar: Climatology. (3.0 cr.; Student Option No Audit; prereq #; fall, odd years) Sample topics: climate modeling; climatic variability; climate change and predictability; severe local storms; drought; energy balance; urban climate; statistical climatology.

GEOG 8280. Biogeography. (3.0 cr. [max 9.0 cr.]; prereq #; fall, every year) Forest dynamics, dendrochronology, tree rings and climate, environmental disturbance, paleobiogeography, field/lab methods in biogeography.

GEOG 8290. Seminar in GIS and Cartography. (3.0 cr.; prereq #; fall, spring, offered periodically) 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 8302. Research Development. (3.0 cr.; S-N or Audit; prereq #; fall, offered periodically) Students in geography and related social sciences are guided in key steps to effective research proposal writing.

GEOG 8333. FTE: Masters. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

GEOG 8336. Development Theory and the State. (3.0 cr.; A-F or Audit; spring, every year) Why certain interventionist states in third world countries have been able to guide their economies to overcome legacy of underdevelopment 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.
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>GEOG 8350</td>
<td>Seminar: World Population. (3.0 cr.; prereq #: fall, spring, offered periodically) Contemporary research in world population development and problems. Topics vary with interests of faculty offering course.</td>
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<tr>
<td>GEOG 8405</td>
<td>Seminar: Graduate Student Professional Development. (1.0 cr. [max 2.0 cr.;] S-N or Audit; prereq Geography grad student; fall, spring, offered periodically) 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.</td>
</tr>
<tr>
<td>GEOG 8420</td>
<td>Teaching Practicum. (1.0 cr. [max 3.0 cr.;] S-N or Audit; prereq [Geog or MGIS] grad student or #: fall, spring, every year) Teaching methodologies, learning objectives, course content, classroom techniques, student/ course evaluation. Specific application to instruction in Geography.</td>
</tr>
<tr>
<td>GEOG 8444</td>
<td>FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)</td>
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<tr>
<td>GEOG 8666</td>
<td>Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.;] No Grade Associated; 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; fall, spring, summer, every year) (No description)</td>
</tr>
<tr>
<td>GEOG 8777</td>
<td>Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)</td>
</tr>
<tr>
<td>GEOG 8800</td>
<td>Seminar: Development of Geographic Thought. (3.0 cr.; prereq #: fall, spring, offered periodically) Topics vary with interests of faculty offering course.</td>
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<tr>
<td>GEOG 8888</td>
<td>Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer: 24 cr required; fall, spring, summer, every year) (No description)</td>
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<tr>
<td>GEOG 8970</td>
<td>Directed Readings. (1.0-5.0 cr. [max 10.0 cr.;] prereq #: fall, spring, summer, every year) (No description)</td>
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<tr>
<td>GEOG 8980</td>
<td>Topics in Geography. (1.0-3.0 cr. [max 15.0 cr.;] prereq #: fall, spring, every year) Seminar offered by visiting or regular faculty. Topics vary with interests of faculty.</td>
</tr>
<tr>
<td>GEOG 8990</td>
<td>Research Problems in Geography. (1.0-5.0 cr. [max 10.0 cr.;] prereq #: fall, spring, summer, every year) Individual research projects.</td>
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**Geological Engineering (GEOE)**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>GEOE 5321</td>
<td>Geomechanics. (3.0 cr.; A-F or Audit; prereq CSE upper division or grad student, 4301, CE 4301 or #: summer, offered periodically) 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.</td>
</tr>
<tr>
<td>GEOE 5331</td>
<td>Geomechanics Modeling. (3.0 cr.; A-F or Audit; prereq CSE upper division or grad student, 4301 or CE 4301; summer, offered periodically)</td>
</tr>
<tr>
<td>GEOE 5341</td>
<td>Wave Methods for Nondestructive Testing. (4.0 cr.; A-F or Audit; 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.</td>
</tr>
<tr>
<td>GEOE 8300</td>
<td>Seminar: Geomechanics. (1.0-3.0 cr. [max 4.0 cr.;] S-N or Audit; = [CE 8300]; fall, spring, every year) Presentations on various topics.</td>
</tr>
<tr>
<td>GEOE 8311</td>
<td>Advanced Rock Mechanics. (3.0 cr.; A-F or Audit; = [CE 8311]; prereq 5331, CE 5331 or #: CSE grad student; fall, offered periodically) 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 rock breakage.</td>
</tr>
<tr>
<td>GEOE 8331</td>
<td>Modeling Geomechanical Processes. (3.0 cr.; A-F or Audit; = [CE 8331]; prereq 5321 or CE 5321 or #: CSE grad student; fall, offered periodically) Data-limited nature of problems in geomechanics. Dimensional analysis. Regimes of solution. Similarity solutions. Elements of fracture mechanics, elastoplasticity, poroelasticity. Geomechanical applications to stability of underground excavations, fluid flow in fracture, tool-rock interaction, hydraulic fracturing.</td>
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<tr>
<td>GEOE 8333</td>
<td>FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)</td>
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<tr>
<td>GEOE 8336</td>
<td>Boundary Element Methods I. (3.0 cr.; A-F or Audit; = [CE 8336]; prereq CSE grad student or #: fall, even years) Introduction to boundary element methods for elastostatics; stress discontinuity method; displacement discontinuity method; direct boundary integral method. Derivation of basic mathematical solutions from the theory of elasticity. Applications of boundary element methods in geomechanics.</td>
</tr>
<tr>
<td>GEOE 8337</td>
<td>Boundary Element Methods II. (3.0 cr.; A-F or Audit; = [CE 8337]; prereq 8336, CE 8336 or #: fall, offered periodically) Transient and nonlinear problems.</td>
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</table>
GER 5011. Advanced Conversation and Composition. (3.0 cr.; prerequisite 3012, [graduate student or advanced undergraduate]; fall, odd years) Achieving high proficiency in writing/speaking professional/academic German.

GER 5016. Advanced Translation: Theory and Practice. (3.0 cr.; prerequisite 3012 or #, [graduate student or advanced undergraduate]; spring, offered periodically) Translation theory. Related issues in stylistics, philosophy of language. Sample translations. Student production of translations, with methodological commentary.

GER 5410. Topics in German Literature. (3.0 cr, [max 9.0 cr.]; prerequisite 3011; fall, spring, every year) Topic may focus on a specific author, group of authors, genre, period, or subject matter. Topics specified in Class Schedule.

GER 5510. Topics in Contemporary German Culture. (3.0 cr, [max 9.0 cr.]; prerequisite 3011; fall, spring, offered periodically) A topic of contemporary German culture explored in depth.

GER 5610. German Literature in Translation. (3.0 cr, [max 9.0 cr.]; prerequisite No knowledge of German required; cr toward major or minor requires reading in German; fall, spring, offered periodically) Study in depth of authors or topics from various periods in German literature. Requires no knowledge of German.

GER 5630. Topics in German Cinema. (3.0 cr, [max 9.0 cr.]; prerequisite 30xx film course or #; spring, offered periodically) Topics chosen may focus on specific directors, genres, film production or reception, and/or other formal, theoretical, historical, or political issues.

GER 5711. History of the German Language I. (3.0 cr; prerequisite 3011; fall, every year) Historical development of German, from beginnings to 1450.

GER 5712. History of the German Language II. (3.0 cr; prerequisite 5711; spring, every year) Historical development of German from 1450 to 2000.

GER 5721. Introduction to Middle High German. (3.0 cr; fall, odd years) Introduction to Middle High German language and literature. Study of grammar through formal description of Middle High German phonology, morphology, and syntax. Normalized MHG texts read.

GER 5722. Middle High German: Advanced Readings. (3.0 cr; prerequisite 5721; spring, odd years) Acquisition of fluency in reading Middle High German normalized as well as non-normalized texts, both poetry and prose.

GER 5731. Old High German I. (3.0 cr; fall, offered periodically) Study of the monuments of Old High German. Detailed investigation of Old High German in comparison with the other Germanic languages.

GER 5732. Old High German II. (3.0 cr; prerequisite 5731; spring, offered periodically) Study of the monuments of Old High German. Detailed investigation of Old High German in comparison with the other Germanic languages.

GER 5734. Old Saxon. (3.0 cr; fall, offered periodically) Study of the poetry of Old Saxon. Detailed investigation of Old Saxon in comparison with the other Old Germanic languages.

GER 5740. Topics in Germanic Medieval Studies. (3.0 cr, [max 9.0 cr.]; spring, offered periodically) Topics specified in Class Schedule.

GER 5993. Directed Studies. (1.0-4.0 cr, [max 12.0 cr.]; fall, spring, summer, every year) Guided individual reading or study. Prerequisite instructor consent, dept consent, college consent.

GER 8010. Current Debates in Literary and Cultural Theory. (3.0 cr, [max 12.0 cr.]; spring, every year) Seminar. Close readings of theoretical constellations in texts. Topic such as text/image, history/memory/time, oral culture/literacy, public/private, authority/crisis. Draws on literary, philosophical, and theoretical work.

GER 8020. Problems in Literary and Cultural History. (3.0 cr, [max 12.0 cr.]; spring, every year) Historiographic texts as literature and literary or filmic texts as historical documents. Homogenizing/constructive elements in historiography. Strategies of writing historical syntheses.

GER 8200. Seminar in Medieval German Literature and Culture. (3.0 cr, [max 9.0 cr.]; prerequisite 5721; spring, odd years) Topics for specific author, group of authors, genre, or subject matter in German literature, ca. 800-1450.

GER 8210. Seminar in Early Modern German Literature and Culture. (3.0 cr, [max 9.0 cr.]; fall, spring, offered periodically) Topics for specific author, group of authors, genre, or subject matter in German literature, 1450-1750.

GER 8220. Seminar in 18th-Century German Literature and Culture. (3.0 cr, [max 9.0 cr.]; fall, spring, offered periodically) Literary, philosophical, and aesthetic texts emerging from major 18th-century literary trends, 1720-1810. Cultural and historical contexts of Enlightenment and Weimar Classicism.

GER 8230. Seminar in 19th-Century German Literature and Culture. (3.0 cr, [max 9.0 cr.]; fall, spring, offered periodically) Examination of an author, issue, or movement, using a variety of critical approaches.

GER 8240. Seminar in 20th-Century German Literature and Culture. (3.0 cr, [max 9.0 cr.]; A-F or Audit; fall, spring, offered periodically) Topics for literature, film, or other forms of "high" and popular culture.

GER 8300. Topics in Literature and Cultural Theory. (3.0 cr, [max 9.0 cr.]; fall, spring, offered periodically) Authors, themes, movements, and social issues from 1700 to present. Focus varies each semester.

GER 8741. Gothic and Methods of Comparative Reconstruction I. (3.0 cr.) The oldest extant Germanic language and the prehistory of Germanic group of languages.

GER 8742. Gothic and Methods of Comparative Reconstruction II. (3.0 cr; prerequisite 8741) Continuation of study of the oldest extant Germanic language and the prehistory of Germanic group of languages.

GER 8751. Paleography: Medieval Manuscript Readings. (3.0 cr; A-F or Audit; spring, offered periodically) Introduction to techniques of reading and transcribing medieval German and Latin manuscripts.

GER 8752. Medieval Text Editing. (3.0 cr; spring, offered periodically) Introduction to techniques of historical text-critical editing of medieval Germanic and Latin manuscripts.

GER 8820. Seminar in Advanced Theory. (3.0 cr, [max 9.0 cr.]; fall, spring, offered periodically) Topic in critical thought, e.g., the Frankfurt School, hermeneutics, reception theory.

GER 8994. Directed Research. (1.0-3.0 cr, [max 12.0 cr.]; prerequisite #, %; may be taken as tutorial with #; fall, spring, summer, every year) tbd
GERO 5100. Topics in Gerontology. (0.5-4.0 cr.; fall, spring, summer, offered periodically) Timely topics related to the biology, sociology, and psychology of aging and applied aging services.

GERO 5101. Milestones in the Biology of Aging. (1.0 cr.; prereq NIA training grant Functional Proteomics of Aging [grad student or postdoc fellow] or biology research grad student; #; spring, every year) Biological research in aging. Original literature, including seminal, historical background papers. Progress in field of biogerontology research.


GERO 5110. Biology of Aging. (3.0 cr.; spring, every year) Biological changes that occur with aging. Methods for studying aging, descriptions of population aging, theories on how/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. (2.0 cr.; prereq Introductory course in epidemiology or #; fall, every year) Methodological issues unique to studies of older populations. Focuses on measurement of epidemiological characteristics. Health conditions/disorders of older Americans.

GERO 5115. Introduction to Geriatrics. (2.0 cr.; S-N only; fall, spring, summer, every year) Online course. Major topics in geriatrics. How to diagnose/treat conditions common in caring for older people.

GERO 5125. Gerontology Service Learning. (3.0 cr.; fall, spring, summer, every year) At least 100 hours of service to seniors or organizations serving seniors required. Longitudinal one-on-one relationship with at least two seniors. Service activities may include: friendly visiting, escorting seniors to medical appointments, chore services, teaching health education to groups of seniors and staff, participating in social or recreational activities with seniors, assisting with immunization and screening programs, assisting seniors with selection of health plans, or providing volunteer home health aide or nursing assistant services or emergency non-medical response under the supervision of a nurse. Students may use up to 25 percent of their service time for project that benefits the campus as a whole. Reading, monthly class discussions, a term paper and weekly self-reflection.

GERO 5191. Independent Study: Gerontology. (1.0-4.0 cr.; [max 16.0 cr.]; Student Option No Audit; prereq Approval of [adviser, DGS] for gerontology minor; fall, spring, summer, every year) Independent study: gerontology.

GERO 8020. Seminar in Gerontology. (2.0 cr.; prereq #; fall, spring, every year) 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.

GERO 8021. Application of Proteomics to Aging. (1.0 cr.; S-N only; prereq [Grad students, post-doctoral fellows involved in National Institutes on Aging training grant Functional Proteomics of Aging] or grad students or post-doctoral fellows with #; fall, odd years) Proteomic technology in aging research. Faculty/student led discussions on topics relevant proteomic research. Overview of special techniques/analytical approaches complementary to proteomics, hands-on experience with data analysis, discussion of literature.

GERO 8022. Fostering a Career in Aging Research. (1.0 cr.; S-N only; =RSC 8022; prereq Grad students/post-doctoral fellows involved in National Institutes on Aging training grant Functional Proteomics of Aging or grad students or post-doctoral fellows with #; spring, even years) Prepare pre-doctoral students/post-doctoral fellows for next step in academic career. Student/faculty led discussions on preparing for job interviews, including composing CV/cover letter, preparing grant applications/manuscripts, developing course syllabus based on biology of aging.

GERO 8023. Aging Policy Seminar. (2.0 cr.; S-N only; prereq Grad student or # [recommended to have taken GERO 5105]; fall, every year) Topics chosen to match student interest. Potential issues include Medicare, Medicaid, Social Security, policies about long-term care, preventive care for older people, employment discrimination, ethical topics. Run seminar on topic of choice, write follow-up paper.


GLOS 5403. Human Rights Advocacy. (3.0 cr.; prereq Grad student; fall, every year) Theoretical basis of human rights movement: Organizations, strategies, tactics, programs. Advocacy: fact-finding, documentation, campaigns, trial observations. Forensic
GLOS 5900. Topics in Global Studies. (1.0-4.0 cr. [max 12.0 cr.]; prereq Jr or sr or grad student; fall, spring, summer, every year) Proseminar. Selected issues in global studies. Topics specified in Class Schedule.

GLOS 5910. Topics in East Asian Studies. (1.0-3.0 cr.; fall, spring, offered periodically) Description varies with topic title.

GLOS 5920. Topics in European Studies. (3.0 cr.;) Description varies with topic title.

GLOS 5930. Topics in Latin American Studies. (3.0 cr.; fall, spring, offered periodically) Description varies with topic title.

GLOS 5940. Topics in Middle Eastern Studies. (3.0 cr.;) Description varies with topic title.

GLOS 5950. Topics in Russian Area Studies. (3.0 cr.;) Description varies with topic title.

GLOS 5960. Topics in South Asian Studies. (3.0 cr. [max 4.0 cr.]; fall, spring, every year) Description varies with topic title.

GLOS 5993. Directed Studies. (1.0-4.0 cr. [max 12.0 cr.]; prereq #, %, @; fall, spring, every year) Guided individual reading or study. Open to qualified students for one or more semesters.

GLOS 5994. Directed Research. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, every year) Qualified students work on a tutorial basis. Prereq instr consent, dept consent, college consent.

GDES 5100. Preparation for University Teaching for Nonnative English Speakers. (2.0 cr.; S-N only; prereq English Language Proficiency Rating of 4, current or anticipated TA assignment; #; fall, spring, every year) 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.

GDES 5105. Practicum in University Teaching for Nonnative English Speakers. (2.0 cr.; S-N or Audit; prereq [5102 or English Language Proficiency Rating of 2 or 3], [current or anticipated TA assignment]; fall, spring, every year)

GDES 5170. Topics in Graphic Design. (1.0-4.0 cr. [max 32.0 cr.]; A-F or Audit; prereq Jr or sr or grad student; fall, spring, every year) In-depth investigation of specific topic, announced in advance.

GDES 5193. Directed Study in Graphic Design. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Jr or sr or grad student; fall, spring, every year) Independent study in graphic design under tutorial guidance.

GDES 5196. Field Study: National/International. (1.0-10.0 cr.; A-F or Audit; # [APST 5196, HSG 5196, DES 5196, IDES 5196]; prereq #: fall, spring, summer, every year) Faculty-directed field study in national or international setting.

GDES 5311. Illustration. (3.0 cr.; A-F only; prereq 1311 or ArtS 1101 or PDes 3702 or LA 1301 or Arch 3250 or Arch 2301 or #; spring, every year)

GDES 5341. Interactive Design. (3.0 cr.; A-F or Audit; prereq [2334 or 2342], design minor or graphic design major or grad student or #; fall, spring, every year) Design of interactive multimedia projects. Interactive presentations and electronic publishing. Software includes hypermedia, scripting, digital output.

GDES 5342. Web and Interface Design. (3.0 cr.; A-F or Audit; prereq [2334 or 2342], design minor or graphic design major or grad student or #; spring, every year) Internet-based design. Static Web pages, embedded media, cascading style sheets. Design/ usability of interface between humans and technology. Evaluation of visual elements that control/organize dealings with computers to direct work. Students develop designs, do usability testing.

GDES 5343. Data Visualization II: Interactive Information. (3.0 cr.; A-F only; prereq [2342, 4343] or #; spring, every year) Skills/tools necessary to process large quantities of information/present them through interactive mediums. Create data visualizations for web utilizing Javascript libraries. Linear/nonlinear data-driven narratives.

GDES 5383. Digital Illustration and Animation. (3.0 cr.; A-F or Audit; prereq [2334 or 2342], design minor or [4384 or DHA 4384 or 5341 or DHA 5341], [graphic design major or [grad student, experience with computer illustration]] or #; fall, spring, offered periodically) Advanced computer design. Integration of design knowledge with Macintosh computer applications. Students use software to create digital illustration and animations. Adobe Illustrator, After Effects, Flash.

GDES 5386. Fundamentals of Game Design. (3.0 cr.; A-F or Audit; prereq [2334 or 2342], design minor or [4384 or DHA 4384 or 5341 or DHA 5341], [graphic design major or [grad student, experience with game design]] or #; fall, spring, offered periodically) Games of all kinds. Theoretical/practical aspects of making games. Investigation of design process. Rules, strategies, methodologies. Interactivity, choice, action, outcome, rules in game design. Social interaction, story telling, meaning/ideology, semiotics. Signs, cultural meaning.

GDES 5388. Graphic Design Research. (3.0 cr.; A-F or Audit; prereq Graphic design major or grad student or #; spring, offered periodically) Experience in Graphic Design research strategies and methods. Applied, theoretical, and human-centered aspects directed at project development. Design prototyping, testing, analysis.

GDES 5399. Theory of Electronic Design. (3.0 cr.; A-F or Audit; prereq Graphic design track student or #; spring, even years)
Theories, methodologies, histories of electronic design, its impact on visual communications. Digital artifacts, processes, paradigms.

GDES 8170. Topics in Graphic Design. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, spring, every year) In-depth investigation of topic, announced in advance.

GDES 8180. Professional Seminar. (1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; fall, spring, every year) Professional development issues/trends.

GDES 8192. Readings in Graphic Design. (1.0-3.0 cr. [max 8.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) Independent study, review of books/periodicals under tutorial guidance.

GDES 8193. Directed Study. (1.0-3.0 cr. [max 8.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) Directed study in graphic design.

GDES 8222. Plan B Master's Project. (3.0 cr. [max 4.0 cr.; S-N or Audit; prereq [Design or DHA master's student]; #; fall, spring, every year) Plan B master's project.

GDES 8361. Color, Design, and Human Perception. (3.0 cr.; A-F or Audit; prereq Basic color theory course or #; spring, even years) Perceptual 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.

GDES 8362. The Nature of Representation in Visual Communication. (3.0 cr.; A-F or Audit; spring, odd years) Theories of representation and studio production (digital, non-digital) centered around representation in culture.

GDES 8990. MFA Creative Thesis. (6.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Completed coursework requirements for MFA in DHA w/ multimedia emphasis; #; fall, spring, summer, every year) MFA project.

Greek (GRK) College of Liberal Arts

GRK 5003. Intermediate Greek Prose: Graduate Student Enrollment. (3.0 cr.; [GRK 3003]; prereq Grade of at least [C- or S] in [1002 or 5001] or [#; grad student]; fall, every year) 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. (3.0 cr.; [GRK 3004]; prereq [5003 or equiv], grad student or #; spring, every year) Greek poetry. Readings from Ilid or Odyssey. Nature of Homeric epic. Homeric dialect. Greek meter. Meets with 3004.

GRK 5100. Advanced Reading. (3.0 cr. [max 18.0 cr.]; prereq [GRK 3004 or equiv], at least two yrs of college level Greek. Must contact Classical and Near Eastern Studies department for permission to register.; fall, spring, every year) Reading in Greek texts/authors. Texts/authors vary.

GRK 5200. Biblical Greek. (3.0 cr. [max 6.0 cr.; prereq [GRK 3004 or equiv], at least two yrs of college level Greek. Must contact Classical and Near Eastern Studies department for permission to register.; fall, every year) Readings from Gospels, epistles of Paul, related literature. Emphasizes proficiency in reading Greek New Testament. Selections vary.

GRK 5701. Prose Composition. (3.0 cr.; prereq Grad student or #; spring, even years) 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 English prose into Greek.

GRK 5702. Text Criticism. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Theory/practice. Elements of paleography and manuscript study. Tools for analyzing textual apparatus; constructing a critical edition of a literary text.

GRK 5704. Greek Paleography. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) 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. (3.0 cr. [max 7.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Historical/comparative grammar of Greek/ Latin, from their Proto-Indo-European origins to classical norms.

GRK 5706. History of Greek. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Reading and formal analysis of documents illustrating evolution of Greek language from Mycenaean to modern times.

GRK 5800. Sight Reading for Graduate Students. (1.0 cr. [max 6.0 cr.; S-N only; prereq Enrollment in a grad program in Department of Classical/Near Eastern Studies; fall, spring, every year) Practice in reading Greek texts at sight.

GRK 5993. Directed Studies. (1.0-4.0 cr. [max 18.0 cr.; fall, spring, summer, every year) Guided individual reading or study. Prereq Grad student or instr consent.

GRK 5994. Directed Research. (1.0-12.0 cr. [max 18.0 cr.; fall, spring, every year) Supervised original research on topic chosen by student. Prereq Grad student or instr consent.

GRK 5996. Directed Instruction. (1.0-12.0 cr. [max 20.0 cr.; fall, spring, every year) Supervised teaching internship. Prereq Grad student or instr consent.

GRK 8100. Readings in Greek Prose. (3.0 cr. [max 18.0 cr.; prereq Advanced grad student; fall, spring, every year) Reading and discussion of ancient Greek prose texts.

GRK 8120. Greek Text Course. (3.0 cr. [max 15.0 cr.; prereq 3111 or #; not for students in dept of Classical and Near East Studies; fall, spring, every year) Students attend 3xxx Greek courses. Supplementary work at discretion of instructor.

GRK 8200. Readings in Greek Verse. (3.0 cr. [max 18.0 cr.; prereq Advanced grad student; fall, spring, every year) Reading/discussion of ancient Greek poetic texts.

GRK 8262. Survey of Greek Literature I. (3.0 cr.; ) Extensive selections from all genres of Greek literature of archaic and early classical periods.

GRK 8263. Survey of Greek Literature II. (3.0 cr.; ) Extensive selections from Greek authors of the classical and Hellenistic eras.

GRK 8300. Readings in Greek Texts. (3.0 cr. [max 18.0 cr.; prereq Advanced grad student; fall, spring, every year) 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. (3.0 cr. [max 6.0 cr.; prereq Advanced grad student; fall, odd years) Reading/discussion of early Christian texts in Greek.

GRK 8910. Seminar. (3.0 cr. [max 30.0 cr.; fall, spring, offered periodically) Various topics in Greek literature examined in depth with emphasis on current scholarship and original student research.

Health Informatics (HINF)
Academic Health Center Shared

HINF 5115. Interprofessional Healthcare Informatics. (3.0 cr.; prereq Grad student or professional student or #; fall, spring, summer, every year) Implications of informatics for practice, including nursing, public health, and healthcare in general. Electronic health record issues. Relates ethical, legislative and political issues informatics. Global and future informatics issues.

HINF 5430. Health Informatics I. (3.0 cr.; A-F or Audit; prereq Junior or senior or grad student or professional student or #; fall, every year) Introductory survey of health informatics, focusing on foundational concepts. Conceptualizations of data, information, knowledge. Current terminologies, coding, classification systems for medical information. Ethics, privacy, security. Systems analysis, process/data modeling. Human-computer interaction/data visualization.
HINF 5431. Health Informatics II. (3.0 cr.; A-F or Audit; prereq Junior or senior or grad student or professional student or #; spring, every year) Introductory survey of health informatics, focusing on applications of informatics concepts/technologies. Health informatics research, literature, evaluation. Decision models. Computerized decision support systems. Data mining, natural language processing, other emerging technologies. Security for health care information handling.

HINF 5436. AHC Informatics Grand Rounds. (1.0 cr. [max 10.0 cr.]; S-N or Audit; fall, spring, every year) Presentation/discussion of research problems, current literature/topics of interest in Health Informatics.

HINF 5496. Internship in Health Informatics. (1.0-6.0 cr. [max 18.0 cr.]; S-N or Audit; prereq HINF student or #; fall, spring, summer, every year) Practical industrial experience not directly related to student's normal academic experience.

HINF 5499. Capstone Project for the Masters of Health Informatics. (3.0 cr.; A-F only; prereq second semester MHI student or #; fall, spring, summer, every year) Final opportunity to apply newly acquired knowledge/skills to project involving practical problem in health informatics. Submit written project report in lieu of final examination.

HINF 5501. US Health Care System: Information Challenges in Clinical Care. (1.0 cr.; S-N or Audit; prereq Junior or senior or professional student or grad student or #; fall, spring, every year) Health care system/its unique interaction between key health system stakeholders. Relationship between patients, providers, payers, regulatory bodies. Role of information management/challenges of information standardization/exchange.

HINF 5502. Programming Essentials Python 3. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Junior or senior or grad student or professional student or #; fall, spring, every year) Computer programming essentials for health sciences/health care applications using Python 3. Intended for students with limited programming background, or students wishing to obtain proficiency in Python programming language.

HINF 5510. Applied Health Care Databases: Database Principles and Data Evaluation. (3.0 cr.; A-F or Audit; prereq Junior or senior or grad student or professional student or #; fall, every year) Principles of database theory, modeling, design, manipulation of databases. Taught with health care applications emphasis. Using relational database management system (RDBMS). Database manipulation. Structured Query Language (SQL) to compose/execute queries.

HINF 5520. Clinical Informatics and Patient Safety. (2.0 cr.; A-F or Audit; prereq Junior or senior or grad student or professional student or #; fall, spring, every year) Application/operation of clinical information systems, electronic health records, decision support/application in health care system. Use of clinical information systems/association with health care delivery, payment, quality, outcomes.

HINF 5530. Health Care Software Management. (2.0 cr.; A-F or Audit; prereq HINF student or #; spring, every year) Health care software and unique interaction between key stakeholders in health care software development and implementation. Systems analysis, software development, and software life cycle management for health care applications.

HINF 5531. Health Data Analytics and Data Science. (2.0 cr.; A-F or Audit; prereq Junior or senior or professional student or grad student or #; spring, every year) Data science methods/techniques for extraction, preparation, use of health data in decision-making.

HINF 5540. Interprofessional Health Informatics. (2.0 cr.; A-F only; spring, every year) Informatics applications in various healthcare professions. Clinical specialties. Informatics tools to improve healthcare services/outcomes through lectures/presentations.

HINF 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

HINF 8405. Advanced Topics in Health Informatics I. (1.0-4.0 cr. [max 12.0 cr.]; prereq Professional student or grad student or #; fall, every year) Topics may include computer systems design for health sciences, small computer concepts/use, computers for clinical services, computer-aided medical decision making, biomedical image processing, pattern recognition, data mining. Case studies from health sciences.

HINF 8406. Advanced Topics in Health Informatics II. (1.0-4.0 cr. [max 12.0 cr.]; prereq Professional student or graduate student or #; spring, every year) 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 8434. Medical Decision Support Techniques. (3.0 cr.; A-F or Audit; prereq 5432 or #; fall, spring, every year) 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. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

HINF 8446. Professional Studies in Health Informatics. (1.0-2.0 cr.; A-F or Audit; prereq 5431, PubH 5452 or #; grad hth inf major; fall, spring, every year) 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 or Research in Health Informatics. (1.0-6.0 cr. [max 24.0 cr.]; Student Option No Audit; prereq HINF student or #; fall, spring, summer, every year) Directed readings or research in topics of current or theoretical interest in health informatics.

HINF 8494. Research in Health Informatics. (1.0-6.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) Directed research under faculty guidance.

HINF 8525. Health Informatics Teaching. (2.0 cr.; A-F only; prereq HINF student or #; spring, odd years) Use selected teaching techniques to assist in the delivery of course content in health informatics curriculum. Work with a professor who is the course director. From evaluation and feedback on their teaching technique, students develop a teaching philosophy as a final course project.

HINF 8535. Advanced Health Informatics Research Methods. (3.0 cr.; A-F only; prereq HINF student or #; spring, odd years) Application of research methods, evaluation. Design, data collection, and data analysis in the context of health informatics, including computational and health data challenges.

HINF 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

HINF 8770. Plan B Project. (4.0 cr.; No Grade Associated; prereq Advanced plan B MS student; fall, spring, summer, every year) Research project. Topic arranged between student/instructor. Written report required.

HINF 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

HINF 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)
HEBR 5090. Advanced Modern Hebrew. (3.0 cr.; [max 18.0 cr.]; prereq 3012 or #; fall, every year) Various authentic Hebrew texts. Comprehension/speaking. Conducted entirely in Hebrew. Emphasizes Modern Israeli Hebrew. Grammar, widening vocabulary. Contemporary short fiction, essays, articles on cultural topics, films, Hebrew Internet sites, TV.

HEBR 5200. Advanced Classical Hebrew. (3.0 cr.; [max 18.0 cr.]; =[HEBR 3200]; prereq [3 sem of biblical Hebrew, 5 sem of modern Hebrew] or #; fall, spring, offered periodically) In-depth reading, analysis, and discussion of classical Hebrew texts. Grammar, syntax. Introduction to text-criticism, history of scholarship, and scholarly tools. Format varies between survey of themes (e.g., law, wisdom, poetry) and extended concentration upon specific classical texts.

HEBR 5300. Post-Biblical Hebrew: Second Temple Period. (3.0 cr. [max 18.0 cr.]; prereq Grad student or #; fall, even years) Readings in late/post-biblical Hebrew literature of Persian, Hellenistic, and early Roman periods (e.g., Chronicles, Ezra-Nehemiah, Ecclesiastes, Daniel, Dead Sea Scrolls, apocrypha, pseudepigrapha). Focuses on historical development of Hebrew language and literature in relation to earlier biblical sources.

HEBR 5400. Rabbinic Texts. (3.0 cr. [max 18.0 cr.]; prereq Grad student or #; spring, even years) Language, idiom, and literary forms of classical Rabbinic sources in Hebrew. Selections drawn from legal, homiletical, and narrative texts (Mishnah, Tosefta, Talmud, Midrash). Original socio-historical/cultural background of Rabbinic literature, its enduring religious significance.

HEBR 5990. Topics in Hebrew Studies. (1.0-4.0 cr. [max 12.0 cr.]; prereq Grad student or #; fall, offered periodically) Historical, linguistic, literary, religious, or humanistic study of Hebrew society/culture. Approach/method of study varies with topic.

HEBR 5992. Directed Readings. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Guided individual reading or study. Prereq instr consent, dept consent, college consent.

HINDI-URDUPRINCIPLES OF INDIAN RELIGIOUS AND PHILOSOPHICAL THOUGHT

HINDI-URDU (HNUR) College of Liberal Arts

HNUR 5040. Readings in Hindi-Urdu Texts. (3.0 cr. [max 9.0 cr.]; prereq 3032 or #; fall, spring, offered periodically) Read authentic materials of various types to improve reading/speaking ability.

HNUR 5993. Directed Readings. (1.0-5.0 cr. [max 15.0 cr.]; fall, spring, every year) Guided individual reading or study of modern Hindi-Urdu texts. Prereq instr consent, dept consent, college consent.

History (HIST) College of Liberal Arts

HIST 5011. Measuring the Past: Quantitative Methods for Historical Research. (4.0 cr.; =[HIST 3011]; prereq Primarily for 1st-yr grad students; fall, spring, offered periodically) Basics of quantitative historical data collection, measurement, analysis.

HIST 5051. Before Herodotus: History and Historiography of Mesopotamia and the Ancient Near East. (3.0 cr.; A-F or Audit; =[CNES 5051]; prereq Prev coursework in ancient Near Eastern history recommended; fall, spring, offered periodically) Historical method/sources for ancient Near Eastern history. Historical traditions. Historiographic texts of Mesopotamia and neighboring regions of the ancient Near East, secondary emphasis on their relationship to works of classical historians such as Herodotus. Use of these sources in modern historiography of ancient Near East.

HIST 5053. Doing Roman History: Sources, Methods, and Trends. (3.0 cr.; prereq Grad student or #; fall, spring, even years) Survey of major scholarship in field of Roman history since Mommsen. Political, cultural, social, military, and economic history. Focuses on methodological problems posed by evidence. Ways in which these issues shape research.

HIST 5111. Proseminar in the History of Medieval Europe. (3.0 cr.; A-F or Audit; prereq Advanced undergrads of exceptional ability or grads; fall, spring, offered periodically) 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 5115. Medieval Latin Historians. (3.0 cr.; prereq Reading knowledge of Latin; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; =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. (3.0 cr.; [max 4.0 cr.]; =[HIST 3264]; fall, spring, every year) Interaction with Europe and Asia; attempts at modernization and reform; emancipation of the serfs and rise of revolutionary movements.

HIST 5265. 20th-Century Russia: The Collapse of Imperial Russia, the Revolutions, and the Soviet Regime. (3.0 cr.; =[HIST 3265]; spring, every year) 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. (3.0 cr.; A-F or Audit; =[HIST 3271]; fall, spring, offered periodically) 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 5276. Intellectual and Cultural History of Modern Greece. (3.0 cr.; fall, odd years) Literary and cultural contributions of modern Greece. The modern Greek experience seen through Greek historical and cultural monuments. An attempt at self-definition.

HIST 5285. Problems in Historiography and Representation of the Holocaust. (3.0 cr.; =JWST 5111; prereq JWST 3521 or RELS 3521 or #; fall, spring, offered periodically) 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. (3.0 cr.; fall, spring, offered periodically) 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. (3.0 cr.; fall, spring, offered periodically) Social movements (revolutionary, nationalist, women’s; communist and post-communist societies.

HIST 5379. Problems in Early American History. (3.0 cr.; fall, spring, offered periodically) 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. (3.0-4.0 cr. [max 8.0 cr.]; prereq 1301, 1302; fall, spring, offered periodically) 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. (3.0 cr.; fall, spring, offered periodically)
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

Women's history/masculinity. Gender/colonialism, marriage, sexuality, nationalism, labor, political movements, feminism.

HIST 5436. Social History of African Women: 1850 to the Present. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically)
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 5439. Environment and Society in Africa. (3.0 cr.; prereq #; fall, spring, offered periodically)
Major historiographical, theoretical, and methodological debates concerning people-environment relations in Africa, from rise of human societies to present. Environment and the rise of civilizations. Demography, colonial environmental policies, conservation, disease, indigenous knowledge, water management, food.

HIST 5441. Transformations in Pre-Colonial African History. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically)
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. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically)
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 5468. Social Change in Modern China. (3.0 cr.; =EAS 3468, HIST 3468); spring, offered periodically)
Opium 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. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically)
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 5473. Japan's Modernities: Historiographies. (3.0 cr.; A-F or Audit; prereq [Advanced undergrad, #] or grad student; spring, offered periodically)

HIST 5474. Sex and the Politics of Desire: Japan and Beyond. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically)

HIST 5478. Tigers and Dragons: The Rise of the East Asian Economies, 1930-Present. (3.0 cr.; =HIST 3478, GLOS 3278; prereq Grad student; spring, even years)
Rise of East Asian Economies, 1930-Present.

HIST 5479. History of Chinese Cities and Urban Life. (3.0 cr.; A-F or Audit; =EAS 3479, HIST 3479, ALL 3371); fall, spring, offered periodically)
Introduction to traditional Chinese cities, their modern transformation. Ideal city plan in Confucian classics compared with physical layout of some major cities. Models about Chinese cities, influence of the models on our understanding of Chinese history/society.

HIST 5501. Medieval Europe and the World. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically)
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/explores: Assessment of other cultures' knowledge of Europe in the period.

HIST 5505. Survey of the Middle East. (3.0 cr.; prereq Grad or #; )
Peoples, lands, cultures of the Middle East, from earliest civilizations to present.

HIST 5520. Topics in Chinese History. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)
Selected topics not covered in regular courses. Taught as staffing permits.

HIST 5540. Topics in Mediterranean Studies. (1.0-4.0 cr. [max 15.0 cr.]; A-F or Audit; prereq Grad student or advanced undergrad with #; fall, spring, every year)
Mediterranean history, from Middle Ages to present. Taught as staffing permits.

HIST 5541. Islam in the Catholic Age. (3.0 cr.; prereq Grad or #; )

HIST 5547. Empire and Nations in the Middle East. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Modernity in non-Western imperial context. Identity, ideology, economy, environment, language.

HIST 5561. New Directions in the Middle Ages, ca. 300-1100. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically)
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 5562. New Directions in the Middle Ages, ca. 1100-1500. (3.0 cr.; A-F or Audit; prereq [5611, grad student] or #; fall, spring, offered periodically)
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 5564. The Medieval Church. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
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 5566. Proseminar in Medieval Spain. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically)
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 5567. Spain in the Early Modern Period: 1492-1814. (3.0 cr.; A-F or Audit; fall, spring, offered periodically)
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 5569. The French Revolution. (3.0 cr.; A-F or Audit; prereq Grad student or [advanced undergrad, #]; fall, spring, offered periodically)
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 5571. Comparative Early Modern History. (3.0 cr.; A-F or Audit; prereq Hist grad or #; fall, spring, offered periodically)
Critical reading of historical literature dealing with integration of the globe during the early modern period, ca. 1350-1750; book reports, class discussion.

HIST 5572. World History Proseminar. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically)
Theoretical approaches to world/global history. Review of major theories, controversies, chronologies, pedagogical approaches.

HIST 5573. Socio-Economic History of China. (3.0 cr.; A-F or Audit; prereq Grad student or [adv undergrad, #] )
HIST 5640. Topics in Legal History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) 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 5642. U.S. Legal History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Topics in history of American law, legal thought, legal institutions, and legal profession. Proceeds thematically. Primary/secondary sources.

HIST 5646. U.S. Women's Legal History. (3.0 cr.; fall, offered periodically) 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. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Evolution of and interaction among Roman and civil law, customary/feudal law, canon law, and English common law. Primary/secondary sources in English.

HIST 5649. Ideas in Context: Making Early Modern Knowledge, 1500-1800. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq Hist grad or #; fall, spring, offered periodically) Critical reading of historical literature for early modern Europe, ca. 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: British Empire. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Introduction to current historical research on European women's history, 1450-1750. Topics include gender roles and form of family structure, women's participation in religious movements, legal status of women.

HIST 5720. Society/Politics:Modern Europe. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Grad or #; fall, spring, every year) 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. (3.0 cr.; =HIST 3721; prereq previous coursework in 19th- and/or 20th-century Europe, #; fall, spring, offered periodically) 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 5740. Topics in Modern German History. (3.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically) 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.. (3.0 cr.; A-F or Audit; prereq Knowledge of Russian or German or French; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq 5761, knowledge of Russian or German or French; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Standard methods of population analysis. Focuses on methods widely used for historical population research.

HIST 5801. Seminar in Early American History. (3.0 cr.; A-F or Audit; =HIST 8801; fall, spring, offered periodically) Introduction to literature of early American history. Readings selected from some of best scholarship in field. Questions of colonial historians. Theories, methods, sources used in pursuit of those questions.

HIST 5802. Readings in American History, 1848-Present. (3.0 cr.; A-F or Audit; =HIST 8802; fall, spring, every year) Readings-intensive course. U.S. history from Mexican-American War to present.


HIST 5821. American History in the Twentieth Century. (3.0 cr.; A-F or Audit; prereq Grad student, #; fall, spring, offered periodically) Intensive readings seminar.


HIST 5841. Proseminar in American Economic History. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Historical literature on American economic and business history from American Revolution to the modern economy.

HIST 5844. U.S. Labor History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) 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, management strategy, labor protest, and trade union organization.

HIST 5845. History of American Capitalism. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically)
HIST 5871. Readings in U.S. Intellectual History: 19th-20th Centuries. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Introduction to key issues, theoretical frameworks, research, and methodologies of Asian American history. Seminal texts that defined the field. Recent scholarship in history and in related disciplines. Emphasis field’s comparative/transnational linkages to ethnic studies, Asian studies, and the Americas.

HIST 5881. American Foreign Relations to 1895. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Intensive consideration of topics in American Indian history. Topics may include social history, history of particular regions, political systems, education, American Indian policy.

HIST 5900. Topics in European/Medieval History. (1.0-4.0 cr. [max 16.0 cr.]; A-F only; prereq Grad or [advanced undergrad with #]; fall, spring, offered periodically) Selected topics in European or medieval history not covered in regular courses; taught as staffing permits.

HIST 5901. Latin America Proseminar: Colonial. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Introduces beginning graduate and advanced undergraduate students to major historical writings on various Latin American themes.

HIST 5902. Latin America Proseminar: Modern. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Introduces beginning graduate and advanced undergraduate students to major historical writings on various Latin American themes.

HIST 5905. Topics in European Medieval History. (1.0-4.0 cr. [max 16.0 cr.]; prereq Grad or [advanced undergrad with #]; fall, spring, every year) Selected topics in Medieval European history, up to 1500ce.

HIST 5910. Topics in U.S. History. (1.0-4.0 cr. [max 16.0 cr.]; prereq Grad or advanced undergrad student with #; fall, spring, every year) Selected topics in U.S. history not covered in regular courses. Taught as staffing permits.

HIST 5920. Topics in African History. (3.0 cr. [max 15.0 cr.]; prereq Grad or #; fall, spring, offered periodically) Topics not covered in regular courses.

HIST 5930. Topics in Ancient History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; prereq Grad or #; fall, spring, offered periodically) Selected topics in ancient history not covered in regular courses. To be taught as staffing permits and as enrollment warrants.

HIST 5931. Topics in Comparative Third World History. (3.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically) Topics specified in Class Schedule.

HIST 5932. The Production of Knowledge, Negotiating the Past, and the Writing of African Histories. (3.0 cr.; A-F or Audit; [AFRO 5932]; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq Previous coursework in Greek or Roman history; #; fall, spring, offered periodically) Seminar on a selected topic in ancient history.

HIST 5934. Comparative History and Social Theory. (3.0 cr.; A-F or Audit; prereq Grad student or [upper-div undergrad; #]; fall, odd years) Works of history/sociology that are broadly comparative/theoretical. Issues of state formation, social movements, social structure, and economic development.

HIST 5935. Methods and Pedagogy in African History. (3.0 cr.; A-F or Audit; prereq Grad student or [upper-div undergrad; #]; fall, spring, offered periodically) Current historical methods/sources of African history. Pedagogical issues. Students design their own courses.

HIST 5940. Topics in Asian History. (1.0-4.0 cr. [max 16.0 cr.]; prereq Grad student or [advanced undergrad; #]; fall, spring, every year) Topics not covered in regular courses.

HIST 5941. Readings in Chinese Documents. (3.0 cr.; A-F or Audit; prereq Reading knowledge of Chinese; fall, spring, offered periodically) 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. (3.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; prereq Prior history of medicine or history of science course recommended for undergrads; fall, spring, offered periodically) 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. (1.0-4.0 cr. [max 15.0 cr.]; A-F or Audit; prereq Grad or advanced undergrad with #; fall, spring, every year) Selected topics in Latin American history not covered in regular courses. Taught as staffing permits.

HIST 5960. Topics in History. (1.0-4.0 cr. [max 16.0 cr.]; prereq Grad or [advanced undergrad with #]; fall, spring, every year) Selected topics in history not covered in regular courses. Taught as staffing permits.

HIST 5962. Bell Library Research Seminar in Comparative World History. ca. 1000-1800 CE. (3.0 cr.; A-F or Audit; prereq Grad student; #; fall, spring, offered periodically) Research proseminar on actions of Europeans in wider world, 1000-1800. Based on documents in James Ford Bell Library.

HIST 5964. Comparative Economic History. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) 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. (4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, offered periodically) Students will carry out publishable-quality research on a quantitative historical topic.


HIST 5990. Readings in Comparative History. (3.0 cr. [max 9.0 cr.]; A-F only; prereq #; spring, even years)
Students read/discuss historical works that focus on common theme or employ 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. (1.0-16.0 cr. [max 20.0 cr.]; fall, spring, summer, every year) Guided individual reading or study. Prereq [Grad student or sr], instr consent, dept consent, college consent.

HIST 5994. Directed Research. (1.0-16.0 cr.; fall, spring, summer, every year) Work on a tutorial basis. Prereq [Grad student or sr], instr consent, dept consent, college consent.

HIST 8015. Scope and Methods of Historical Studies. (3.0 cr.; A-F or Audit; prereq #; fall, every year) Development of historical studies over time (especially in 19th and 20th centuries). Methodologies currently shaping historical research. Theoretical developments within the discipline during 19th and 20th centuries.

HIST 8016. Practicum in Historical Writing. (3.0 cr.; A-F only; fall, spring, offered periodically) Facilitate transition from writing seminar papers to writing individual research projects part of dissertation. Practice of making historical arguments in common genres of academic profession, such as grant proposals, prospectus, dissertation chapters.

HIST 8021. Seminar: Advanced Historical Writing. (3.0 cr.; A-F or Audit; prereq Grad student, #; fall, spring, offered periodically) 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. (3.0 cr. [max 6.0 cr.]; A-F or Audit; spring, every year) Issues surrounding interaction of memory/history. Genealogy of historical memory. Individual narratives and circulation of historical memory. Sites/forms of collective memory. Justice and historical memory. Case studies, discussions, research projects.

HIST 8110. Medieval History: Research Seminar. (3.0 cr.; A-F or Audit; prereq #, good reading knowledge of Latin, French, one other European language; fall, spring, offered periodically) Research in medieval European history, using primary source material.

HIST 8232. Cultural Fallout: The Cold War and Its Legacy: Research. (3.0 cr.; A-F or Audit; fall, spring, every year) Student 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. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Dynamics of gender, racial, class, and ethnic relations in U.S. history; intersections of these forces.

HIST 8240. Topics in Research in Gender, Race, Class, or Ethnicity in the United States. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically) Dynamics of gender, racial, class, and ethnic relations in U.S. history. Intersections of these forces. Topics vary by instructor.

HIST 8245. Human Rights and Crimes Against Humanity: A Global History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Theoretical literature on genocides and human rights and on race/nation. Readings/discussions on meaning of "genocide" and its codification in international law. Historical cases. Students choose case to research.

HIST 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, every year) (No description)

HIST 8390. Research in American Indian History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Research/writing skills in American Indian history. Identify research questions, locate sources, conduct original research, produce substantial research paper.


HIST 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

HIST 8464. Research in Yuan, Ming, and Qing History. (3.0 cr.; A-F or Audit; prereq Good working knowledge of classical Chinese, background in history of late imperial China; fall, spring, offered periodically) 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. (3.0 cr.; prereq Good working knowledge of classical Chinese, background in history of late imperial China; fall, spring, offered periodically) 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 centering on these texts.

HIST 8540. Topics in Mediterranean Studies. (1.0-4.0 cr. [max 15.0 cr.]; A-F or Audit; prereq Grad student or advanced undergrad with #; fall, spring, every year) Mediterranean history from Middle Ages to present. Taught as staffing permits.

HIST 8630. Seminar in World History. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Critical examination of historical literature dealing with theoretical approaches to world history and teaching of world history.

HIST 8640. Topics in Legal History Research. (3.0 cr.; [max 9.0 cr.]; A-F or Audit; fall, spring, offered periodically) Comparative, methodological, theoretical, and topical courses in legal historical research, from ancient world to present. Offerings rotate.

HIST 8644. Legal History Workshop. (3.0 cr.; A-F or Audit; prereq #; fall, spring, every year) 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. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

HIST 8709. Seminar: History of Sexuality. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Theories of sexuality (by, e.g., Foucault, Butler, deLaurets), their application in history. Topics may include: feminist critique of Foucault and the classics, psychoanalytic approaches to religious transformations such as the Reformation, varying forms of gender transgression, sexuality in colonial encounters, operation of sexual metaphors in political conflict, and AIDS and the writing of history.

HIST 8715. Research on European Women's History, 1450-1750. (3.0 cr.; prereq 5715; fall, spring, offered periodically) Research techniques for completing a major research project based on primary sources.

HIST 8720. Research Seminar on Central European History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, summer, every year) Broad research theme/problem: in most cases preparation for dissertation. Students identify primary/secondary sources, conduct research, write paper, and read/comment 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. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)
HIST 8801. Seminar in Early American History. (3.0 cr.; A-F or Audit; [max 16.0 cr.]; fall, spring, offered periodically) Introduction to literature of early American history. Readings selected from some of best scholarship in field. Questions of colonial historians. Theories, methods, sources used in pursuit of those questions.

HIST 8802. Readings in American History, 1848-Present. (3.0 cr.; A-F or Audit; [max 16.0 cr.]; fall, spring, offered periodically) Readings-intensive course. U.S. history from Mexican-American War to present.

HIST 8832. Cultural Fallout: The Cold War and Its Legacy: Research. (3.0 cr.; A-F or Audit; prereq 5831; fall, spring, every year) Student produces research paper on history/culture of Cold War era in the United States after World War II. Research projects build upon readings from 5831.

HIST 8857. Seminar: Research in the History of American Women. (3.0 cr.; A-F or Audit; prereq 5857; #; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq 5801 or #; fall, spring, offered periodically) 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. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 14 cr per semester or summer, 24 cr required; fall, spring, summer, every year) (No description)

HIST 8900. Topics in European/Medieval History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, every year) Topics not covered in regular courses.

HIST 8905. Topics in European Medieval History. (1.0-4.0 cr. [max 16.0 cr.]; fall, spring, every year) Selected topics in Medieval European history, up to 1500ce.

HIST 8910. Topics in U.S. History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, every year) Topics not covered in regular courses.

HIST 8920. Topics in African History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, offered periodically) Topics not covered in regular courses.

HIST 8930. Topics in Ancient History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, offered periodically) Topics not covered in regular courses.

HIST 8940. Topics in Asian History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, offered periodically) Topics not covered in regular courses.

HIST 8944. Research Seminar: New Directions in African Social History I. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) First of two-part course. Radical transformation in field of African social history during past two decades. Students select major research topic and begin preliminary investigation.

HIST 8945. Research Seminar: New Directions in African Social History II. (3.0 cr.; S-N or Audit; prereq 8944, #; fall, spring, offered periodically) Second of two-part course. Students conceptualize and write major research paper.

HIST 8950. Topics in Latin American History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; spring, every year) Topics not covered in regular courses.

HIST 8960. Topics in History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, every year) Topics not covered in regular courses.

HIST 8961. Research Seminar: Intellectual History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) 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 8970. Advanced Research in Quantitative History. (4.0 cr. [max 16.0 cr.]; A-F or Audit; prereq Grad student; fall, spring, summer, every year) Students carry out publishable-quality research on quantitative history topic.

HIST 8990. Topics in Comparative History-Research. (3.0 cr.; max 15.0 cr.; #; fall, spring, every year) 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. (1.0-16.0 cr.; A-F or Audit; prereq Grad student; #; fall, spring, summer, every year) Students work on tutorial basis. Guided individual reading or study.

HIST 8994. Directed Research. (1.0-16.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) Work on a tutorial basis.

**History of Medicine (HMED) Medical School**

HMED 5002. Public Health Issues in Historical Perspective. (3.0 cr.; fall, spring, offered periodically)

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 5035. The Germ Theory and Modern Medicine. (3.0 cr.; fall, spring, offered periodically) Analysis of the formulation of the germ theory of disease and of its consequences for medical procedures (therapeutics, surgery, management of hospitals), public health programs, and the structure and prestige of the medical profession.

HMED 5045. Modern Medical Profession. (3.0 cr.; fall, spring, offered periodically) Historical analysis of American medical profession in 19th/20th centuries. Role of institutions, influence of social/moral values. Consequences of specialization, scientific innovation.

HMED 5055. Women, Health, and History. (3.0 cr.; prereq Grad student or [jr or sr] with prev coursework in hist or #; fall, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq #; fall, spring, odd years) 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. (3.0 cr.; fall, spring, every year) An introductory survey of the history of medicine in Europe and America.

HMED 5201. History of Medicine from 1700 to 1900. (3.0 cr.; prereq 5200; spring, every year) An introductory survey of the history of medicine in Europe and America.

HMED 5210. Seminar: Theories and Methods in Medical History. (3.0 cr.; A-F or Audit; fall, every year) Historiography of the history of medicine.

HMED 5211. Seminar: Theories and Methods in Medical History. (3.0 cr.; A-F or Audit; prereq 5210; spring, every year) Use of archives, primary sources. Supervised research project.

HMED 5600. Directed Study. (0.0-4.0 cr. [max 16.0 cr.; #]; fall, spring, summer, every year) Directed Study

HMED 5940. Topics in the History of Medicine. (3.0-4.0 cr. [max 16.0 cr.]; fall, spring, offered periodically)
History of Science and Technology (HSCI)
College of Science and Engineering

HSCI 5211. Biology and Culture in the 19th and 20th Centuries. (3.0 cr.; [HSCI 3211]; fall, spring, every year)
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. (3.0 cr.; [HSCI 3242]; fall, spring, offered periodically)

HSCI 5244. History of Ecology and Environmentalism. (3.0 cr.; [HSCI 3244]; )
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. (3.0 cr.; [HSCI 3331]; fall, spring, offered periodically)
Development of American technology in its cultural/intellectual context from 1790 to present. Transfer of technology to America. Establishment of infrastructure promoting economic growth. Social response to technological developments.

HSCI 5332. Science and American Culture. (2.0-3.0 cr.; [HSCI 3332]; fall, spring, offered periodically)

HSCI 5401. Ethics in Science and Technology. (3.0 cr.; [HSCI 3401]; fall, spring, offered periodically)
Historical issues involving ethics in science. Ethical problems posed by modern science/technology, including nuclear energy, chemical industry, and information technologies.

HSCI 5421. Engineering Ethics. (3.0 cr.; [HSCI 3421]; fall, spring, every year)
Engineering ethics in historical context, including the rise of professional engineering societies; ethical problems in engineering research and engineers' public responsibility; ethical implications of advanced engineering systems such as the production of nuclear weapons; development of codes of ethics in engineering.

HSCI 5611. Enlightenment, Revolution, and the Rise of Modern Science. (3.0 cr.; [HSCI 3611]; spring, every year)

HSCI 5993. Directed Studies. (1.0-15.0 cr.; prereq #; fall, spring, summer, every year)
Guided individual reading or study.

HSCI 5994. Directed Research. (1.0-15.0 cr.; prereq #; fall, spring, every year)
TBD

HSCI 8111. Research Methods in the History of Science, Technology, and Medicine. (3.0 cr.; A-F only; =HSCI 8113; spring, every year)
Introduction to sources, methods, and problems of research in history of science, technology, and medicine. Preparation of major research paper under faculty supervision.

HSCI 8124. Foundations for Research in Ancient Science. (3.0 cr.; A-F or Audit; prereq Grad HSCI major or minor or #; fall, offered periodically)

HSCI 8125. Foundations for Research in the Scientific Revolution. (3.0 cr.; A-F or Audit; prereq Grad HSCI major or minor or #; fall, spring, even years)
Development of sciences/natural philosophy, 1500-1725.

HSCI 8131. Industrial Revolutions. (3.0 cr.; A-F only; spring, odd years)
Development of industrial society, from 1700 through 1850. Emphasizes developments in mechanical/engineering sciences. Scientific,
economic, political, and social dimensions of industrialization.

HSCI 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

HSCI 8421. Social and Cultural Studies of Science. (3.0 cr.; fall, spring, offered periodically) 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. (3.0 cr.; prereq #; fall, spring, offered periodically) 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. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

HSCI 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

HSCI 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) (No description)

HSCI 8830. Topics in the History of Science, Technology, and Medicine. (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically) Historical literature of topics common to history of science, technology, and medicine.

HSCI 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

HSCI 8900. Seminar: History of Early Physical Science. (3.0 cr.; prereq #; fall, spring, offered periodically) For advanced graduate students; topics in development of natural and mathematical science before 1800.

HSCI 8910. Seminar: History of Modern Physical Sciences. (3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, offered periodically) For advanced graduate students; topics in development of physical sciences since 1800.

HSCI 8920. Seminar: History of Biological Sciences. (3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, every year) For advanced graduate students; topics in development of natural, biological, and medical sciences from Aristotle to the present.

HSCI 8930. Seminar: History of Technology. (3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, offered periodically) 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. (3.0 cr.; prereq #; fall, spring, every year) 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. (3.0 cr.; prereq #; fall, every year) For advanced graduate students; topics in development of science and technology in or across specific geographic regions or particular cultures.

HSCI 8993. Directed Studies. (1.0-5.0 cr. [max 15.0 cr.]; prereq #; fall, spring, summer, every year) TBD

HSCI 8994. Directed Research. (1.0-5.0 cr. [max 15.0 cr.]; fall, spring, every year) TBD

Hmong (HMNG)
College of Liberal Arts

HMNG 5040. Readings in Hmong Texts. (2.0-4.0 cr. [max 12.0 cr.]; prereq 1016 or 3022 with grade of at least B or #; fall, spring, every year) Comprehensive, multidimensional overview of Hmong oral forms/traditions. Hmong legends, mythology, folksongs, birth, marriage/funeral rites. History, social/cultural anthropology. Values, life ways of traditional village society. Societal changes resulting from emigration to U.S.

Horticultural Science (HORT)
College of Food, Agricultural and Natural Resource Sciences


HORT 5012. Common Chinese Medicinal Plants: Growing and Processing. (3.0 cr.; prereq 1001 or BIOL 1009 or CHEM 1015 or #; fall, even years) How to grow, process, store 40 common Chinese herbs/herbal products.


HORT 5031. Fruit Production and Viticulture for Local and Organic Markets. (3.0 cr.; A-F or Audit; prereq [1001, 3005] or #; fall, odd years) Principles of fruit production. Temperature fruit crops. Integrated management of fruit cropping systems. Site selection, cultural management practices, taxonomic classification, physiological/environmental control of plant development. Writing.

HORT 5032. Organic Vegetable Production. (3.0 cr.; A-F or Audit; prereq [3005, ENT 1005, PLPA 2001, SOIL 2125] or #; spring, even years) Integrated management of vegetable cropping. Site selection/environment, seed/stand establishment, cultural management, commodity use, handling. Types of vegetable cultivars. Breeding, physiological/environmental control.


HORT 5059. Plant Cytogenetics Lab. (1.0 cr. [max 2.0 cr.]; prereq [HORT/AGRO 4401, BIOL 4004] or #; spring, even years) Consolidate knowledge of plant cytogenetics by practicing series of microscopy/computational technologies. Examine number, movement, structure/structure modification of chromosomes. Application in plant improvement.

HORT 5061. Advanced Turfgrass Science. (2.0 cr.; prereq 4061; spring, every year)
For advanced students in turf with career objectives in professional turf management.
Emphasis on ecology, physiology, theory of turf population dynamics/specialized management situations such as golf course, commercial sod production, fine turf aesthetic settings.

HORT 5071. Ecological Restoration. (4.0 cr.; prereq [One college course in ecology, one college course in [plant science or botany]] or #; fall, every year)

HORT 5090. Directed Studies. (1.0-6.0 cr. [max 18.0 cr.]; prereq 8 cr upper div Hort courses; #; fall, spring, summer, every year)
In-depth exploration of concepts, technology, materials, or programs in specific area to expand professional competency/self-confidence. Planning, organizing, implementing, and evaluating knowledge obtained from formal education and from experience.

HORT 5131. Student Organic Farm Planning, Growing, and Marketing. (3.0 cr.; =HORT 3131, AGRO 5131, AGRO 5131); prereq 1001 or AGRO 1101 or AGRO 1103 or BIOL 1001 or BIOL 1009 or #; spring, every year)
Students plan/implement cropping/marketing strategies for organic produce/flowers from Student Organic Farm on St. Paul campus.

HORT 8005. Supervised Classroom or Extension Teaching Experience. (2.0 cr.; S-N or Audit; =BBE 8005, SOIL 8005, LPFA 8005, AGRO 8005, LAAS 8005); prereq #; fall, even years
Classroom or extension teaching experience in one of the following departments: Agronomy and Plant Genetics; Biosystems and Agricultural Engineering; Horticultural Science; Plant Pathology; or Soil, Water, and Climate. Participation in discussions about effective teaching to strengthen skills and develop personal teaching philosophy.

HORT 8007. Extension Horticulture Practicum. (1.0-5.0 cr.; prereq 9 grad cr in [ag or bio] science; #; fall, spring, summer, every year)
Selected activities that may include development of an extension fact sheet, assistance in Dial-U Clinic, or preparation of a workshop or short course.

HORT 8023. Evolution of Crop Plants. (3.0 cr.; A-F; only; prereq 9 grad cr in ag or bio sciences; spring, odd years)
Origin, distribution, and evolution of cultivated plants; implication of the effects of evolutionary processes on crop breeding for needs of people today.

HORT 8044. Manipulation of Plant Growth and Reproduction. (2.0 cr.; prereq PBio 5412; fall, spring, offered periodically)
Impact of environmental and genetic factors on crop growth, development, and reproduction.

Emphasis on whole plant physiology and plant response to the environment as determined by genotype and its manipulation for the purpose of producing a crop. Lectures, discussion of current literature, and projects.

HORT 8090. Graduate Horticultural Research. (1.0-12.0 cr. [max 18.0 cr.]; prereq #; fall, spring, summer, every year)
Conduct literature, lab, and/or field research with horticultural plants and cropping systems.

HORT 8201. Advanced Plant Breeding. (3.0 cr.; A-F only; =AGRO 8201); prereq STAT 5301 or equiv; fall, odd years)
Principles/current methods in breeding agronomic/horticultural crops. Use of genotype/environment data to increase genetic gain, population improvement, parent building, alternative selection strategies, breeding for special traits, new approaches.

HORT 8270. Graduate Seminar. (1.0 cr.; A-F or Audit; =AGRO 8270); prereq Grad major in [hort or applied plant sciences or ent or agro or pnt brdg or pnt path or soil] or #; fall, spring, every year)
Reports/discussions on problems, investigation work.

HORT 8280. Current Topics in Applied Plant Sciences. (1.0 cr.; S-N or Audit; prereq Grad major in [hort or applied pnt sciences or ent or agro or pnt brdg or pnt path or soil] or #; fall, spring, every year)
Topics presented by faculty or visiting scientists.

HORT 8900. Advanced Discussions. (1.0-3.0 cr. [max 12.0 cr.]; S-N or Audit; =AGRO 8900); prereq #; fall, spring, every year)
Special workshops or courses in applied plant sciences.

Housing Studies (HSG)
College of Design

HSG 5170. Topics in Housing Studies. (1.0-4.0 cr. [max 32.0 cr.]; A-F or Audit; prereq Jr or sr or grad student; fall, spring, summer, every year)
In-depth investigation of a single specific topic, announced in advance.

HSG 5193. Directed Study in Housing Studies. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Jr or sr or grad student; fall, spring, summer, every year)
Independent study in Housing Studies under tutorial guidance.

HSG 5196. Field Study: National/International. (1.0-10.0 cr.; A-F or Audit; =GDES 5196, APST 5196, DES 5196, IDES 5196); prereq #; fall, spring, summer, every year)
Faculty-directed field study in national or international setting.

HSG 5463. Housing Policy. (3.0 cr.; A-F or Audit; =PA 5261; prereq [2401 or DHA 2401], [2463 or DHA 2463] or #; spring, every year)
Institutional/environmental settings that make up housing policy in the United States.

Competing ideas about solving housing problems through public intervention in the market. Federal/local public sector responses to housing problems.

HSG 5464. Understanding Housing: Assessment and Analysis. (3.0 cr.; A-F or Audit; prereq [(2401 or DHA 2401), [2463 or DHA 2463] or #; spring, every year)
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.

HSG 5467. Housing and the Social Environment. (4.0 cr.; A-F or Audit; prereq Grad student; fall, every year)
Housing choices in context of social environment. Emphasizes special needs of elderly, disabled, minorities, large families, female-headed households, and low-income households. Students conduct a post-occupancy evaluation of housing.

HSG 5471. Housing Studies Certificate Seminar. (2.0 cr.; A-F or Audit; prereq Admitted to Housing Studies Certificate Prog; spring, even years)
Integrative seminar and "capstone" to Certificate program. Students prepare an individual career plan that focuses on application of housing studies to community/workplace.

HSG 5481. Promoting Independence in Housing and Community. (3.0 cr.; A-F or Audit; prereq [(2401 or DHA 2401), [jr or sr or grad student] or #; fall, odd years)
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.

HSG 5484. Rural Housing Issues. (3.0 cr.; A-F or Audit; prereq [(2401 or DHA 2401), [2463 or DHA 2463] or #; spring, odd years)
Housing issues for non-metropolitan places, small towns, and rural areas. Housing needs and policy implications for rural residents. Economic development strategies for housing availability, adequacy, and affordability.

HSG 8170. Topics in Housing Studies. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, spring, every year)
In-depth investigation of topic announced in advance.

HSG 8180. Professional Seminar. (1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; fall, spring, every year)
Professional development issues/trends.

HSG 8192. Readings in Housing Studies. (1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)
Independent study, review of books, and periodicals under tutorial guidance.

HSG 8193. Directed Study. (1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year)
Directed study in housing studies.
Human Factors (HUMF)
College of Design

HUMF 5001. Foundations of Human Factors/Ergonomics. (3.0 cr.; A-F or Audit; 3022, [CSOM or HRD junior or senior or %]; fall, every year) Variables in human performance influenced by interaction with designs of machines/tools, computers/software, complex technological systems, jobs/work conditions, organizations, sociotechnical institutions. Conceptual, empirical, practical aspects of human factors/ergonomics.

HUMF 5193. Directed Study in Human Factors and Ergonomics. (1.0-4.0 cr. [max 8.0 cr.]; A-F only; prereq #, fall, spring, summer, every year) Independent study in human factors/ergonomics under tutorial guidance.

HUMF 5211. Human Factors and Work Analysis. (4.0 cr.; A-F or Audit; 3022, [CSOM or HRD junior or senior or %]; fall, every year) Human factors engineering (ergonomics), methods engineering, work measurement. Displays, controls, instrument layout, supervisory control. Anthropometry, work physiology, biomechanics, Noise, illumination, toxicology. Operations analysis, motion study, time standards.

HUMF 5722. Human Factors Psychology. (3.0 cr.; A-F or Audit; 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.

HUMF 5874. Service Design: Designing complex systems to improve service delivery. (4.0 cr.; A-F only; prereq Grad student, spring, every year) Real world service delivery problems. Perceptual/cognitive strengths/weaknesses addressed when designing systems.

HUMF 8001. Special Topics: Human Factors/Ergonomics. (2.0-3.0 cr.; prereq Grad HumF major or minor or #, fall, spring, every year)


HUMF 8002. Proseminar in Human Factors/Ergonomics. (1.0 cr. [max 2.0 cr.]; A-F or Audit; prereq Grad HumF major or minor or #; fall, spring, every year) Issues/concerns tailored to interests of faculty/students regarding human factors/ergonomics. Interdisciplinary science concerned with interaction of performance/behavior with design factors in performance environment.

HUMF 8333. Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser consent, DGS consent; fall, spring, summer, every year) FTE: Master's.

HUMF 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser consent, DGS consent; fall, spring, summer, every year) FTE: doctoral.

HUMF 8541. Decision Support Systems. (4.0 cr.; A-F or Audit; 3022, [CSOM or HRD junior or senior or %]; fall, spring, every year) Students build a decision support system for a problem of their choice. How to identify appropriate problems. Styles of DSSs, evaluating their effectiveness.

HUMF 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; fall, spring, summer, every year) Doctoral pre-thesis credits.

HUMF 8777. Thesis Credits: Master's. (1.0-15.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 or total required [Plan A only]; fall, spring, summer, every year) Thesis credits: master's.

HUMF 8794. Human Factors Research. (1.0-4.0 cr.; S-N only; fall, spring, summer, every year) Human factors research.

HUMF 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) Thesis credit: doctoral.

Human Resources and Industrial Relations (HRIR)
Curtis L. Carlson School of Management

HRIR 5000. Topics in Human Resources and Industrial Relations. (2.0 cr.; prereq Grad majors must register A-F; 3022, [CSOM or HRD junior or senior or %]; fall, spring, summer, every year) Topics in human resources/industrial relations.

HRIR 5655. Public Policies on Work and Pay. (3.0 cr.; [PA 5431]; prereq HRIR MA student must register A-F, ECON 1101, [CSOM or HRD junior or senior or %]; spring, every year) Analysis of public policies regarding employment, unions, labor markets. Public programs affecting wages, unemployment, training, worker mobility, security, quality of work life. Policy implications of changing nature of work.


HRIR 5992. Independent Study in Human Resources and Industrial Relations. (1.0-8.0 cr.; prereq % or #; fall, spring, summer, every year) Individual readings or research topics.

HRIR 8012. Applied Quantitative Methods in Human Resources and Industrial Relations. (2.0 cr.; prereq [8011, grad HRIR major or %; grad majors must register A/F; fall, spring, summer, every year) Evaluation of applied statistical research in human resources and industrial relations. Appropriate statistical procedures/applications. Sampling issues, multiple regression, advanced topics.

HRIR 8013. Research Methods in Social and Labor Policy. (3.0 cr.; A-F or Audit; [PA 8386]; prereq 8011, grad HRIR major or %; grad majors must enroll A-F only; fall, offered periodically) Application of social science research methods to public policy issues.

HRIR 8041. Design and Management of Organizations. (4.0 cr.; prereq Econ 1101, Econ 1102, Psy 1001 or #, grad HRIR major or %; grad majors must enroll A-F only; fall, every year) 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 8061. Introduction to Labor Market Analysis. (4.0 cr.; prereq Econ 1101, Econ 1102 or #, grad HRIR major or %; grad majors must enroll A-F only; fall, spring, summer, every year) 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. (2.0 cr.; prereq 8061 or #, grad HRIR major or %; grad majors must enroll A-F only) Case studies used to design strategy.

HRIR 8063. Human Resources and Organizational Performance. (2.0 cr.; = [PA 8105]; prereq 8061 or #, grad HRIR major or %; grad majors must enroll A-F only; fall, every year) Impact of human resource policies and practices on organizational productivity and effectiveness. Role of government, unions, and private sector institutions on organizational effectiveness.

HRIR 8065. Topics in Macro Labor Market Analysis. (2.0-4.0 cr.; prereq 8061 or #, HRIR PhD student or %; grad majors must enroll A-F only; fall, spring, offered periodically) 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 8074. Labor-Management Negotiations. (2.0 cr.; prereq 8071 or #, grad HRIR major or %; grad majors must enroll A-F only; ) Analysis of the nature of negotiations with applications to private and public sector collective bargaining. Nature of conflict and dilemma between competition and cooperation. Determinants of bargaining strategies, tactics, outcomes, and impasses. Newly emerging issues.

HRIR 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq HRIR MA student, %; fall, spring, summer, every year) (No description)

HRIR 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

HRIR 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

HRIR 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)


HRIR 8812. Core Seminar: Research Methods in Work and Organizations. (4.0 cr.; prereq [Business Admin PhD student or %], grad majors must enroll A-F; spring, offered periodically) Application in research projects.

HRIR 8820. Seminar: Special Topics in Work and Organizations Research. (2.0 cr. [max 12.0 cr.]; prereq [Business Admin student or %], grad majors must enroll A-F; spring, every year) Contemporary theories/research on specific topics in work/organizations. Topics vary.

HRIR 8825. Research Practicum/Workshop. (1.0 cr. [max 4.0 cr.]; S-N only; prereq Business Admin PhD student or %, fall, spring, every year) Experience in conducting research/other doctoral student activities.

HRIR 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

HRIR 8891. Independent Study in Human Resources and Industrial Relations. (1.0-8.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) Individual readings and/or research projects.

Industrial Engineering (IE)

College of Science and Engineering

IE 5080. Topics in Industrial Engineering. (1.0-4.0 cr.; prereq Upper div or grad student; fall, spring, offered periodically) Topics vary each semester.

IE 5111. Systems Engineering I. (2.0 cr.; A-F or Audit; prereq CSE upper div or grad student; fall, every year)
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.** (3.0 cr.; A-F or Audit; prereq [Math 2243 or Math 2373 or equiv], [one semester of probability or statistics], [CSE upper div or grad student]; fall, spring, every year) Survey of Operations Research models/methods 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.** (4.0 cr.; A-F or Audit; prereq 5111, a course on basic probability, [CSE upper div or grad student]; spring, every year) 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.

**IE 5441. Financial Decision Making.** (4.0 cr.; A-F only; prereq CSE upper div or grad student; fall, spring, summer, every year) Cash flow streams, interest rates, fixed income securities. Evaluating investment alternatives, capital budgeting, dynamic cash flow process. Mean-variance portfolio selection, Capital Asset Pricing Model, utility maximization, risk aversion. Derivative securities, asset dynamics, basic option pricing theory.

**IE 5511. Human Factors and Work Analysis.** (4.0 cr.; A-F or Audit; [ME 5211, HUMF 5211, IE 4511]; prereq Upper Div CSE or grad student; fall, every year) Human factors engineering (ergonomics), methods engineering, and work measurement. Human-machine interface; displays, controls, instrument layout, and supervisory control. Anthropometry, work physiology and biomechanics. Work environmental factors: noise, illumination, toxicology. Methods engineering, including operations analysis, motion study, and time standards.

**IE 5512. Applied Ergonomics.** (4.0 cr.; A-F or Audit; prereq Upper Div CSE or grad student, 5511; summer, offered periodically) 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.** (4.0 cr.; A-F or Audit; prereq Upper Div CSE or grad student; fall, spring, every year) 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.** (4.0 cr.; [IE 3522]; prereq [4521 or equiv], [upper div or grad student or CNR]; fall, spring, offered periodically) Quality engineering/management, economics of quality, statistical process control design of experiments, reliability, maintainability, availability.

**IE 5531. Engineering Optimization I.** (4.0 cr.; prereq Upper Div or grad student or CNR; fall, every year) Linear programming, simplex method, duality theory, sensitivity analysis, interior point methods, integer programming, branch/bound/dynamic programming. Emphasizes applications in production/logistics, including resource allocation, transportation, facility location, networks/flows, scheduling, production planning.

**IE 5541. Project Management.** (4.0 cr.; = [IE 4541W]; prereq Upper Div or grad student; fall, spring, every year) Introduction to engineering project management. Analytical methods of selecting, organizing, budgeting, scheduling, and controlling projects, including risk management, team leadership, and program management.

**IE 5545. Decision Analysis.** (4.0 cr.; prereq 4521 or equiv) Normative theories of decision making. Emphasizes structuring of hard decision problems arising in business and public policy contexts. Decision trees, expected utility theory, screening prospects by dominance, assessment of subjective probability, multiple attribute utility, analytic hierarchy process, benchmarking with data envelopment analysis, basics of game theory.

**IE 5551. Production Planning and Inventory Control.** (4.0 cr.; = [IE 4551]; prereq CNR or upper div or grad student; fall, spring, every year) 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. Integration of information technologies and of electronic commerce for supply chain management and factory operation.

**IE 5552. Design and Analysis of Manufacturing Systems.** (4.0 cr.; prereq Upper Div or grad student; ) Flow lines, assembly systems, cellular manufacturing systems, and flexible manufacturing systems. Emphasis is on methodologies for modeling, analysis and optimization. Lead time analysis, capacity and workload allocation, scheduling and shop floor control, work-in-process management, facilities planning and layout, and information management.

**IE 5553. Simulation.** (4.0 cr.; = [IE 3553]; prereq Upper Div or grad student; familiarity with probability/statistics recommended; fall, spring, offered periodically) Discrete event simulation. Using integrated simulation/environment to create, analyze, and evaluate realistic models for various industry settings, including manufacturing/service operations and systems engineering. Experimental design for simulation. Selecting input distributions, evaluating simulation output.

**IE 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**IE 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)


**IE 8532. Stochastic Processes and Queuing Systems.** (4.0 cr.; prereq 4521 or equiv; fall, every year) Introduction to stochastic modeling and processes. Random variables, discrete and continuous Markov chains, renewal processes, queuing systems, Brownian motion, and elements of reliability and stochastic simulation. Applications to design, planning, and control of manufacturing and production systems.


**IE 8534. Advanced Topics in Operations Research.** (4.0 cr. [max 8.0 cr.]; prereq 5531, 8532; fall, spring, every year) Special topics determined by instructor. Examples include Markov decision processes, stochastic programming, integer/combinatorial optimization, and queuing networks.

**IE 8536. Advanced Topics in Engineering Management.** (4.0 cr. [max 8.0 cr.]; A-F or Audit; spring, offered periodically) Areas such as financial engineering, revenue management, management of health systems, service operations, management of technology, and public policy.

**IE 8538. Advanced Topics in Information Systems.** (4.0 cr.; A-F or Audit; prereq 8541, college-level computer programming course; ) Decision support methods. Case studies of specific systems. Methods for testing usability/ performance. Trust/over-reliance, their impact
on system performance. System-level issues, general planning, design, information analysis, problem paradigms. How to frame problems. Techniques to combine engineering and information technology.

IE 8541. Decision Support Systems. (4.0 cr.; A-F or Audit; [HUMF 8541]; spring, every year) Decision Support Systems (DSSs) to assist people in making better decisions, interpreting complex information, and managing complex situations safely/effectively. Principles of human-centered design, cognitive engineering, and evaluation. Applications in projects of students' own choosing.

IE 8552. Advanced Topics in Production, Inventory, and Distribution Systems. (4.0 cr.; max 8.0 cr.; prereq 5551; fall, spring, offered periodically) Cutting edge research issues in production, inventory, and distribution systems. Stochastic models of manufacturing systems, stochastic inventory theory, multi-echelon inventory systems/supply chains, supplier-retailer/supplier-manufacturer coordination, supplier/warehouse networks, business logistics, transportation.

IE 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; max 12.0 cr.; No Grade Associated; 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; fall, spring, summer, every year) tbd

IE 8773. Graduate Seminar. (1.0 cr.; S-N or Audit; fall, spring, every year) Recent developments.

IE 8774. Graduate Seminar. (1.0 cr.; S-N or Audit; prereq 8773; fall, spring, every year) Recent developments.

IE 8777. Thesis Credits: Master's. (1.0-18.0 cr.; max 50.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, summer, every year) (No description)

IE 8794. Industrial Engineering Research. (1.0-6.0 cr.; max 10.0 cr.; prereq #: fall, spring, summer, every year) Directed research.

IE 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; max 100.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

IE 8951. Plan B Course. (1.0 cr.; S-N or Audit; fall, every year) Structured environment in which students can complete M.S. Plan B project.

IE 8953. Plan B. (2.0 cr.; A-F or Audit; prereq 8951; spring, every year) Structured environment in which students can complete M.S. Plan B project.

IE 8991. Curricular Practical Training. (1.0-2.0 cr.; max 6.0 cr.; S-N only; fall, spring, summer, every year) Industrial work assignment involving advanced mechanical engineering. Review/approval by faculty member/director of graduate studies. Final report covering work assignment.

Information and Decision Sciences (IDSC)


IDSC 8511. Conceptual Topics and Research Methods in Information and Decision Sciences. (4.0 cr.; prereq Business admin PhD student or #: fall, every year) 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. (2.0 cr.; prereq Business admin PhD student or #: fall, spring, offered periodically) 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 8531. Organizational Theory and Research in Information Systems. (2.0 cr.; A-F only; prereq PhD student in Business Administration; spring, odd years) Introduction, adoption, use/exploitation of information systems in organizations. Critically examine empirical work. Formulate research questions. Conduct research.

IDSC 8541. Introduction to Economics of Information Systems. (2.0 cr.; A-F only; prereq PhD student in Business Administration or #: spring, even years) Classical research questions. Methods/findings that form backbone of economics of IS. Online auctions, electronic markets, offshoring, human capital issues.

IDSC 8711. Cognitive Science. (4.0 cr.; prereq Business admin PhD student or #: fall, every year) 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. (2.0 cr.; [max 4.0 cr.; prereq Business admin PhD student or #: offered alt yrs; fall, spring, offered periodically) Traditional/current research. Major models/methodologies. Issues of preference, judgment, and choice under conditions of certainty/uncertainty. Seminar format.

IDSC 8722. Heuristic Decision Making. (2.0 cr.; 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. (4.0 cr.; [max 20.0 cr.; prereq Business admin PhD student or #: fall, spring, offered periodically) 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. (2.0 cr.; [max 20.0 cr.; prereq Business Admin PhD student or #: spring, every year) New areas of research, research methods, issues.

IDSC 8892. Readings in Information and Decision Sciences. (1.0-6.0 cr.; [max 16.0 cr.; prereq Business Admin PhD student; fall, spring, summer, every year) 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. (1.0-8.0 cr.; [max 16.0 cr.; prereq Business Admin PhD student or #: fall, spring, summer, every year) Individual research on an approved topic appropriate to student's program and objectives.

Infrastructure Systems Management Engineering (ISME)

College of Science and Engineering

ISME 5010. Project Management. (3.0 cr.; A-F or Audit; prereq Open to general grad students but with #: fall, every year) Broad areas in project management/leadership. Emphasizes practical understanding of business/engineering project management. Project planning, scheduling, controlling. Budgeting, staffing, task/cost control. Communicating with, motivating, leading, managing conflict.

ISME 5104. Construction Estimating. (2.0 cr.; A-F or Audit; prereq ISE grad student; )

ISME 5105. Computer Applications II. (1.0 cr.; A-F or Audit; prereq ISE grad student;) Application features in Excel, Visual Basic, and Web Authoring. Data reduction, data presentation, interactive Web calculations. Student projects.

ISME 5112. Infrastructure Systems Engineering Management. (2.0 cr.; A-F or Audit; prereq Open to advanced master's students; spring, every year) Managing public works infrastructure. Case studies of decision making in environment of conflicting interests.

ISME 5113. Computer Applications in Infrastructure Systems Engineering. (2.0 cr.; A-F or Audit; prereq ISE grad student; fall, spring, every year) Advanced application of computer tools/methods in infrastructure engineering problems. Spreadsheet Visual Basic programming, HTML, JAVA script.


ISME 5302. Critical Infrastructure Security and Protection. (2.0 cr.; A-F only; prereq ISE grad student or #; spring, every year) Security challenges of protecting critical infrastructure, facilities, and built environment. Security, agility, and robustness/survivability of large-scale critical infrastructure that face new threats and unanticipated conditions. Systems risk analysis, engineering, economics, and public policy approaches to infrastructure security. Design/management of complex civil infrastructure systems.

ISME 5401. Water Distribution Systems. (1.0 cr.; A-F or Audit; prereq ISE grad student;) Components/design of water distribution systems. Methods of evaluation/management. Maintenance/rehabilitation techniques.

ISME 5402. Storm Water Management. (2.0 cr. [max 10.0 cr.]; A-F or Audit; prereq ISE grad student; spring, offered periodically) Components/design of storm water collection systems. Methods of evaluation/management. Maintenance/rehabilitation techniques.


ISME 5500. Public Interactions. (1.0 cr. [max 2.0 cr.]; A-F or Audit; prereq Advanced grad student or open to grad students with #; fall, every year) Techniques for effective public communication. How to run public hearing. Resources for publishing public notices. Sequence course in three parts.

ISME 5501. Geographic Information Systems. (2.0 cr.; A-F or Audit; prereq ISE student; spring, every year) Introduction to geographic Information Systems (GIS) for infrastructure. GIS application domains, data models/sources, analysis methods, and output techniques. Lectures, readings, hands-on experience with GIS software.


ISME 5504. Construction Law and Ethics. (2.0 cr.; A-F or Audit; prereq ISE student; fall, every year) Legal framework for responsible management of public works projects. Moral leadership, trust in public/private organizations, quality control.

ISME 6105. Capstone Project. (1.0-2.0 cr. [max 3.0 cr.]; A-F or Audit; prereq ISE student; fall, spring, every year) 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 aspect of design, management, or operation of some feature of infrastructure.

ISME 8333. FTE: Master's. (1.0 cr.; No Grade Associated; fall, spring, every year) FTE: Master's Prerequisite Master's student, adviser approval, DGS approval.
INAR 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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.; fall, spring, summer, every year) (No description)

INAR 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

INAR 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer, 24 cr required; fall, spring, every year) (No description)

Interdissiplinary Program (IDEP)

College of Design

IDES 5170. Topics in Interior Design. (1.0-4.0 cr. [max 32.0 cr.]; A-F or Audit; prereq Jr or sr or grad student; fall, spring, summer, every year) In-depth investigation of specific topic, announced in advance.

IDES 5193. Directed Study in Interior Design. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Jr or sr or grad student; fall, spring, summer, every year) Independent study in interior design under tutorial guidance.

IDES 5196. Field Study: National/International. (1.0-10.0 cr.; A-F or Audit; = IDS 5196, APST 5196, HSG 5196, DES 5196; prereq #; fall, spring, summer, every year) Faculty-directed field study in national or international setting.

IDES 8170. Topics in Interior Design. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, spring, every year) In-depth investigation of topic, announced in advance.

IDES 8180. Professional Seminar. (1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; fall, spring, every year) Professional development issues/trends.

IDES 8192. Readings in Interior Design. (1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year) Independent study, review of books/journals under tutorial guidance.

IDES 8193. Directed Study. (1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year) Directed study in interior design.

IDES 8222. Plan B Master's Project. (3.0 cr.; S-N or Audit; prereq [DHA or design] master's student; #; fall, spring, every year) Plan B master's project.
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5201. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5202. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5203. International Business: Undergraduate Exchange. (0.5-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5204. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5205. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5206. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq 60 cr; Carlson School International Programs consent; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5207. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5208. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5209. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5300. International Business: Graduate Exchange. (0.0-16.0 cr. [max 48.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. For current offerings, contact Carlson International Programs.

IBUS 5301. Copenhagen Summer Program in International Business (Graduate). (4.0-8.0 cr. [max 24.0 cr.; S-N only; prereq Carlson grad student; summer, every year)
Summer study abroad at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5302. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5303. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5304. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5305. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5306. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5307. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5308. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5998. Directed Studies in International Business. (1.0-32.0 cr.; )

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Interpersonal Relationships Research (IREL)
College of Education and Human Development

IREL 8001. Proseminar in Interpersonal Relationships Research. (2.0 cr.; S-N or Audit; prereq Grad IRel minor; fall, every year)
Survey of major topics, including theoretical assumptions, methods, and samples of current research.

IREL 8021. Seminar: Statistical and Methodological Issues in Research on Dyadic Relationships. (3.0 cr.; S-N only; prereq Grad IRel minor, [one prior course in multiple regression or structural equation modeling], #; spring, odd years)
Survey of topics in design/analysis of research on behavior in two-person interactions.

IREL 8360. Seminar: Topics in Interpersonal Relationships Research. (1.0-3.0 cr. [max 6.0 cr.; prereq Grad IRel minor or #; fall, spring, offered periodically)
Intensive study of topics.

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Introduced Species and Genotypes (ISG)
College of Food, Agricultural and Natural Resource Sciences

ISG 5010. Risk Analysis for Introduced Species and Genotypes. (3.0 cr.; A-F only; prereq Grad student or [sr. #]; fall, every year)

ISG 5020. Risk Analysis Modeling for Introduced Species and Genotypes. (1.0 cr.; S-N only; prereq [5010 or equiv], #; spring, every year)
Four-day workshop. Role/mechanics of mathematical modeling within ecological risk assessment. Integrated exercises, cases.

ISG 8001. Discussions in Introduced Species and Genotypes. (1.0 cr. [max 10.0 cr.; S-N only; fall, spring, every year)
Forum for presentation of dissertation proposals, results from ISG practica, discussion of environmental risk assessment topics. Focuses on ongoing research or key publications on introduced species/genotypes.

ISG 8021. Problem Solving Practicum in Risk Analysis. (3.0 cr. [max 6.0 cr.;] A-F only; prereq 5010, 5020; summer, every year)
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.

ISG 8031. Cooperative Learning Practicum. (1.0 cr.; A-F only; prereq 8021; spring, every year)
Cooperative learning techniques. Scenario planning, decision cases. Students develop/
test cooperative learning exercises for environmental risk assessment based on their research experience in 8021. Linking research to teaching.

**Italian (ITAL)**
College of Liberal Arts

ITAL 5201. Reading Italian Texts: Poetics, Rhetoric, Theory. (3.0 cr. [max 12.0 cr.]; =ITAL 3201); prereq grad student or #; )
Rhetorical/poetic aspects of language and literature. Interpretive methods, theoretical concepts.

ITAL 5203. Italian Travelers: From the Enlightenment to the Present. (3.0 cr. [max 12.0 cr.]; =ITAL 3203); prereq grad student or #;
Library representations of travel, migration, immigration, exile, and tourism in Italy, from Enlightenment to present.

ITAL 5209. Trecento Literature: Ruling the Immigration, Exile, and Tourism in Italy, from the 13th Century to the Present. (3.0 cr. [max 12.0 cr.]; prereq 3015, 3201 or #; )
Works of Boccaccio and Petrarch and their role in establishing the canon of Italian vernacular literature. Taught in English also as MeSt 5610.

ITAL 5289. The Narrow Door: Women Writers and Feminist Practices in Italian Literature and Culture. (4.0 cr. [max 16.0 cr.]; prereq 3015; )
Focuses on issues of gender, sexual difference, equality, and emancipation raised by Italian women writers and thinkers from the 19th century to the present.

ITAL 5305. Staging the Self: Theater and Drama in Modern Italy. (4.0 cr. [max 16.0 cr.]; =ITAL 3305); prereq grad student or #; )
Theatrical representations of the self in modern Italy. Focuses on issues of identity, gender, and class in theatrical works ranging from Alfieri's Mirra, Pirandello's Enrico IV to Dacia Maraini's Clytemnestra.

ITAL 5321. Italian Renaissance Epic. (4.0 cr. [max 16.0 cr.]; prereq 3015, 3201 or #; )
Study of the narrative poems of Boiardo, Ariosto, and Tasso in the context of the fashioning of early modern Europe.

ITAL 5337. Nation and Narration: Writings in the 19th Century. (4.0 cr. [max 16.0 cr.]; prereq 3015; )
Introduces the construction of modern Italian national identity by examining the role that literature plays in this process. Works by Manzoni, Foscolo, Leopardi, Gioia, Verga, Serao, and Deledda studied in the context of a range of sociopolitical and cultural issues.

ITAL 5401. Mondo di Dante. (4.0 cr. [max 16.0 cr.]; prereq 3015, 3201 or #; )
Intensive reading of Dante's Inferno, Purgatorio, and Vita Nuova with emphasis on Dante's linguistic and cultural contributions.

ITAL 5502. Making of Modern Italy: From the Enlightenment to the Present. (3.0 cr. [max 12.0 cr.]; =ITAL 3502); prereq grad student or #;

test cooperative learning exercises for environmental risk assessment based on their research experience in 8021. Linking research to teaching.

**Italian (ITAL)**
College of Liberal Arts

ITAL 5550. Topics in 19th Century Italy. (3.0 cr. [max 12.0 cr.]; prereq Ital 3015 or #; fall, every year)
Explores the literature and culture of Italy in the 19th century. Content will vary depending on the instructor. Topics and readings may include literary, critical, cultural, historical, and/or social issues, a specific author, a genre, or other topics of interest for the period. Specific content will be posted in the department and listed in the Course Guide.

ITAL 5609. World of Dante. (4.0 cr. [max 8.0 cr.]; )
Taught in English. Intensive reading of Dante's Inferno, Purgatorio, and Vita Nuova with emphasis on the personal, poetic, and political stakes of the journey of Dante's pilgrim through hell to the earthly paradise.

ITAL 5640. Topics in Italian Studies. (3.0 cr. [max 12.0 cr.]; prereq Ital 3015; fall, every year)
Topics of interest in studies of Italian and/or Italian American culture of the 20th century. Topics and readings may include literary, critical, cultural, historical, and/or social issues, a specific author, a genre, or other topics.
Content varies by instructor. Specific content posted in the department and in the Course Guide.

ITAL 5606. Negotiating the Terms: Italian Film and Literature. (3.0 cr. [max 12.0 cr.]; =ITAL 3806); prereq grad student or #; )
Cinematic representations of Italian literary texts. Basic tools of literary/film analysis. How both media impact Italian culture. Taught in English.

ITAL 5970. Directed Readings. (1.0-4.0 cr. [max 4.0 cr.]; prereq #; fall, spring, every year)
Meets unique requirements decided on the instructor. Topics and readings may be negotiated by faculty member and student. Individual contracts list contact hours, number of credits, written and other work required.

ITAL 8333. FTE: Masters. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ITAL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ITAL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
(tbd)

ITAL 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 16 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, summer, every year)
(No description)

ITAL 8892. Directed Readings. (1.0-4.0 cr. [max 16.0 cr.]; prereq #; fall, spring, every year)
Requirements decided on by faculty member and student; contact hours, number of credits, written/other work.

**Japanese (JPN)**
College of Liberal Arts

JPN 5040. Readings in Japanese Texts. (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq 4042 or equiv or #; fall, spring, every year)
Students read authentic materials of various types to increase reading/speaking ability. Topics specified in Class Schedule.

JPN 5071. Communicative Competence for Japan-Oriented Careers. (4.0 cr.; prereq 4041 or 4042 or #; )
Effective communication using spoken and written Japanese in contexts likely to be encountered by a career-oriented professional in Japan.

JPN 5211. Introductory Classical Chinese I. (3.0 cr.; =KOR 5211, CHN 5211); prereq Two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or #; fall, offered periodically)
Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/lits importance in study of East Asian cultures. Taught in English.

JPN 5212. Introductory Classical Chinese II. (3.0 cr.; =KOR 5212, CHN 5212); prereq 5211 and two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or #; spring, offered periodically)
Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/lits importance in study of East Asian cultures. Taught in English.

JPN 5993. Directed Studies in Japanese. (1.0-15.0 cr. ; fall, spring, every year)
Individual study with guidance of a faculty member. Prereq instr consent, dept consent, college consent.

JPN 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

JPN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

JPN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
(tbd)

JPN 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, summer, every year)
(No description)

JPN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

**Jewish Studies (JWST)**
College of Liberal Arts
JWST 5111. Problems in Historiography and Representation of the Holocaust. (3.0 cr.; [HIST 5285]; prereq JWSt 3521 or RELS 3521 or #; spring, every year)
Focuses on issues connected with the Holocaust. Inclusiveness of other groups, Holocaust vs. Shoah., historiographical conflicts about perpetrators, an examination of the problems of representation in literature and art, problems of narrative theology after Auschwitz.

JWST 5115. Midrash: Jewish Biblical Interpretation. (3.0 cr.; =RELST 3115, JWST 3115, CNES 5115, RELS 5115, CNES 3115]; fall, spring, offered periodically)
Jewish law studies as mirror of society and as way to actualize its value. Original socio-religious contexts, current applications. Biblical interpretations addressing moral, theological, legal, and literary problems.

JWST 5204. Dead Sea Scrolls. (3.0 cr.; =JWST 3204, RELS 3204, RELS 5204, CNES 5204, CNES 3204); spring, even years)
Introduction to Dead Sea Scrolls and Qumran. Contents of Dead Sea Scrolls, significance for understanding development of the Bible. Background of Judaism and Christianity. Archival and site of Qumran.

JWST 5513W. Scripture and Interpretation in Israelite Religion and Judaism. (3.0 cr.; A-F or Audit; =RELST 5513W, CNES 8513, CNES 5513W); prereq At least one upper level course (3xxx or higher) in academic biblical or religious studies; spring, even years)

JWST 5900. Topics in Jewish Studies. (3.0-4.0 cr. [max 8.0 cr.]; fall, spring, summer, every year)
Topics specified in Class Schedule.

JWST 5992. Directed Readings. (1.0-12.0 cr.; prereq #; fall, spring, summer, every year) Guided individual reading or study.

Journalism and Mass Communication (JOUR)
College of Liberal Arts

JOUR 5131. In-Depth Reporting. (3.0 cr.; A-F only; prereq [3004W or 3004V], [3101 or 3101H], 3121, [jour major or approved BIS/IDIM/ICP program]; fall, every year)
Techniques/issues of special project stories. Explanatory, investigative, civic, literary, or ethnographic journalism. Topics (e.g., civil rights, governmental malfeasance, health care problems) typically involved in stories.

JOUR 5155. Database Reporting. (3.0 cr.; A-F only; prereq [3004W or 3004V], [3101 or 3101H], 3121, [jour major or approved BIS/IDIM/ICP program]; spring, every year)
Obtaining/analyzing digital data for computer-assisted reporting that can be published on various media platforms. Using spreadsheets/database to manage information, find news stories, produce maps/graphics.

JOUR 5174. Magazine Editing and Production. (3.0 cr.; A-F only; prereq [[3004W or 3004V], [3101 or 3101H], [3155 or 3173W or 3321 or 4302]]; [jour major or approved BIS/IDIM/ICP program] or grad student; fall, spring, every year)
Writing, editing, illustration, design, layout, photocomposition of print or Web magazine. Emphasizes reporting, telling substantive stories. Work in groups with varying specializations.

JOUR 5251. Psychology of Advertising. (3.0 cr.; =JOUR 4251; prereq Stat Comm MA grad major or grad math comm major/minor or #; spring, every year)
Psychological principles, research techniques, applications in advertising/selling. Consumer attitudes/behavior. Psychological mechanisms upon which effectiveness of advertisements/commercials depends.

JOUR 5501. Communication, Public Opinion, and Social Media. (3.0 cr.; fall, every year)
Theories of mass communication, persuasion, attitude change. Functions of mediated communication in formation/diffusion of public opinion about major social/political issues. Social media as tool for measuring/influencing public opinion.

JOUR 5541. Mass Communication and Public Health. (3.0 cr.; =PUBH 6074); fall, every year)
Intersections of mass media, public health, behavior. Role of theory in understanding intended/unintended campaign effect. Role of health journalism. Decisions that inform media-based interventions.

JOUR 5542. Theory-based Health Message Design. (3.0 cr.; A-F or Audit; spring, every year)
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. (3.0 cr.; A-F or Audit; prereq [5541, enrolled in MA in health journalism or grad student or jour major or mass comm minor or approved IDIM major or ICP major or BIS major] or #; spring, every year)
Draws upon the campaign evaluation literature. Recommendations on evaluation research design. Cross-sectional, experimental, and time-based designs. Focuses on summative efforts.

JOUR 5552. Law of Internet Communications. (3.0 cr.; A-F or Audit; spring, every year)
Whether/how/which traditional media laws/regulations apply to Internet. Developing law of communication on Internet, global/ethical issues.

JOUR 5601W. History of Journalism. (3.0 cr.; spring, every year)
Development of American media from beginnings in Europe to present day. Rise of film/television/Internet. Relation of communications development to political, economic, social trends.

JOUR 5606W. Literary Aspects of Journalism. (3.0 cr.; =ENGW 5606); spring, every year)
Literary aspects of journalism. American/British writers, past/present. Lectures, discussions, weekly papers, critiques.

JOUR 5615. History of the Documentary. (3.0 cr.; fall, every year)

JOUR 5725. Management of Media Organizations. (3.0 cr.; fall, every year)

JOUR 5777. Contemporary Problems in Freedom of Speech and Press. (3.0 cr.; A-F or Audit; =LAW 6030); prereq Jour major or jour minor or approved BIS/IDIM/ICP program; fall, every year)
Legal/constitutional derivation of freedom of press/speech. Emphasizes case law, statutes, judicial theories. Leading cases in privacy torts, prior restraints, news gathering/dissemination. Access to courts/government, including via Internet. Legal-research techniques.

JOUR 5990. Special Topics in Mass Communication: Professional. (3.0 cr.; max 6.0 cr.; A-F or Audit; prereq Jour major or approved IDIM major or ICP major or BIS major; spring, every year)
Professional-skills-learning opportunity not regularly offered. Topics specified in Class Schedule.

JOUR 5991. Special Topics in Mass Communication: Context. (3.0 cr.; max 6.0 cr.; A-F or Audit; spring, offered periodically)
Special context topics not regularly offered. Topics specified in Class Schedule.

JOUR 5993. Directed Study. (1.0-3.0 cr.; max 6.0 cr.; A-F or Audit; fall, spring, summer, every year)
Directed study/projects. Prereq [Jour major or jour minor or approved IDIM major or ICP major or BIS major]. GPA of at least 3.00, college consent, dept consent, instr consent.

JOUR 8001. Studies and Theories of Mass Communication. (3.0 cr.; A-F or Audit; fall, every year)
Introduction to key concepts, theories, methods in study of mass communication from social sciences perspective. Survey of research literature using individualistic/structural approaches.

JOUR 8002. Studies in Mass Communication II. (3.0 cr.; A-F or Audit; prereq 8001; spring, every year)
JOUR 8003. Digital Media Issues and Theories. (3.0 cr.; A-F or Audit; prereq Journalism grad student; fall, spring, offered periodically)
Nonprofessional skills course. Prepares entering graduate students to work in changing media environment. Political, social, economic, legal, ethical, technological implications nationally/globally. Produce scholarly research about changing media.

JOUR 8009. Pro-seminar in Mass Communication. (1.0 cr.; S-N only; prereq Grad students enrolled in Mass Communication MA or PhD program; fall, every year)
Introduction/socialization to scholarly discipline of mass communication, mass communication pedagogy, pathways to successful career. Develop action plan for completing graduate school/starting career in academy or relevant communication industries.

JOUR 8191. Health Journalism: Introduction to Health and Medical Journalism. (3.0 cr.; A-F or Audit; prereq Enrolled in MA in health journalism or #; fall, every year)
Best practices in health/medical reporting in different formats/media. Story ideas that challenge conventional wisdom about health care. Elements of health beat. Narrative/ investigative styles of journalism. Students do semester-long project.

JOUR 8192. Advanced Health Journalism: Computer-Assisted Reporting on Health. (3.0 cr.; A-F or Audit; prereq Enrolled in MA in health journalism or #; spring, every year)
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 8193. Capstone: Health Journalism and Communication. (4.0 cr.; A-F or Audit; prereq Enrollment in MA in health journalism or #; spring, every year)
Students focus on different aspects of health communication and journalism. Final project (possibly group project) such as publishable article(s), research paper, or multimedia production.

JOUR 8194. Health Journalism Field-Based Practicum. (3.0 cr.; A-F only; prereq [5101, 8191] or enrolled in MA in health jour; fall, spring, every year)
Field-based practicum. Students are teamed with a local news organization, media company, or communications office of a health care entity to write/produce health news/ information under guidance of an editorial manager at that institution and a faculty instructor. With faculty permission, may lead to capstone project for 8193.

JOUR 8200. Communication Strategy Research in Rapidly Changing and Complex Media Environments. (3.0 cr.; A-F or Audit; prereq Strat Comm MA grad major; fall, spring, summer, every year)

Concepts, analytical techniques, and methods to analyze audiences, target markets, and social trends affecting communication strategy in context of complex and rapidly changing media environments.

JOUR 8201. Factors Affecting Communication Strategy. (3.0 cr.; A-F only; prereq Strat Comm MA grad major; fall, spring, summer, every year)
Literature/research concerning identification/ analysis of the media and environmental, regulatory, competitive, and economic factors that affect the development of communication strategy.

JOUR 8202. Generation and Selection of Communication Strategies. (3.0 cr.; A-F only; prereq Strat Comm MA grad major; fall, spring, summer, every year)
Concepts/methods to support analytic/ creative processes that lead to development of breakthrough communication strategies. Criteria for selecting among strategic alternatives.

JOUR 8203. Integration of Communication Strategies Across Media. (3.0 cr.; A-F only; prereq 8200, 8201, 8202, strat comm MA grad major; fall, spring, summer, every year)
Concepts, analytical techniques, and methodologies used to plan communication strategies and implement communication campaigns utilizing a diverse range of media.

JOUR 8204. Measuring the Effectiveness of Strategic Communication Campaigns. (3.0 cr.; A-F only; prereq 8203, Strat Comm MA grad major; fall, spring, summer, every year)
Examination, evaluation, and application of concepts/methods to evaluate effectiveness of strategic communication campaigns and their components.

JOUR 8205. Cases in Strategic Communication. (3.0 cr.; A-F only; prereq 8203, strat comm MA grad major; fall, spring, summer, every year)
Case study analysis concerning development, implementation, and evaluation of communication strategies. Cases cover broad range of organizations, focus on such issues as brand introduction, brand reinforcement, revitalizations, crisis communication, issues management, and legal/ethical considerations.

JOUR 8206. Directed Study: Development of an Integrated Strategic Communication Campaign. (3.0 cr. [max 6.0 cr.]; A-F only; prereq 8205, strat comm MA grad major; fall, spring, summer, every year)
Project to develop a case study analysis concerning development, implementation, and evaluation of a strategic communication campaign.

JOUR 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

JOUR 8442. Seminar: Broadcast News. (3.0 cr.; A-F or Audit; prereq 4442 or #; fall, spring, offered periodically)
Major issues. Confrontations between federal government and network news departments. Historical studies.

JOUR 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

JOUR 8501. Seminar: The Process of Quantitative Mass Communication Research. (3.0 cr.; A-F or Audit; prereq 9 cr soc sci, EPSy 5260 or equiv & EPSy 5260; fall, every year)
Logic of social sciences research. Relationship between theory and research, concept explanation, measurement, instrumentation, and design issues.

JOUR 8502. Seminar: Multi-method research in Mass Communication. (3.0 cr.; A-F or Audit; prereq 8501, [EPSy 5260 or equiv & EPSy 5260]; spring, every year)
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 8503. Seminar: Qualitative Methods in Mass Communication Research. (3.0 cr.; A-F or Audit; prereq Grad students enrolled in Mass Communication MA or PhD program or #; spring, every year)
Qualitative research methodology/data analysis techniques used in field of mass communication. How to conduct qualitative research to address questions related to mass communication. Ethnography, interviews, focus groups, case study, qualitative content analysis, historical research.

JOUR 8504. Seminar: Analyzing Media Content. (3.0 cr.; A-F only; prereq Grad students enrolled in Mass Communication MA or PhD program or #; fall, spring, offered periodically)
Methods of analyzing media content/application of methods to theoretically-driven studies of media content. Conceptual/methodological issues surrounding analyzing media content in today’s contemporary digital media environment, including collecting social media data, computer-aided analyses.

JOUR 8513. Seminar: Ethnographic Methods in Mass Communication Research. (3.0 cr.; A-F or Audit; prereq [8001, 8002] or #; same as Anth 8810; spring, every year)
Theoretical foundations in anthropology/ sociology. Field projects.

JOUR 8514. Seminar: Advanced Mass Communication Theories. (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq 8001; fall, spring, offered periodically)
Research paradigms, concepts, findings for developing general theory of mass communication.

JOUR 8601. Seminar: Methods in Mass Communication History Research. (3.0 cr.;


JOUR 8620. Seminar: Advertising Theory and Research. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 5251 or #; fall, spring, offered periodically) Advertising as persuasive communication. Current research/theory related to advertising decision-making process.

JOUR 8621. Seminar: Public Relations Theory and Research. (3.0 cr.; A-F only; prereq Grad students enrolled in Mass Communication MA or PhD program or #; fall, spring, offered periodically) Study of theoretical body of knowledge in public relations field. Diverse roles played by public relations in organization. Current state of public relations research in regard to theory building. How theory informs professional practice of public relations.

JOUR 8650. Seminar: Psychology of Media Effects. (3.0 cr.; A-F only; prereq Grad students enrolled in Mass Communication MA or PhD program or #; fall, spring, offered periodically) In-depth study of psychological concepts/theories concerning individual cognitive processing of content of both traditional/new electronic media. Critically evaluate latest empirical research concerning how individuals respond to the content of both traditional mass media/newest electronic digital media.

JOUR 8651. Seminar: Mass Communication, Audiences, and Society. (3.0 cr.; A-F or Audit; prereq 8001 or 8002 or equiv; fall, spring, offered periodically) Interplay between social theories/media studies. Pragmatism, structural-functionalism, Marxism, political economy, cultural studies, globalization.

JOUR 8662. Seminar: Literary Aspects of Journalism. (3.0 cr.; A-F or Audit; prereq 5606; fall, spring, offered periodically) Research in literary aspects of journalism exemplified in careers/works of American/British writers.

JOUR 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) tbd

JOUR 8671. Seminar: Communication Ethics--Public/Civic Journalism. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Historical underpinnings, philosophical debate, theoretical dynamics, legal concerns, ethical implications.

JOUR 8673. Seminar: Media Management. (3.0 cr.; A-F or Audit; prereq 5725 recommended; fall, spring, offered periodically) Management issues in media organizations. Relation to dynamics of organization structure, employees, markets, economics/finances.

JOUR 8678. Seminar: Constitutional Law--Theories of Freedom of Expression. (3.0 cr.; A-F or Audit; =LAW 6059; prereq 5777 or # or law student; spring, every year) Problems of constitutional/tort law affecting the press. Underlying theories.

JOUR 8679. Seminar: Research Methods in Media Ethics and Law. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Research at intersection of first amendment and media ethics.

JOUR 8681. Seminar: International Media Perspectives. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Main problems/currents. Concepts, research, policy relevant to global development. Issues of freedom/constraint, media technology, role of journalism in world affairs.

JOUR 8720. Seminar: Mass Media and Health. (3.0 cr.; A-F only; prereq Grad students enrolled in Mass Communication MA or PhD program or #; fall, spring, offered periodically) Theories, methods, research that characterize field of health communication. Mass media influence on health, including use of mass media to promote health behaviors. Theoretical frameworks that inform health communication scholarship, as well as methodological approaches to studying health communication issues.

JOUR 8721. Seminar: Communication Agencies as Social Institutions. (3.0 cr.; A-F or Audit; fall, spring, every year) Influence/effects of mass communication, internal dynamics of media organizations, criticism/modes of reform. Theoretical frameworks for analysis.

JOUR 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, summer, every year) (No description)

JOUR 8801. Seminar: Comparative Research in Mass Communication, a Cross-National Approach. (3.0 cr.; A-F or Audit; prereq 4801 or 5825; fall, spring, offered periodically) Comparative research designs/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. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

JOUR 8990. Special Problems in Mass Communications. (3.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Mass comm grad student or #; fall, spring, offered periodically) Topics specified in Class Schedule.

JOUR 8993. Directed Study. (1.0-6.0 cr.; A-F or Audit; prereq Grad mass comm major or minor, #, %; fall, spring, summer, every year) Directed study.

Kinesiology (KIN)

College of Education and Human Development

KIN 5001. Foundations of Human Factors/Ergonomics. (3.0 cr.; A-F or Audit; =HUMF 5001; fall, every year) Variability 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 5103. Developmental/Adapted Physical Education. (3.0 cr.; A-F or Audit; fall, spring, summer, every year) 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 5104. Physical Activities for Persons with Disabilities. (3.0 cr.; A-F or Audit; fall, spring, summer, every year) 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. (3.0 cr.; A-F or Audit; prereq Kin or Rec grad student or MEd student; fall, spring, summer, every year) Steps in planning/building facilities for athletics, physical education, and sport for college, professional, and public use.
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 5196. Practicum: Developmental/Adapted Physical Education. (1.0-4.0 cr.; S-N only; prereq [5103 or 5104]; #, fall, every year)
Observation of, participation in physical education instruction for students with disabilities. Current issues in developmental/adapted physical education. Exchange of ideas/problems.

KIN 5201. Health Education Foundations. (3.0 cr.; A-F only; summer, every year)

KIN 5202. Current Issues in Health. (2.0 cr.; A-F only; summer, every year)
Critical thinking for health issues in research/media. Issues specific to conflict, stress, public policy, and communication. Projects, debates.

KIN 5203. Health Media, Consumerism, and Communication. (2.0 cr.; A-F only; spring, every year)
Effects of media, consumerism, technology, and health related issues. Students form/defend opinions on positive/negative aspects of how health information is disseminated and how individual health decisions are made.

KIN 5204. Methods in Health Education. (3.0 cr.; A-F only; prereq Health licensure student or #; fall, every year)
Background knowledge/skills to deliver comprehensive health education program. Techniques, skills, and methods for teaching active learning projects. Lessons/units in health curriculum discussed/demonstrated. Focuses on grades 5-12.

KIN 5205. Health Education Curriculum. (3.0 cr.; A-F only; prereq Health licensure student or #; fall, every year)

KIN 5235. Advanced Biomechanics II: Kinetics. (3.0 cr.; A-F or Audit; prereq [3112 or equiv]; PMed 5135, undergrad college physics, intro calculus; spring, even years)

KIN 5371. Sport and Society. (3.0 cr.; A-F or Audit; prereq [3126W, grad student] or #; spring, every year)
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. (3.0 cr.; spring, summer, every year)
Cognitive, behavioral, and biological 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 Healthy Aging & Disease Prevention and Management. (3.0 cr.; A-F only; prereq Physiology or biology undergrad; spring, every year)
Exercise testing/prescription with modifications required because of special considerations associated with aging, gender differences, or presence of medical conditions.

KIN 5421. Sport Finance. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year)
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. (3.0 cr.; A-F only; prereq [3385, 4385, Kin major] or #; spring, every year)
Theoretical constructs, in-depth description of procedures used in exercise science research and clinical settings. Laboratory exercises, lectures.

KIN 5461. Issues in the Sport Industry. (3.0 cr.; A-F only; prereq postbac or grad student or #; fall, every year)
Critical analysis of management issues within sport industry. Strategic management, corporate social responsibility, human resource management/diversity, governance, sport globalization, sport development.

KIN 5485. Advanced Electrocardiogram Interpretation. (3.0 cr.; A-F only; prereq [3385, 4385] or #; fall, every year)
Placement and interpretation. Clinical exercise testing hands-on experience in electrocardiogram for resting and exercise testing situations.

KIN 5505. Human-Centered Design - Principles and Applications. (3.0 cr.; #=[KIN 3505]; fall, every year)
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. Sport and Gender. (3.0 cr.; A-F only; #=[REC 5511]; fall, every year)
Critically examines women's involvement in/contributions to sport, physical activity, and leisure.

KIN 5585. Pediatric Physiology and Health: Concepts and Applications. (2.0 cr.; A-F only; prereq 3385 or 4385; summer, every year)
Current understanding of pediatric medicine and exercise physiology. Use of physical...
activity and weight management in the treatment of various diseases (i.e., obesity) that affect children and adolescents.

KIN 5601. Sport Management Ethics and Policy. (3.0 cr.; A-F or Audit; prereq MED or grad student or #; spring, every year) 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. (3.0 cr.; A-F or Audit; prereq Kin or Rec grad student or #; fall, spring, every year) 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. (3.0 cr.; A-F only; prereq 4385 or SPST 3641 or SPST 4641 or exercise physiology course or #; spring, summer, every year) Current scientific literature on physiological adaptation through training/conditioning for sport. Applying methods in research journals to improve physiological adaptation through training/conditioning with sport specificity.

KIN 5696. Practicum in Kinesiology. (1.0-6.0 cr.; S-N only; prereq [Kin MED or grad student] #; fall, spring, summer, every year) Practical experience in kinesiology under supervision of a University faculty member and an agency supervisor.

KIN 5720. Special Topics in Kinesiology. (2.0-4.0 cr. [max 12.0 cr.]; prereq Kin upper div undergrad or grad student or #; fall, spring, summer, every year) 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. (3.0 cr.; A-F or Audit; prereq Grad student or #; spring, every year) 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 5723. Psychology of Sport Injury. (3.0 cr.; prereq Intro psych course; fall, spring, every year) Psychosocial bases of risk factors preceding sport injury, responses to the occurrence of sport injury, and the rehabilitation process. Lecture, discussion, guest lecture, interviews, and presentation experience.

KIN 5725. Organization and Management of Physical Education and Sport. (3.0 cr.; A-F or Audit; prereq Grad/initial licensure or #; spring, summer, every year) 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 5801. Legal Aspects of Sport and Recreation. (4.0 cr.; A-F or Audit; prereq Kin or rec major; fall, spring, every year) Legal issues related to recreation, park, and sport programs/facilities in public/private sectors.

KIN 5804. National Collegiate Athletic Association (NCAA) Compliance. (2.0 cr.; A-F only; prereq [Upper div undergrad or grad student] in Kin, #; spring, every year) Governance structure, policies, and procedures in intercollegiate athletics. Careers in college athletics as coach, administrator, athletic trainer, counselor, etc.

KIN 5941. Clinical Movement Neuroscience. (3.0 cr.; A-F only; prereq [3027 or ANAT 3001 or SPST 3611 or ANAT 3611 or equiv] [PHSL 3051 or equiv], [4441]; spring, offered periodically) Various neural subsystems involved in controlling human motor function. How injury and disease of the nervous system affects motor behavior. Possibilities for rehabilitation and treatment. Lectures, seminars, class presentations.

KIN 5981. Research Methodology in Kinesiology, Recreation, and Sport. (3.0 cr.; A-F or Audit; [REC 5981]; prereq 3151 or equiv; fall, spring, summer, every year) 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. (2.0 cr.; Student Option No Audit; prereq Grad student; spring, even years) 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. (1.0-9.0 cr.; A-F only; prereq [Kin upper div undergrad or MED or grad student]; #; fall, spring, summer, every year) Independent study under tutorial guidance.

KIN 5995. Research Problems in Applied Kinesiology. (1.0-6.0 cr.; A-F only; prereq [Kin upper div undergrad or MED or grad student]; 15 cr. of major coursework [including 4981 or 5981]; #; fall, spring, summer, every year) Selected topics in physical activity and human performance.


KIN 8002. Proseminar in Human Factors/ Ergonomics. (1.0 cr. [max 2.0 cr.]; A-F or Audit; prereq Enrollment in good standing, grad HumF minor; fall, spring, every year) Issues/concerns tailored to interests of faculty/students regarding human factors/ergonomics. Interaction of performance/behavior with design factors in performance environment.

KIN 8122. Seminar: Exercise Physiology. (2.0 cr. [max 8.0 cr.]; A-F only; prereq 5122 or equiv or #; fall, spring, every year) Classic/contemporary literature in exercise physiology/allied disciplines. Contributions of major leaders in field. Opportunities for interdisciplinary research. Spring semester students/faculty in exercise science present original research.

KIN 8126. Sports Medicine Psychology. (3.0 cr.; A-F only; prereq Grad student or #; spring, offered periodically) Advanced seminar course. Multidisciplinary contributors to sports medicine psychology. Theory, research, and practice in the behavioral/social aspects of injury prevention/experiences among physically active populations across the life span.

KIN 8128. Doctoral Sport Management Seminar. (3.0 cr.; A-F only; [REC 8128]; prereq PhD student, #; fall, spring, offered periodically) Analysis of current literature, theoretical constructs, research methodology and design relative to sport management. Foci uses on student-selected topics, research problems.

KIN 8132. Seminar: Motor Development. (3.0 cr.; A-F or Audit; prereq grad student or #; spring, offered periodically) Contemporary research literature on motor skill development from before birth to senescence. Emphasizes interaction between physical/environmental/performer constraints. Coordination/control of movement.

KIN 8135. Seminar: Motor Control and Learning. (3.0 cr.; A-F or Audit; prereq grad student or #; spring, offered periodically) Advanced reading/discussion of research on motor control, motor learning, human performance.

KIN 8211. Seminar: Perception and Action. (3.0 cr.; A-F or Audit; prereq grad student or #; spring, offered periodically) Survey of theory/research on use of perceptual information for control of action. 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. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

KIN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser
and DGS consent; fall, spring, summer, every year)
   (No description)

KIN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; max 24.0 cr.); No Grade Associated; prereq Doctoral student who has not passed prelim oral; Dept consent required; No grade associated; 4 completions allowed; up to 24 combined cr.; fall, spring, summer, every year)
   (No description)

KIN 8969. Internship: Applied Sport Psychology. (3.0-6.0 cr.; S-N or Audit; prereq 5126, 8126. Kin PhD student, #; fall, spring, offered periodically)
   Supervised internship; emphasis on educational sport psychology approaches to athletic performance enhancement and psychological adjustment to sport injury.

KIN 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 or total required (Plan A only); fall, spring, summer, every year)
   (No description)

KIN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
   (No description)

KIN 8980. Graduate Research Seminar in Kinesiology. (1.0 cr. [max 9.0 cr.]; S-N only; prereq KIN M.S. or Ph.D. or SMGT M.A. or #; fall, spring, every year)
   Reporting/discussion of student/faculty research activity.

KIN 8995. Research Problems in Kinesiology. (1.0-12.0 cr.; S-N only; prereq Kin Ph.D. student or SMGT grad student or #; fall, spring, summer, every year)
   Individual scholarly research.

KOR 5040. Readings in Korean Texts: North Korean Dialect. (3.0 cr. [max 9.0 cr.]; Student Option No Audit; prereq 3022 or intermediate level of Korean proficiency; fall, offered periodically)
   Expose advanced students of Korean to various North Korean contexts. Improve ability to understand North Korean literary work. Various authentic texts from North Korea. Mostly taught in Korean.

KOR 5140. Readings in Sino-Korean Texts. (3.0 cr. [max 9.0 cr.]; prereq 3032 or equiv or #; fall, spring, every year)
   Sino-Korean vocabulary/characters necessary for advanced and superior level of knowledge in Korean. Students conduct research projects based on specialized readings in their own fields of study.

KOR 5211. Introductory Classical Chinese I. (3.0 cr.; [=JPN 5211, CHN 5211]; prereq Two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or #; fall, offered periodically)
   Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English.

KOR 5212. Introductory Classical Chinese II. (3.0 cr.; [=JPN 5212, CHN 5212]; prereq 5211 and two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or #; spring, offered periodically)
   Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English.

KOR 5993. Directed Studies. (1.0-5.0 cr. [max 15.0 cr.]; Student Option No Audit; prereq #, %; fall, spring, every year)
   Guided individual study of Korean language or linguistics.

Laboratory Medicine and Pathology (LAMP)
Medical School

LAMP 5100. General and Systemic Pathology for Dental Students. (5.0 cr.; A-F or Audit; prereq Registered dental student; fall, spring, every year)
   Causes, courses, mechanisms, and outcomes of disease. Required as preparation for clinical dental practice and oral pathology.

LAMP 5125. Chronobiology. (2.0-6.0 cr.; O- N or Audit; summer, every year)
   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.

Land and Atmospheric Science (LAAS)
College of Food, Agricultural and Natural Resource Sciences

LAAS 5050. Integrated Topics in Land & Atmospheric Science. (3.0 cr.; A-F or Audit; fall, every year)
   Earth system science. Interactions between the land and atmosphere. Biogeochmesty, human-environment interactions, environmental biophysics, and global environmental change.

LAAS 5051. Thesis Proposal Writing for Land & Atmospheric Science. (2.0 cr.; A-F or Audit; spring, every year)
   Grant proposals, including proposal formats of various funding sources, how to develop a significance statement, hypotheses and objectives, background, methods, project summary, time line, and budget. Critique proposal samples/discuss other aspects of seeking funding for research. Discuss LAAS graduate program prelim exam process.

LAAS 5311. Soil Chemistry and Mineralogy. (3.0 cr.; prereq [Chem 1022 or equiv]. Phys 1102, grad or #; fall, spring, every year)

LAAS 5425. Atmospheric Processes I: Thermodynamics and Dynamics of the Atmosphere. (3.0 cr.; A-F or Audit; prereq One yr college-level [calculus, physics, chemistry]]; LAAS 5425 recommended; spring, odd years)
   Basic laws governing atmospheric motion through analysis of atmospheric dynamics and thermodynamics at the micro, synoptic, and global scales. Fundamental thermodynamic and dynamical processes/equations governing the behavior of the atmosphere/applied to larger-scale geophysical situations.

LAAS 5426. Atmospheric Processes II: Radiation, Composition, and Climate. (3.0 cr.; A-F or Audit; prereq One yr college-level [calculus, physics, chemistry]]; LAAS 5425 recommended; spring, even years)

LAAS 5480. Special Topics in Land and Atmospheric Science. (1.0-4.0 cr. [max 6.0 cr.]; prereq grad student or #; fall, spring, summer, every year)
   Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule.

LAAS 5515. Soil Formation: Earth Surface Processes and Biogeochemistry. (3.0 cr.; A-F or Audit; prereq 2125 or #; spring, every year)

LAAS 8005. Supervised Classroom or Extension Teaching Experience. (2.0 cr.; S-N or Audit; [=BBE 8005, SOIL 8005, PLPA 8005, AGRO 8005, HORT 8005]; prereq #; fall, spring, every year)
   Teaching experiences in biosystems and agricultural engineering or agronomy and plant genetics or horticultural science or soil, water, and climate or plant pathology. Discussions about effective teaching to strengthen skills and develop a personal teaching philosophy.

LAAS 8128. Land and Atmospheric Science Seminar. (1.5 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, every year)
   Students present an open seminar on an advanced topic and attend seminars presented by other graduate students.

LAAS 8195. Research Problems in Soils. (1.0-5.0 cr. [max 10.0 cr.]; prereq [Grad major
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

LA 5311. Geospatial Data Analysis and Design. (3.0 cr.; A-F only; prereq Master of Landscape Architecture Student or #; fall, every year) Introduction to geospatial data analysis/application in landscape architectural, environmental design research/practice.

LA 5201. Making Landscape Spaces and Types. (6.0 cr.; A-F or Audit; prereq B.E.D accelerated status or LA grad or #; fall, every year) 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. (1.0 cr.; S-N or Audit; fall, every year) 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. (6.0 cr.; A-F or Audit; prereq LA major or #; recommended for both BED and Grad students; spring, every year) Design studio experience drawing on ecological, cultural, aesthetic influences to explore development of design ideas responsive to ecological issues and human experience.

LA 5204. Metropolitan Landscape Ecology. (3.0 cr.; A-F only; prereq BED accelerated status or LA grad student or #; fall, spring, every year) Theories/principles of holistic landscape ecology. People, nature, and environmental stewardship in metropolitan landscapes. Urban areas, rural areas that provide food, water, energy, and recreation.

LA 5301. Introduction to Landscape Architecture Drawing. (3.0 cr.; =LA 3003, ARCH 2301, LA 5376; prereq LA grad student or accelerated B.E.D. student; fall, spring, every year) Perceiving/representing material environment. Sketching/drawing conventions, visual phenomena/forms.

LA 5322. Computer Methods II. (1.0 cr.; prereq B.E.D. major or LA grad or #; may not be taken for graduate credit; fall, spring, summer, every year) Intermediate concepts, tools, and techniques of computer-aided drawing with current AutoCAD Release software. Strategies and techniques for producing dimensioned and annotated drawings. Use of dimension variables, attributes, blocks, symbols, and creation of customized menus.

LA 5371. Computer Methods I. (1.0 cr.; S-N or Audit; =LA 5301, ARCH 2301, LA 5376; prereq B.E.D. accelerated status or LA grad or #; fall, every year) Introduction to current techniques, programs, and new editions of computer programs, and their application to landscape architecture computing.

LA 5372. Computer Methods II. (1.0 cr.; S-N or Audit; =LA 5375, ARCH 3372, LA 3377; prereq Arch.LA 5371, LA grad or #; spring, every year) Current techniques and computer programs, and their application to landscape architecture computing.


LA 5400. Topics in Landscape Architecture. (1.0-3.0 cr.; =ARCH 3100, LA 3300; fall, spring, every year) 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. (1.0-3.0 cr.; No description)
LA 5402. Directed Studies in Landscape Architecture History and Theory. (1.0-6.0 cr.; [max 12.0 cr.]; prereq #; fall, spring, every year) Independent studies under the direction of landscape architecture faculty.

LA 5403. Directed Studies in Landscape Architecture Technology. (1.0-6.0 cr.; [max 12.0 cr.]; prereq #; fall, spring, every year) Independent studies under the direction of landscape architecture faculty.

LA 5404. Directed Studies in Landscape Architecture Design. (1.0-6.0 cr.; [max 12.0 cr.]; prereq #; fall, spring, every year) Independent studies under the direction of landscape architecture faculty.

LA 5405. Interdisciplinary Studies in Landscape Architecture. (1.0-6.0 cr.; [max 12.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Research, planning, or design projects. Topics vary.

LA 5406. Urban Design Journal. (3.0-4.0 cr.; A-F or Audit; prereq Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark; fall, spring, every year) 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. (3.0-4.0 cr.; A-F or Audit; prereq Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark; fall, spring, every year) 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. (3.0-4.0 cr.; A-F or Audit; prereq Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; prereq One course in history at 1xxx or higher; fall, every year)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. (3.0 cr.; A-F or Audit; fall, every year) 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 5514. Making the Mississippi. (3.0 cr.; A-F or Audit; = [LA 3514]; spring, every year) Critical environmental parameters affecting growth/development of metropolitan areas. Students assess these parameters and prepare a multi-functional land use plan for a defined locale.

LA 5571. Landscape Construction: Landform Systems and Spatial Performance. (3.0 cr.; A-F or Audit; prereq Accelerated B.E.D student or LA grad student; fall, every year) 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. (3.0 cr.; A-F or Audit; prereq [5201, 5203, plant identification course] or #; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; prereq jr or sr 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. (3.0 cr.; A-F or Audit; prereq B.E.D. advanced status or LA grad student or #; fall, every year) 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 5576. Ecological Restoration Project Planning and Management. (3.0 cr.; A-F only; prereq [MILA student, senior B.E.D.] or senior or grad with one college course in ecology/one college course in plant science or botany or #; fall, every year) Applied practice of ecological restoration of landscapes. Grasslands, wetlands, forests, disturbed agricultural sites, former industrial parcels. Restoration management, skills needed to lead successful projects.


LA 5755. Infrastructure, Natural Systems and the Space of Inhabited Landscapes. (3.0 cr.; A-F or Audit; = [LA 4755]; prereq Grad student; fall, every year) Cross-disciplinary exploration of urban infrastructural solutions to mitigate/reverse anthropogenic impacts on Earth. Design of sustainable urban infrastructure systems, policy options, available technologies, criteria, design methods.

LA 5771. Landscape Infrastructure and Systems I. (3.0 cr.; [max 6.0 cr.]; A-F only; prereq Master of Landscape Architecture Student, [Accelerated Track B.E.D or #]; fall, every year) Basic principles, techniques, skills of creating infrastructures of built landscapes. Basic concepts of simple plant taxonomy, plant community structure, earthwork, water management, landscape structures. Small site scale design development.

LA 5772. Landscape Infrastructure Systems II. (3.0 cr.; [max 6.0 cr.]; A-F only; prereq Master of Landscape Architecture Student, [Accelerated BED Student or #]; spring, every year) Principles, techniques, skills of creating ecological infrastructures of built landscapes. Builds on basic concepts taught in LA 5771. Focuses on ecological connections among plants, landscape structure, earthwork techniques, water management, landscape structural systems.

LA 5790. Special Topics in Metropolitan Design. (3.0 cr.; [max 6.0 cr.]; A-F or Audit; = [ARCH 5790]; prereq Enrollment in CMD prog or #; )

LA 8201. Designing Landscapes for Dwelling and Settlement. (6.0 cr.; A-F or Audit; prereq 5203, 5571, grad LA major, & 8202 or #; fall, spring, every year) 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 technics. Requires concurrent registration in LA 8202.

LA 8202. Design of Planned Developments. (2.0-3.0 cr.; prereq Grad LA major or #; fall, spring, every year) 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. (6.0 cr.; A-F or Audit; prereq 8202, grad LA major; concurrent enrollment 8204 or LA 8204; fall, every year)
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. (3.0 cr.; A-F or Audit; prereq Grad LA major or #; fall, spring, offered periodically)
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. (6.0-8.0 cr.; prereq 2 yrs of studio, grad LA major or #; fall, spring, every year)
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 8206. Making Urban Landscape Space. (6.0 cr.; A-F only; prereq MLA grad student; fall, every year)
Studio course focusing on the restoration and reuse of urban brownfield (former industrial) sites. Biological and mechanical remediation processes and the development of hard and soft site infrastructures to deal with storm water, energy generation, and the handling of waste. Re-design sites in terms of new uses and economies, and to re-integrate sites into existing and future urban systems of transportation.

LA 8207. Cities on Water International Workshop. (4.0-8.0 cr.; max 16.0 cr.; A-F only; prereq Grad LA or ARCH major or #; spring, every year)
Intensive studio course on international applications of sustainable urban design.

LA 8301. Landscape Architecture: Research Issues and Methods. (3.0 cr.; A-F or Audit; prereq 8201 or & 8201, grad LA major or #; fall, spring, every year)
Alternative methodological approaches to landscape architectural research and consideration of their appropriateness for contemporary research topics.

LA 8302. Professional Practice. (3.0 cr.; A-F or Audit; prereq 8205, grad LA major or #; spring, every year)
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. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

LA 8400. Topics in Landscape Architecture. (1.0-2.0 cr.; max 96.0 cr.; prereq Grad LA major or #; fall, spring, summer, every year)
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. (1.0-6.0 cr. [max 12.0 cr.]; prereq Grad LA major or #; fall, spring, every year)
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. (1.0-6.0 cr. [max 12.0 cr.]; prereq Grad LA major or #; fall, spring, every year)
Advanced independent studies under direction of landscape architecture faculty.

LA 8403. Directed Studies in Landscape Architecture Technology. (1.0-6.0 cr. [max 12.0 cr.]; prereq Grad LA major or #; fall, spring, every year)
Advanced independent studies under direction of landscape architecture faculty.

LA 8404. Directed Studies in Landscape Architecture Design. (1.0-6.0 cr.; prereq Grad LA major or #; fall, spring, every year)
Advanced independent studies under direction of landscape architecture faculty.

LA 8405. Interdisciplinary Studies in Landscape Architecture. (1.0-6.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad LA major or #; fall, spring, every year)
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. (3.0 cr.; A-F or Audit; prereq Grad land arch major or #; fall, spring, offered periodically)
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. (3.0 cr.; prereq Grad land arch major or #; fall, spring, offered periodically)
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. (3.0 cr.; A-F or Audit; prereq Grad land arch or arch major or #; fall, spring, offered periodically)
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 treatises and works of landscape architecture.

LA 8409. Fitting Buildings to the Land. (3.0 cr.; A-F or Audit; prereq Grad LA arch student with 1 yr grad design or #; fall, spring, offered periodically)
Exercises and projects in site manipulation to adjust structures and attendant uses and circulation to specific land parcels.

LA 8411. The foundational studio course on international applications of sustainable design in urban Europe. (4.0-8.0 cr. [max 16.0 cr.]; A-F only; prereq LA major or #; spring, every year)
Design preparation for restoration/reuse of abandoned sites in urban/exurban areas reclaimed from/influenced by saltwater coastal environments.

LA 8554. Project Programming. (2.0 cr. [max 4.0 cr.]; A-F only; prereq 8203, [grad land arch major or #]; fall, every year)
Individual research in preparation for final studio.

LA 8555. Advanced Landscape Planning and Design. (6.0 cr.; A-F or Audit; prereq 8205, grad land arch major or #; spring, every year)
Advanced studies in area of student's choice.

LA 8574. Landscape Storm Water Management. (3.0 cr.; A-F only; prereq 8201, grad land arch major or #; fall, spring, every year)
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, and storm sewer systems, run-off systems, sedimentation, and erosion control systems).

LA 8575. The Art and Ecology of Landscape Design Detail. (3.0 cr.; prereq Grad LA major or #; fall, spring, every year)
Design of pavements, enclosures, decks, lighting, electrical, and irrigation systems for landscape architecture. Theory/principles of design of light structures, properties/use of materials, construction communication. Landscape integrity and economic viability as performance issues.

LA 8741. Metropolitan Design Workshop and Optional Seminar. (3.0-6.0 cr.; max 12.0 cr.; A-F only; prereq 8204; spring, every year)
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 8773. Landscape Infrastructure and Systems III. (3.0 cr. [max 6.0 cr.]; A-F only; prereq Master of Landscape Architecture Student or #; fall, every year) Third course in landscape infrastructure/systems sequence that introduces technical skills required to work/obtain professional licensure as landscape architect. Programming, qualitative/quantitative performance of constructed hydrologic systems, planting design, representation of constructed systems, paving systems for hydrologic control.

LA 8774. Landscape Infrastructure and Systems IV. (3.0 cr. [max 6.0 cr.]; A-F only; prereq Master of Landscape Architecture Student or #; fall, every year) Fourth course in landscape infrastructure/systems sequence that introduces students to technical skills required to work/obtain professional licensure as landscape architect. Use/implementation of complex constructed assemblies in urban context.

LA 8775. Landscape Infrastructure and Site Technology V. (3.0 cr.; A-F only; prereq 8773, 8774 preferred; students outside of Master of Landscape Architecture program are encouraged to enroll upon demonstration of similar pre-requisite coursework and #; spring, every year) Seminar, cross-disciplinary. Advanced inquiry into complex site-scale problems requ Applied theory. Professional practice applications with emphasis on urban/post-industrial sites. Programmatic, regulatory/construction contexts. Directed research of emerging/speculative infrastructure.

LA 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer, 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

Language, Teaching, and Technology (LGTT)

College of Liberal Arts

LGTT 5101. Applications of Technology in Language Teaching. (3.0 cr.; =LGTT 5110); fall, spring, every year) Explore uses of technology in language teaching; theoretical background, demonstrations, and applications.

LGTT 5110. Technology in the Second Language Classroom. (2.0 cr.; =LGTT 5101); spring, summer, every year) Examine, evaluate, and use technology in language teaching. Theoretical background, demonstration, hands-on exploration.

LGTT 5710. Special Topics in Language Teaching and Technology. (2.0 cr. [max 6.0 cr.]; fall, summer, offered periodically) Examine, evaluate, apply specific area of technology to K-higher education, second/foreign language teaching/learning in classroom, independent study, distance education environments.


Latin (LAT)

College of Liberal Arts

LAT 5001. Intensive Latin. (3.0 cr. =LAT 1001, LAT 1111H); prereq Prev experience in another foreign language is desirable; fall, every year) Covers material usually taught over two semesters.

LAT 5003. Intermediate Latin Prose: Graduate Student Enrollment. (3.0 cr.; =LAT 3003); prereq [Grade of at least C- or S] in [1002 or 5001] or #, grad student; fall, every year) Reading Latin. Reviews elementary grammar, vocabulary, and morphology. Introduction to major themes/issues in Latin literature/Roman culture. Meets with 3003.

LAT 5004. Intermediate Latin Poetry for Graduate Students. (3.0 cr.; =LAT 3004); prereq [5003 or equiv], grad student or %; spring, every year) Introduction to classical Latin poetry. Readings from Vergil's Aeneid. Nature of Augustan literature, poetic vocabulary/grammar, Latin meter. Meets with 3004.

LAT 5100. Advanced Reading. (3.0 cr. [max 18.0 cr.]; prereq [3004 or equiv], at least two yrs of college level Latin. Must contact Classical/Near Eastern Studies department for permission to register; fall, spring, every year) Reading in Latin texts/authors. Texts/authors vary.

LAT 5200. Advanced Reading in Later Latin. (3.0 cr. [max 18.0 cr.]; prereq [LAT 3004 or equiv], at least two yrs of college level Latin. Must contact Classical and Near Eastern Studies department for permission to register.; fall, spring, offered periodically) Authors of late antiquity, Middle Ages, Renaissance. Topics specified in Class Schedule.

LAT 5701. Latin Prose Composition. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Latin grammar, syntax, diction, and prose style. Graduated exercises in prose composition.


LAT 5703. Epigraphy. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Practical/theoretical 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 5705. Introduction to the Historical-Comparative Grammar of Greek and Latin. (3.0 cr.; =GRK 5705): prereq Two yrs college [Greek or Latin] or #; fall, offered periodically) Historical/comparative grammar of Greek/Latin, from proto-Indo-European origins to classical norms.

LAT 5706. History of Latin. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) 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. (1.0 cr. [max 6.0 cr.]; S-N only; prereq Enrolled in a grad program in Department of Classical/Near Eastern Studies; fall, spring, every year) Practice in reading Latin texts at sight.

LAT 5993. Directed Studies. (1.0-4.0 cr. [max 18.0 cr.]; prereq #, %; fall, spring, summer, every year) Guided individual reading or study.

LAT 5994. Directed Research. (1.0-12.0 cr. [max 20.0 cr.]; prereq Grad student or #; fall, spring, every year) Guided research on original topic chosen by student.

LAT 5996. Directed Instruction. (1.0-12.0 cr. [max 20.0 cr.]; prereq Grad student or #; fall, spring, every year) Supervised teaching internship.

LAT 8100. Readings in Latin Prose. (3.0 cr. [max 18.0 cr.]; prereq Advanced grad student; fall, spring, every year) Reading/discussion of Latin prose texts.

LAT 8120. Latin Text Course. (3.0 cr. [max 15.0 cr.]; prereq 3111 or %; not for students in dept of Classical and N East Studies; fall, spring, every year) Students attend 3xxx Latin courses. Supplementary work at discretion of instructor.

LAT 8200. Readings in Latin Verse. (3.0 cr. [max 18.0 cr.]; prereq Advanced grad student; fall, spring, every year) Reading/discussion of Latin poetic texts.

LAT 8262. Survey of Latin Literature I. (3.0 cr.; ) Extensive readings in variety of works from republican and early Augustan period.

LAT 8263. Survey of Latin Literature II. (3.0 cr.; ) Variety of works from Augustan and imperial periods.

LAT 8267. Graduate Survey of Latin Literature of Late Antiquity. (3.0 cr.; prereq #, %; spring, offered periodically) Latin literature of 3rd to 6th centuries A.D., including Ammianus and Augustine.
LING 5001. Introduction to Linguistics. (4.0 cr.; [LING 3001, LING 3001H]; prereq grad or #; fall, spring, summer, every year) Phonology of human languages. Reading papers in the literature. Doing research in phonology.

LING 5461. Conversation Analysis. (3.0 cr.; [COMM 5461]; prereq 3001 or 3001H or 5001 or #; fall, offered periodically) Discourse processes. Application of concepts through conversation analysis.

LING 5462. Field Research in Spoken Language. (3.0 cr.; [COMM 5462]; prereq 3001 or 3001H or 5001 or #; spring, offered periodically) Transcribing/analyzing talk and movement related to talk. Applying concepts to recorded conversations.

LING 5501. Introduction to Language Acquisition. (3.0 cr.; prereq 3001 or 3001H or 5001 or #; summer, every year) First/second language acquisition.

LING 5601. Historical Linguistics. (3.0 cr.; [LING 3601]; prereq 3001 or 3011H or 5001; spring, every year) Historical change in phonology, syntax, semantics, and lexicon. Linguistic reconstruction. Genetic relationship among languages.

LING 5801. Introduction to Computational Linguistics. (3.0 cr.; prereq [4201 or 5201] or programming experience or #; spring, every year) Methods/issuses in computer understanding of natural language. Programming languages, their linguistic applications. Lab projects.

LING 5900. Topics in Linguistics. (1.0-4.0 cr.; [max 12.0 cr.]; fall, spring, every year) Topics vary. See Class Schedule.

LING 5931. Morphology and Syntax of Contemporary English. (3.0 cr.; prereq 3001 or 3001H or 5001 or #; fall, spring, offered periodically) Linguistic analysis of word/sentence structure of contemporary English. Focuses on data from recorded/written texts.

LING 5993. Directed Study. (1.0-3.0 cr.; [max 10.0 cr.]; fall, spring, every year) Directed study for Linguistics. Prereq instr consent, dept consent, college consent.

LING 8005. Research Paper Workshop. (3.0 cr.; [max 12.0 cr.]; S-N or Audit; prereq [5105, 5202, 5205, [4302W or 5302] or #; [grad ling major]; spring, every year) Workshop on research methodology/writing in linguistics.

LING 8105. Field Methods in Linguistics I. (4.0 cr. [max 8.0 cr.]; prereq [5001, 5201, 5302, grad linguistics major] or #; fall, every year) Techniques and practice in obtaining/analyzing linguistic data from an unfamiliar language through direct interaction with a native speaker. Study of a language by elicitation of speech samples/analysis of patterns that emerge.

LING 8106. Field Methods in Linguistics II. (4.0 cr. [max 8.0 cr.]; prereq 8105 [taken in same academic yr]; spring, every year) Continued analysis through work with a native speaker of language begun in 8105.
LING 8200. Topics in Syntax and Semantics. (3.0 cr. [max 9.0 cr.]; prereq 5202, 5205 or #; ) Syntax and semantics of natural language, with particular emphasis on the interface between the two.

LING 8210. Seminar in Syntax. (3.0 cr. [max 9.0 cr.]; prereq 5202, 5205 or #; fall, offered periodically) Current issues in syntactic theory. Topics vary.

LING 8300. Topics in Phonetics and Phonology. (3.0 cr. [max 9.0 cr.]; prereq 5303 or #; )

LING 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

LING 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

LING 8500. Topics in Second Language Acquisition. (3.0 cr. [max 9.0 cr.]; prereq 5001, 5505; fall, spring, offered periodically) tbd

LING 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

LING 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

LING 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

LING 8888W. Thesis Credit Dissertation Seminar. (1.0-3.0 cr. [max 24.0 cr.]; No Grade Associated; prereq Doctoral student who has passed oral prelims; fall, spring, every year) A means for students to make progress on the dissertation in a structured setting. Brings together students writing on related topics. Credits are applied to doctoral thesis credits. Contact instructor for description.

LING 8900. Seminar: Topics in Linguistics. (3.0 cr. [max 9.0 cr.]; prereq #; spring, every year) Topics vary. See Class Schedule.

LING 8920. Topics in Language and Cognition. (3.0 cr. [max 6.0 cr.]; prereq 5001 or #; fall, every year) 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. (1.0-4.0 cr. [max 15.0 cr.]; prereq #; fall, spring, every year) Independent Study

Logistics Management (LM)
Curtis L. Carlson School of Management

LM 8892. Readings in Logistics Management. (1.0-8.0 cr. [max 16.0 cr.]; prereq Adviser consent or #; fall, spring, every year) Readings useful to student’s individual program or objectives that are not available in regular courses.

LM 8894. Graduate Research in Logistics Management. (1.0-8.0 cr. [max 16.0 cr.]; prereq Adviser consent or #; fall, spring, every year) Individual research on an approved topic appropriate to student’s program and objectives.

Management (MGMT)
Curtis L. Carlson School of Management

MGMT 5019. Business, Natural Environment, and Global Economy. (2.0 cr.; A-F only; = [ESPM 5019]; prereq MBA student; fall, every year) Resource deployment policies that affect the natural environment. Sustainability. Local/global environmental threats, how government policies address these issues. Business strategies/practices that produce "win-win" outcomes.

MGMT 5480. Topics in Natural Resources. (3.0 cr.; A-F only; spring, offered periodically) Specific topic for each offering.

MGMT 8101. Theory Building and Research Design. (4.0 cr.; prereq Business admin PhD student or #; spring, offered periodically) Problem formulation, conceptual modeling, theory building, and research design in the social and behavioral sciences.

MGMT 8201. Foundations of Business, Government, and Society. (4.0 cr.; prereq Business admin PhD student or #; fall, offered periodically) Considers works in political and legal philosophy, ethics, and economics.

MGMT 8202. Seminar in International Management. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, offered periodically) Overview of the field of international management research.

MGMT 8204. Topics in BGS - I. (2.0 cr.; A-F or Audit; prereq PhD student or #; fall, offered periodically) Topics vary.

MGMT 8205. Topics in Business, Government, and Society II. (2.0 cr.; A-F or Audit; prereq PhD student or #; ) Topics vary.

MGMT 8301. Seminar in Organizational Behavior. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, offered periodically) Major theories and current research on individual behavior and group processes in organizations from a micro perspective.

MGMT 8302. Seminar in Organizations Theory. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, offered periodically) Major theories and current research on organizational and interorganizational topics from a macro perspective.

MGMT 8304. Topics in Organizations I. (2.0 cr.; A-F or Audit; prereq PhD student or #; fall, spring, offered periodically) Topics vary.

MGMT 8305. Topics in Organizations II. (2.0 cr.; A-F or Audit; prereq PhD student or #; fall, spring, offered periodically) Review of research in strategy formulation.

MGMT 8402. Seminar in Strategy Process. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, every year) Strategic management. Topics vary.

MGMT 8403. Strategy Seminar. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, every year) Examines research on process by which strategy is formulated and implemented in firms.

MGMT 8404. Topics in Strategy I. (2.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq PhD student or #; fall, spring, odd years) Topics vary.

MGMT 8405. Topics in Strategy II. (2.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq PhD student or #; fall, spring, even years) Topics vary.

MGMT 8892. Readings in Management Theory and Administration. (1.0-8.0 cr. [max 16.0 cr.]; prereq Business admin PhD student or #, adviser consent; fall, spring, every year) Intensive research on a management topic; major term paper.

MGMT 8894. Graduate Research in Management Theory and Administration. (1.0-8.0 cr. [max 16.0 cr.]; prereq Business admin PhD student or #, adviser consent; fall, spring, every year) Research project on a management problem of interest to student; may be completed in cooperation with a business firm.

Management of Technology (MOT)
College of Science and Engineering

MOT 5001. Technological Business Fundamentals. (2.0 cr.; A-F only; prereq
Degree seeking or non-degree graduate students; fall, every year)


MOT 5003. Technological Business Planning Workshop. (1.0 cr. [max 2.0 cr.]; A-F only; prereq Degree seeking or non-degree graduate students. Student must also enroll for MOT 5001 or MOT 5002; fall, spring, every year)

Applies lessons of 5001 or 5002 directly to technology of the student's choosing, possibly thesis topic. Aspects of strategic technology plan or business plan, culminating in presentation of plan. Must be taken in parallel with 5001 or 5002.

MOT 5224. Introduction to Technological Leadership and Management: Assessing Emerging and Pivotal Technologies. (1.0 cr.; A-F only; fall, every year)

Selected emerging technologies expected to play key roles in future industrial development.

MOT 5991. MOT Independent Study. (1.0-3.0 cr. [max 1.0 cr.]; S-N or Audit; prereq MOT grad student; )

Independent study in MOT-related topic.

MOT 8111. Marketing Management for Technology-based Organizations. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)

Function of marketing strategy in technology-based organizations. Emphasizes marketing industrial products. Issues in product strategy, including pricing, promotion, product mix, and sales/distribution decisions.

MOT 8112. Management Accounting. (1.5 cr. [max 2.0 cr.]; A-F or Audit; prereq Grad MOT major; fall, every year)

Introduction to methods for estimating/analyzing product costs and for using cost information to make product mix and pricing decisions. Cases from technology-oriented firms illustrate principles of activity-based costing. Uses of cost data in managerial decision making, budgeting/control, and financial statement analysis.

MOT 8113. Operations Management for Competitive Advantage. (1.5 cr. [max 2.0 cr.]; A-F or Audit; prereq Grad MOT major; spring, every year)

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. (2.0 cr.; A-F only; prereq Grad MOT major; fall, every year)

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 8512. Financial Management for Technology-based Organizations. (2.0 cr.; A-F or Audit; prereq Grad MOT major; spring, every year)

Creating value within the organization. Financial methods important to managers of technology-based organizations. Budgeting capital, projecting financial needs, and managing working capital.

MOT 8513. Communication in a Technical Environment. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)

Oral and written communication. Introductory and specialized workshops on topics such as presentation skills, memo and report writing, listening skills, and visual aid design and integration.

MOT 8512. Developing New Technology Products. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)

Review of methods and organizational strategies for development of new technology products. Product development strategy. Necessary organizational interactions between research/development, operations, marketing, and intellectual property strategy in design/delivery.

MOT 8513. Macroevironment of Technology. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)

Development of scenarios of 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 8514. Technology Foresight and Forecasting. (2.0 cr.; A-F only; prereq Grad MOT major; fall, every year)

Tools/techniques for technology forecasting, assessment, and strategic foresight for decision making in business/government. Technology dynamics, R&D strategy, portfolio management, resource allocation.

MOT 8521. Project and Knowledge Management. (1.5 cr. [max 2.0 cr.]; A-F or Audit; prereq Grad MOT major; spring, every year)

Survey/application of project and knowledge management in management of technology. Business/engineering project/knowledge management. Planning, scheduling, controlling.


MOT 8524. Pivotal Technologies. (2.0 cr.; A-F or Audit; prereq MOT grad major; fall, every year)

Technologies expected to play pivotal roles in future industrial development. State-of-the-art for each technology. Barriers/opportunities for commercialization. Guest expert lectures. Students analyze potential applications of technologies to industry.

MOT 8521. Managing Information Resources in Technology-based Organizations. (1.0 cr. [max 2.0 cr.]; A-F or Audit; prereq Grad MOT major; fall, spring, every year)

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 8522. Managing Technological Innovation. (2.0 cr.; A-F or Audit; spring, every year)

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 in existing businesses and new ventures.

MOT 8523. Strategic Management of Technology. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)


MOT 8524. Capstone Project. (0.5-2.0 cr.; A-F or Audit; prereq Completion of two semesters, grad MOT major; fall, spring, summer, every year)

Applied research activity, specifically related to management of technology, in cooperation with participant's home organization. Working with a faculty adviser and work mentor, students address an industry-based management of technology project, venture, process, or challenge. Formal presentation to capstone committee is required.

MOT 8533. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, summer, every year) (No description)

MOT 8580. Innovation Leadership and Organizational Effectiveness. (0.5-2.0 cr.; A-F only; prereq MOT major; fall, spring, every year)

Made up of four Â½ credit units that unfold over four semesters of MOT program. Building talent, organizational capability, culture needed to execute innovation strategy.

MOT 8900. Conflict Management. (0.5 cr.; prereq Grad MOT major; fall, every year)
Theory and methods for applying conflict management techniques in organizations. Cooperative and competitive models of conflict, basics of bargaining, conflict strategies, communicating in styles, listening skills, dispute resolution, third-party mediation, and use of computers for conflict mediation.

MOT 8910. Corporate Responsibility. (1.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year) Principles of stakeholder management. Ethical framework for responsible management of investors, 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 8920. Science and Technology Policy. (1.5 cr.; A-F or Audit; prereq MOT grad student; fall, every year) Role of government in science/technology. Impact of policy on economy/society. Ways companies/individuals may influence science/technology policy. Technology-related public policy in the United States, elsewhere.

MOT 8921. Global Management of Technology. (0.0-0.5 cr.; A-F only; prereq MOT student; spring, every year) Global management of technology.

MOT 8930. Topics in Emerging Technologies. (0.5 cr.; S-N or Audit; prereq MOT grad student; spring, every year) Invited 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. (0.5-1.5 cr.; S-N only; prereq MOT grad student; fall, every year) 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 Audit; prereq MOT grad student; spring, every year) 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.

MCOM 5400. Managerial Communications for the HR Professional. (2.0 cr.; A-F only; prereq HRIR student; fall, spring, every year) Memo writing, oral presentations, and team communication required of HR professional.

Emphasizes hands-on, experiential learning, including videotaping.

MCOM 5500. Enhancing Your Executive Image in Business Communications. (2.0 cr. [max 4.0 cr.]; A-F only; prereq MBA student; fall, every year) Techniques to project executive presence in all business communications.

MCOM 5510. Persuasive Writing in Business. (2.0 cr.; A-F only; prereq MBA student;) Writing to motivate/affect change. Form/content. Techniques of persuasion. Producing polished text. Writing with power.

MCOM 5520. Persuasive Writing in Business: Non-Native Speakers of English. (2.0 cr.; A-F only; prereq MBA student, non-native English speaker;) Writing to motivate/affect change. Form/content. Techniques of persuasion. Producing polished text. Writing with power.


Marketing (MKTG) Curtis L. Carlson School of Management

MKTG 8809. Consumer Behavior Research Methods. (2.0 cr.; A-F or Audit; prereq Doctoral student or [masters programs student, #]; fall, spring, offered periodically) Seminar. Topics related to conceptual theories/arguments about experimental design and statistical analysis of experiments. How to design experimental research for testing hypotheses and drawing conclusions.

MKTG 8810. Consumer Behavior Special Topics. (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Doctoral student or [masters program student, #]; fall, spring, offered periodically) Theories of consumer categorization. Literature on brand categories, category measurement, brand extensions/dilution/affect. Readings from branding literature. Theoretical analysis.

MKTG 8811. Consumer Attitudes and Persuasion I. (2.0 cr.; [prereq [MBA 6210 or equiv], business admin PhD student] or #; fall, spring, odd years) Reading, discussing, and evaluating theories of consumer attitudes and persuasion. Theoretical analysis, rather than practitioner focus.

MKTG 8812. Consumer Attitudes and Persuasion II. (2.0 cr.; A-F or Audit; prereq Doctoral student or [#]; fall, spring, odd years) Science of persuasion. Principles of stickiness-universal principles that lead messages to succeed rather than fail. Principles of influence-universal psychological principles that motivate a person to say "yes,"

MKTG 8813. Consumer Judgment and Decision Making I. (2.0 cr.; A-F or Audit; prereq Doctoral student or [master's program student, #]; fall, spring, offered periodically) Different theoretical approaches taken in judgment and decision-making research. Heuristics/biases, affect in decision making, judgments/decisions over time.

MKTG 8814. Consumer Judgment and Decision Making II. (2.0 cr.; A-F or Audit; prereq Doctoral student or [master's program student, #]; fall, spring, offered periodically) Draws from work on prospect theory and its derivatives. Anomalous choice. Emphasizes on applications to Marketing theory, from inter-temporal choice to regret and counterfactual thinking in consumers/managers.

MKTG 8831. Seminar: Inter-Organizational Relations. (4.0 cr.; prereq MBA 6210 or equiv, business admin PhD student or #; fall, spring, offered periodically) From an efficiency perspective, inter-organizational networks involved in task of moving goods and services from point of production to point of consumption. Literature covering the functional, institutional, analytical, and methodological traditions, as well as the behavioral school of thought and transaction cost and relational contracting.

MKTG 8842. Quantitative Modeling I. (2.0 cr.; A-F or Audit; prereq Doctoral student or [master's program student, #]; fall, spring, offered periodically) Advanced readings seminar. Quantitative research in marketing. Topics from theoretical/emirical research in marketing, econometrics, and industrial organization. Classic/contemporary articles.

MKTG 8843. Quantitative Modeling II. (2.0 cr.; A-F or Audit; prereq Doctoral student or [master's program student, #]; fall, spring, offered periodically) Advanced readings seminar. Quantitative research in marketing. Topics from theoretical/emirical research streams in marketing, econometrics, and industrial organization. Classic/contemporary articles.

MKTG 8851. Seminar: Marketing Management and Strategy I. (2.0 cr.; prereq [[MBA 6210 or equiv], business admin PhD student] or #; fall, spring, offered periodically) Topics in marketing management and formulation and implementation of marketing strategies. Diversity of thought, within marketing and strategic management literature.

MKTG 8852. Marketing Management & Strategy II. (2.0 cr.; prereq Business
admin PhD student or #; fall, spring, offered periodically)
PhD seminar. Role of branding within the organization, its business strategy, and
its success. Brand management. Critically evaluate fundamental ideas and more recent
developments.

MKTG 8890. Seminar: Marketing Topics. (1.0-4.0 cr. [max. 8.0 cr.]; prereq Business
admin PhD student or #; fall, spring, offered periodically)
Current topics and problems of interest considered in depth. Topics vary with each
offering.

MKTG 8892. Readings in Marketing. (1.0-8.0 cr. [max. 16.0 cr.]; prereq MBA 6210 or equiv,
business admin PhD student or #; fall, spring, every year)
Readings useful to student's individual program and objectives that are not available in regular
courses.

MKTG 8894. Graduate Research in
Marketing. (1.0-8.0 cr. [max. 16.0 cr.]; prereq MBA 6210 or equiv, business admin PhD
student or #; fall, spring, summer, every year)
Individual research on an approved topic appropriate to student's program and
objectives.

Master of Business Taxation (MBT)
Curtis L. Carlson School of Management

MBT 5200. Tax Accounting Methods and
Periods. (4.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; fall, every year)
Rules affecting timing of income and deductions for tax purposes. Examination of
cash and accrual accounting methods on an overall basis and with respect to individual
items of income and deductions; rules for changing accounting methods and periods;
annual accounting and transactional concepts, including the claim of right doctrine, the
Arrowsmith doctrine, and the tax benefit rule.

MBT 5220. Tax Research, Communication,
and Practice. (4.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; fall, every year)
Tax questions. Locating/assessing potential authority. Communicating research results.
Sources of IRS policy. Processing/auditing returns. Rulings, determination letters. Closing

MBT 5223. Tax-exempt Organizations. (2.0
cr.; A-F or Audit; prereq ACCT 5135, MBT student; fall, every year)
Tax law/issues concerning Section 501(c)(3) and other tax-exempt organizations.
Qualification, procedures. Unrelated business income, private foundations (including
intermediate sanctions), joint ventures.

MBT 5226. Negotiation Techniques in
Taxation. (2.0 cr.; A-F or Audit; summer, every year)
Hands-on approach. Applications from facilitating business sales, mergers, and
acquisitions, to representing client's position before IRS, to controlling TV remote.
Negotiation process: planning, pre-negotiation preparation, strategy development.

MBT 5230. Corporate Taxation I. (2.0 cr.; A-
F or Audit; prereq ACCT 5135, MBT student; spring, every year)
Establishment of capital structure. Determination of tax liability. Dividends,
nonliquidating distributions. Stock redemptions, liquidations.

MBT 5323. Mergers and Acquisitions I. (2.0
cr.; A-F or Audit; prereq 5230, MBT student; fall, every year)
Different types of acquisitions, dispositions, reorganizations, and spin-offs involving C
corporations. Tax consequences of acquisition to corporations/shareholders involved. Use
of 338 elections, limitations on acquired net operating losses/credits, use of covenants not
to compete, consulting agreements, deferred payment terms, treatment of transaction costs.

MBT 5333. Tax Aspects of Consolidated
Returns. (2.0 cr.; A-F or Audit; prereq 5230, MBT student; spring, every year)
Filing. Determining affiliated groups. Election filing. Intercompany transactions. Limitations on
certain loss and credit carryforwards. Allocation of federal income tax liability. E&P, investment

MBT 5335. Taxation of the Small Business
Corporation. (2.0 cr.; A-F or Audit; prereq 5230, MBT student; spring, summer, every year)
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 Partners and
Partnerships. (2.0 cr.; A-F or Audit; prereq Acct 5135, MBT student; spring, summer, every year)
Reviews tax consequences associated with formation, operation, and dissolution of a
partnership.

MBT 5346. ASC 740 Computations and
Analysis. (2.0 cr.; A-F or Audit; prereq 5230, MBT student; fall, every year)
Financial accounting/reporting standards for effects of income taxes from corporate
activities. Computation of current/deferred tax expense/benefit. Temporary differences,
Foreign operations, tax allocations, interim period tax calculations.

MBT 5348. Advanced ASC 740 Concepts. (2.0
cr.; A-F or Audit; prereq 5346, MBT student; fall, odd years)
Examination of topics under ASC 740
Accounting for Income Taxes. Share-based
awards, uncertain tax positions, valuation allowances, business combinations, foreign
operations, interim period tax calculations. Process design/perspective of stakeholders of
income tax accounting.

MBT 5350. Wealth Transfer I (Estates and
Gifts). (2.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; fall, spring, summer, every year)
Taxation of transfers under federal estate and gift tax laws. Property owned by decedent.
deduction. Taxable inter vivos gifts, splitting/credits.

MBT 5353. Trusts and Estates. (2.0 cr.; A-F
or Audit; prereq ACCT 5135, MBT student; fall, spring, every year)
Simple, complex, and revocable trusts. Estates. Accumulation distributions and income with
respect to decedents. Trust accounting income and principal. Distributable net income.
Terminations. Excess distributions.

MBT 5360. State and Local Taxation. (2.0
cr.; A-F or Audit; prereq Acct 5135, MBT student; spring, every year)
Examines state levying of individual income, corporate income, property, sales, and excise
taxes. Tax problems of businesses with multistate operations.

MBT 5361. State and Local Taxation II. (2.0
cr.; A-F or Audit; fall, every year)
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 5363. Compensation and Benefits. (2.0
cr.; A-F or Audit; prereq ACCT 5135, MBT student; spring, every year)
Federal income taxation of executive compensation, relevant fringe benefit programs. Benefit programs other than qualified retirement plans. Salary continuation,
stock options, non-profit organization plans, health/welfare plans.

MBT 5370. Taxation of Property
Transactions. (2.0 cr.; A-F or Audit; prereq Acct 5135, MBT student; fall, spring, every year)
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 5380. Tax Aspects of International
Business I. (2.0 cr.; A-F or Audit; prereq 5230, MBT student; fall, spring, every year)
Multinational business operations/transactions involving foreign income. Tax consequences
of transactions with/by foreign organizations/companies.
MBT 5381. Tax Aspects of International Business II. (2.0 cr.; A-F or Audit; prereq 5380, MBT student; fall, spring, every year) 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 5382. Transfer Pricing. (2.0 cr.; A-F or Audit; prereq [5230, 5380] or equiv; summer, every year) Transfer pricing requirements facing multinational companies. Tax requirements of the United States and other countries that have adopted the "arm's-length standard" or the transfer pricing guidelines adopted by the Organization for Economic Cooperation and Development. Regulations, methods, economic models, pricing policies, transaction accounting, and management of audits of managing transfer prices within a multinational company.

MBT 5390. Topics in Taxation. (1.0-4.0 cr. [max 160.0 cr.]; A-F or Audit; prereq ACCT 5135, MBT student; summer, offered periodically) Topics vary.

MBT 5420. Current Topics in Taxation. (1.0-4.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; fall, spring, summer, every year) Tax research/compliance, other tasks. Students submit summary paper.


MBT 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

Master of Development Practice (MDP)
Academic Affairs, Senior Vice President

MDP 5001. Ways of Knowing and Sustainable Livelihoods. (2.0 cr.; A-F or Audit; prereq Grad MDP major or #; fall, every year) Complexities of interdisciplinary study of development and a range of "ways of knowing," the field of development studies and sustainability. Approaches practiced by physical, biological, social science, and humanities scholars. "Ways of knowing" in different cultures/groups and from a variety of situational perspectives. Key issues and concepts and key methodological challenges facing us as we engage in interdisciplinary and international development study and practice. Sustainable livelihoods. Team taught when possible by faculty from biological, social sciences, and humanities, or at minimum will include guest lecturers who can offer a range of disciplinary perspectives on questions of development.

MDP 5002. Research Methods for Sustainable Livelihoods. (4.0 cr.; A-F only; prereq MDP grad student or #; spring, every year) Research/writing skills to support work in international development. Discussion of basic qualitative research methods/data analysis. Qualitative/quantitative data, collaborative research/analysis. Relationship between research/policy.

MDP 5003. Field Study Pre-Departure Seminar. (1.0 cr.; Student Option No Audit; prereq MDP grad student or #; spring, every year) Preparation for international field experience. Identify arrangements for summer field experience in consultation with faculty leader of seminar/MDP advisers. Feedback on colleagues' plans.

MDP 5100. International Field Seminar. (1.0 cr.; A-F only; prereq MDP grad student or #; fall, every year) Debriefing/identifying important learning from field experiences. Complete final report on field project. Build upon skills in peer review/feedback developed in 5003.

MDP 5200. Capstone Workshop in Development Practice. (1.0-2.0 cr. [max 3.0 cr.]; A-F or Audit; prereq MDP grad student or #; fall, spring, every year) Learning from field experiences. Analytical/practical skills developed in academic training. Apply skill/experiences to "real world" problem provided by local or international development-focused organization. Reflective practice.

Master of Healthcare Administration (MHA)
Curtis L. Carlson School of Management

MHA 8763. External Forces Affecting Health Services Delivery. (2.0 cr.; A-F or Audit; 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. (2.0 cr.; A-F or Audit; prereq PhD student; fall, spring, every year) Field experience in healthcare research. Supervised independent and team research on selected topics and problems.

Materials Science (MATS)
Institute of Technology

MATS 5353. Electron Microprobe Theory and Practice. (3.0 cr.; =[ESCI 5353]; prereq [One yr chem, one yr physics] or #; spring, offered periodically)

Characterizing solid materials with electron beam instrumentation, including reduction of X-ray data to chemical compositions.

MATS 5517. Electron Microscopy. (3.0 cr.; A-F or Audit; spring, offered periodically) 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 5531. Electrochemical Engineering. (3.0 cr.; [CHEM 5531]; prereq MTS 3011 or #, upper div GSE or grad; fall, offered periodically) 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 5771. Colloids and Dispersions. (3.0 cr.; A-F or Audit; prereq Physical chemistry; fall, every year) Preparation, stability, coagulation kinetics, or colloidal solutions. DLVO theory, electrokinetic phenomena. Properties of micelles, other microstructures.

MATS 8001. Structure and Symmetry of Materials. (3.0 cr.; prereq Mats and ChEn majors must take this course for a grade; fall, every year) Comprehensive description of structure of materials, including metals, semiconductors, organic crystals, polymers, and liquid crystals. Atomic and molecular ordering, influence of intermolecular forces on symmetry and structure. Principles of scattering and use of X-ray, neutron, and electron diffraction.

MATS 8002. Thermodynamics and Kinetics. (3.0 cr.; A-F or Audit; fall, every year) 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, multicomponent equilibria, reaction kinetics, mass transport, diffusion.


MATS 8004. Mechanical Properties. (3.0 cr.; A-F or Audit; spring, every year) 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 8204. Computational Methods and Applications to Problems in Materials
Science and Engineering. (2.0 cr.; A-F or Audit; prereq Grad student, knowledge of programming languages such as Fortran; spring, every year) Implementation of computational methods/applications to numerical problems in materials science and engineering. Emphasizes implementation to applications.

MATS 8211. Physical Chemistry of Polymers. (4.0 cr.; [CHEM 8211, CHEN 8211]; prereq Undergrad physical chem or #; spring, every year) 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 8221. Synthetic Polymer Chemistry. (4.0 cr.; [CHEM 8221, CHEN 8221, MATS 5221, CHEM 4221]; prereq [Undergrad organic chemistry course, undergrad physical chemistry course] or #; fall, every year) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

MATS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

MATS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

MATS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

MATS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

MATS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

MATS 8993. Directed Study. (1.0-12.0 cr.; fall, spring, summer, every year)

MATS 8994. Directed Research. (1.0-12.0 cr.; fall, spring, summer, every year)

MATS 8995. Special Topics. (1.0-4.0 cr.; A-F or Audit; fall, spring, summer, every year) New or experimental courses offered by department or visiting faculty.

Mathematics (MATH) Institute of Technology

MATH 5067. Actuarial Mathematics I. (4.0 cr.; prereq 4065; [one sem [4xxx or 5xxx] [probability or statistics] course]; fall, every year) Future lifetime random variable, survival function. Insurance, life annuity, future loss random variables. Net single premium, actuarial present value, net premium, net reserves.

MATH 5068. Actuarial Mathematics II. (4.0 cr.; prereq 5067; spring, every year) Multiple decrement insurance, pension valuation. Expense analysis, gross premium, reserves. Problem of withdrawals. Regulatory reserving systems. Minimum cash values. Additional topics at instructor's discretion.

MATH 5075. Mathematics of Options, Futures, and Derivative Securities I. (4.0 cr.; prereq Two yrs calculus, basic computer skills; fall, every year) 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. (4.0 cr.; A-F or Audit; prereq 5075; spring, every year) 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 5165. Mathematical Logic I. (4.0 cr.; [MATH 4152]; prereq 2283 or 3283 or Phil 5201 or CSci course in theory of algorithms or #; fall, every year) Theory of computability: notion of algorithm, Turing machines, primitive recursive functions, recursive functions, Kleene normal form, recursion theorem. Propositional logic.


MATH 5285H. Honors: Fundamental Structures of Algebra I. (4.0 cr.; prereq [2243 or 2373 or 2573]; [2283 or 2574 or 3283]; fall, every year) 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. (4.0 cr.; prereq 5285; fall, spring, every year) Ring/module theory, including ideals, quotients, 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. (4.0 cr.; prereq [2243 or 2373 or 2573], [2283 or & 2374 or & 2574]; fall, every year) 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.

MATH 5336. Geometry II. (4.0 cr.; prereq 5335; spring, every year) Projective geometry, including: relation to Euclidean geometry, finite geometries, fundamental theorem of projective geometry. N-dimensional Euclidean geometry from a vector viewpoint. Emphasizes N=3, including: polyhedra, spheres, isometries.

MATH 5345H. Honors: Introduction to Topology. (4.0 cr.; A-F only; prereq [2263 or 2374 or 2573], [2283 or & 2574 or & 3283]; fall, every year) Rigorous introduction to general topology. Set theory, Euclidean/metric spaces, compactness/connectedness. May include Urysohn metrization, Tychonoff theorem or fundamental group/covering spaces.

MATH 5378. Differential Geometry. (4.0 cr.; prereq [2263 or 2374 or 2573], [2243 or 2373 or 2574]; [2283 or 3283] recommended; spring, every year)
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. (4.0 cr.; prereq 2263 or 2373 or 2573; [2243 or 2373 or 2574]; fall, every year)

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. (4.0 cr.; prereq Linear algebra, differential equations; spring, every year)


MATH 5447. Theoretical Neuroscience . (4.0 cr.; prereq 2243 or 2373 or 2574; fall, every year)


MATH 5467. Introduction to the Mathematics of Image and Data Analysis. (4.0 cr.; prereq [2243 or 2373 or 2573], [2283 or 2574 or 3283 or #]; [2263 or 2374], 4567 recommended; spring, every year)


MATH 5485. Introduction to Numerical Methods I. (4.0 cr.; prereq [2243 or 2373 or 2573], familiarity with some programming language; fall, every year)


MATH 5486. Introduction To Numerical Methods II. (4.0 cr.; prereq 5485; spring, every year)


MATH 5490. Topics in Applied Mathematics. (4.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)

Topics vary by instructor. See class schedule.

MATH 5525. Introduction to Ordinary Differential Equations. (4.0 cr.; prereq [2243 or 2373 or 2573], [2283 or 2574 or 3283]; fall, spring, offered periodically)


MATH 5535. Dynamical Systems and Chaos. (4.0 cr.; prereq [2243 or 2373 or 2573], [2263 or 2374 or 2574]; fall, spring, every year)

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. (4.0 cr.; prereq 2 sems soph math [including [2263 or 2374 or 2573], [2283 or 3283] recommended; fall, spring, summer, every year)


MATH 5587. Elementary Partial Differential Equations I. (4.0 cr.; prereq [2243 or 2373 or 2573], [2263 or 2374 or 2574]; fall, every year)

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, electrostatics, shocks.

MATH 5588. Elementary Partial Differential Equations II. (4.0 cr.; A-F or Audit; prereq [[2243 or 2373 or 2573], [2263 or 2374 or 2574], 5587] or #; spring, every year)


MATH 5594H. Honors Mathematics - Topics. (4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq [5393H with grade of at least B, experience in writing proofs] or %; intended for mathematically-talented students with proven achievement in theoretical mathematics courses; fall, offered periodically)

Topics vary depending on interests of instructor. Theoretical treatment of chosen topic.

MATH 5615H. Honors: Introduction to Analysis I. (4.0 cr.; prereq [[2243 or 2373], [2263 or 2374], [2283 or 3283]] or 2574; fall, every year)


MATH 5616H. Honors: Introduction to Analysis II. (4.0 cr.; prereq 5615; spring, every year)


MATH 5651. Basic Theory of Probability and Statistics. (4.0 cr.; 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; fall, spring, every year)

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. (4.0 cr.; prereq 5651 or Stat 5101; fall, spring, every year)

Random walks, Markov chains, branching processes, martingales, queueing theory, Brownian motion.

MATH 5654. Prediction and Filtering. (4.0 cr.; prereq 5651 or Stat 5101; spring, every year)


MATH 5705. Enumerative Combinatorics. (4.0 cr.; prereq [2243 or 2373 or 2573], [2263 or 2374 or 2574 or 3283]; fall, spring, every year)

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. (4.0 cr.; prereq [2243 or 2373 or 2573], [2263 or 2374 or 3283]; spring, every year)

Basic topics in graph theory: connectedness, Eulerian/Hamiltonian properties, trees, colorings, planar graphs, matchings, flows in networks. Optional topics include graph algorithms, Latin squares, block designs, Ramsey theory.

MATH 5711. Linear Programming and Combinatorial Optimization. (4.0 cr.; prereq 2 sems soph math [including 2243 or 2373 or 2573]; fall, spring, every year)

Simplex method, connections to geometry, duality theory, sensitivity analysis. Applications to cutting stock, allocation of resources.

**MATH 5900. Tutorial in Advanced Mathematics.** (1.0-6.0 cr. [max 120.0 cr.]; A-F or Audit; fall, spring, summer, every year) Individually directed study.

**MATH 5990. Topics in Mathematics.** (4.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Topics vary by instructor. See class schedule.

**MATH 8001. Preparation for College Teaching.** (1.0 cr.; S-N or Audit; prereq I math grad student in good standing or #; fall, spring, every year) New approaches to teaching/learning, issues in mathematics education, components/expectations of a college mathematics professor.

**MATH 8141. Applied Logic.** (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Applying 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.** (3.0 cr.; A-F or Audit; spring, offered periodically) 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.** (3.0 cr.; A-F or Audit; 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.** (3.0 cr.; A-F or Audit; 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.** (3.0 cr.; A-F or Audit; prereq Math grad student or #) Analysis of concept of computability, including various equivalent definitions. Primitive recursive, recursive, partial recursive functions. Oracle Turing machines. Kleene Normal Form Theorem. Recursive, recursively enumerable sets. Degrees of unsolvability. Arithmetic hierarchy.

**MATH 8167. Recursion Theory.** (3.0 cr.; A-F or Audit; prereq 8166; spring, offered periodically) Sample topics: complexity theory, recursive analysis, generalized recursion theory, analytical hierarchy, constructive ordinals.

**MATH 8172. Model Theory.** (3.0 cr.; A-F or Audit; 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.** (3.0 cr.; A-F or Audit; prereq 8172 or #) Types of elements. Prime models, homogeneity, saturation, categoricity in power. Forking.

**MATH 8190. Topics in Logic.** (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, offered periodically) Offered for one year or one semester as circumstances warrant.

**MATH 8201. General Algebra.** (3.0 cr.; A-F or Audit; prereq 4xxx algebra or equiv or #; fall, every year) Groups through Sylow, Jordan-Hölder theorems, structure of finitely generated Abelian groups. Rings and algebras, including Gaussian theory of factorization. Modules, including projective and injective modules, chain conditions, Hilbert basis theorem, and structure of modules over principal ideal domains.

**MATH 8202. General Algebra.** (3.0 cr.; A-F or Audit; prereq 8201 or #; spring, every year) 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.** (3.0 cr.; A-F or Audit; prereq 8201 or #; fall, every year) Zeta and L-functions, global fields. Artin L-functions. Hasse-Weil L-functions. Tchebotarev density. Local and global class field theory. Reciprocity laws. finer theory of cyclotomic fields.

**MATH 8212. Commutative and Homological Algebra.** (3.0 cr.; A-F or Audit; prereq 8202 or #; spring, offered periodically) 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 8251. Algebraic Number Theory.** (3.0 cr.; A-F or Audit; prereq 8202 or #; fall, offered periodically) Algebras, graded rings, graded modules, simplicial complexes, polytopes, convex polytopes, triangulated spaces. Sheaves, rings, graded rings, and modules.


**MATH 8253. Algebraic Geometry.** (3.0 cr.; A-F or Audit; prereq 8253 or #; spring, offered periodically) Curves, surfaces, projective space, affine and projective varieties. Rational maps. blowing-up points. Zariski topology. Irreducible varieties, divisors.

**MATH 8254. Algebraic Geometry.** (3.0 cr.; A-F or Audit; prereq 8253 or #; spring, offered periodically) Sheaves, rings, graded rings, and modules. Morphisms. Derived functors and cohomology, Serre duality, Riemann-Roch theorem for curves, Hurwitz’s theorem. Surfaces: monoidal transformations, birational transformations.

**MATH 8270. Topics in Algebraic Geometry.** (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Math 8201, Math 8202; offered for one year or one semester as circumstances warrant; fall, spring, every year)

**MATH 8271. Lie Groups and Lie Algebras.** (3.0 cr.; A-F or Audit; prereq 8302 or #; fall, offered periodically) 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 algebras and simply connected Lie groups; Baker-Campbell-Hausdorff formula; homogeneous spaces.

**MATH 8272. Lie Groups and Lie Algebras.** (3.0 cr.; A-F or Audit; prereq 8271 or #; spring, offered periodically) 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.** (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; offered for one year or one semester as circumstances warrant; )
MATH 8300. Topics in Algebra. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad math major or #; offered as one yr or one sem crse as circumstances warrant; fall, spring, every year) Selected topics.

MATH 8301. Manifolds and Topology. (3.0 cr.; A-F or Audit; prereq [Some point-set topology, algebra] or #; fall, every year) Classification of compact surfaces, fundamental group/covering spaces. Homology group, basic cohomology. Application to degree of a map, invariance of domain/dimension.


MATH 8306. Algebraic Topology. (3.0 cr.; A-F or Audit; prereq 8301 or #) Singular homology, cohomology theory with coefficients. Eilenberg-Steenrod axioms, Mayer-Vietoris theorem.

MATH 8307. Algebraic Topology. (3.0 cr.; A-F or Audit; 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. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

MATH 8380. Topics in Topology. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8301 or #; offered as one yr or one sem crse as circumstances warrant; fall, spring, offered periodically) Selected topics.

MATH 8365. Riemannian Geometry. (3.0 cr.; A-F or Audit; prereq 8301 or basic point-set topology or #; fall, every year) Riemannian metrics, curvature. Bianchi identities, Gauss-Bonnet theorem, Meyers’s theorem, Cartan-Hadamard theorem.

MATH 8366. Riemannian Geometry. (3.0 cr.; A-F or Audit; prereq 8365 or #; spring, every year) Gauss, Codazzi equations. Tensor calculus, Hodge theory, spinors, global differential geometry, applications.

MATH 8370. Topics in Differential Geometry. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8301 or 8365; offered for one yr or one sem as circumstances warrant; fall, spring, every year) Current research in Differential Geometry.

MATH 8380. Topics in Advanced Geometry. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8301, 8365; fall, spring, offered periodically) Current research.


MATH 8386. Calculus of Variations and Minimal Surfaces. (3.0 cr.; A-F or Audit; 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. (3.0 cr.; A-F or Audit; prereq [5xxx numerical analysis, some computer experience] or #; fall, every year) Mathematical models from physical, biological, social systems. Emphasizes industrial applications. Modeling of deterministic/probabilistic, discrete/continuous processes; methods for analysis/computation.

MATH 8388. Mathematical Modeling of Industrial Problems. (3.0 cr.; A-F or Audit; prereq 8597 or #) Techniques for analysis of mathematical models. Asymptotic methods; design of simulation and visualization techniques. Specific computation for models arising in industrial problems.

MATH 8390. Topics in Mathematical Physics. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8601; offered for one yr or one sem as circumstances warrant;) Current research.

MATH 8401. Mathematical Modeling and Methods of Applied Mathematics. (3.0 cr.; A-F or Audit; prereq 4xxx numerical analysis and applied linear algebra or #; fall, every year) Dimension analysis, similarity solutions, linearization, stability theory, well-posedness, and characterization of type. Fourier series and integrals, wavelets, Green's functions, weak solutions and distributions.


MATH 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

MATH 8445. Numerical Analysis of Differential Equations. (3.0 cr.; A-F or Audit; prereq 4xxx numerical analysis, 4xxx partial differential equations or #; fall, every year) 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. (3.0 cr.; A-F or Audit; prereq 8445 or #; spring, every year) 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. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad math major or #; offered as one yr or one sem crse as circumstances warrant; fall, spring, every year) Selected topics.

MATH 8470. Topics in Mathematical Theory of Continuum Mechanics. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, offered periodically) Offered for one year or one semester as circumstances warrant.

MATH 8501. Differential Equations and Dynamical Systems I. (3.0 cr.; A-F or Audit; prereq 4xxx ODE or #; fall, every year) 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 8502. Differential Equations and Dynamical Systems II. (3.0 cr.; A-F or Audit; prereq 8501 or #; spring, every year) Stable, unstable, and center manifolds. Normal hyperbolicity. Nonautonomous dynamics and


MATH 8505. Applied Dynamical Systems and Bifurcation Theory I. (3.0 cr.; A-F or Audit; 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/applications from biology, chemistry, engineering, physics.

MATH 8506. Applied Dynamical Systems and Bifurcation Theory II. (3.0 cr.; A-F or Audit; prereq 5587 or #; fall, offered periodically) 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. (1.0-3.0 cr.; max 12.0 cr.; A-F or Audit; prereq 8502; fall, spring, offered periodically) Current research.

MATH 8530. Topics in Ordinary Differential Equations. (1.0-3.0 cr.; A-F or Audit; prereq 8502; fall, spring, offered periodically) Offered for one year or one semester as circumstances warrant.

MATH 8540. Topics in Mathematical Biology. (1.0-3.0 cr.; max 12.0 cr.; A-F or Audit; fall, spring, every year) Offered for one year or one semester as circumstances warrant.

MATH 8571. Theory of Evolutionary Equations. (3.0 cr.; A-F or Audit; prereq 8502 or #; fall, every year) Infinite dimensional dynamical systems, global attractors, existence and robustness. Linear semigroups, analytic semigroups. Linear and nonlinear reaction diffusion equations, strong and weak solutions, well-posedness of solutions.

MATH 8572. Theory of Evolutionary Equations. (3.0 cr.; A-F or Audit; prereq 8571 or #; spring, offered periodically) Dynamics of Navier-Stokes equations, strong/weak solutions, global attractors. Chemically reacting fluid flows. Dynamics in infinite dimensions, unstable manifolds, center manifolds perturbation theory. Inertial manifolds, finite dimensional structures. Dynamical theories of turbulence.

MATH 8580. Topics in Evolutionary Equations. (1.0-3.0 cr.; max 12.0 cr.; A-F or Audit; prereq 8572 or #; offered for one yr or one semester as circumstances warrant)


MATH 8582. Applications of Linear Operator Theory. (3.0 cr.; A-F or Audit; prereq 8581 or #) Fourier theory. Self-adjoint, compact, unbounded linear operators. Spectral analysis, eigenvalue-eigenvector problem, spectral theorem, operational calculus.


MATH 8584. Theory of Partial Differential Equations. (3.0 cr.; A-F or Audit; prereq 8583 or #; spring, every year) Fundamental solutions/distributions, Sobolev spaces, regularity. Advanced elliptic theory (Schauder estimates, Garding's inequality). Hyperbolic systems.

MATH 8590. Topics in Partial Differential Equations. (1.0-3.0 cr.; A-F or Audit; prereq 8602; offered for one yr or one sem as circumstances warrant; fall, spring, every year) Research topics.

MATH 8600. Topics in Advanced Applied Mathematics. (1.0-3.0 cr.; max 12.0 cr.; fall, every year) Offered for one yr or one semester as circumstances warrant. Topics vary. For details, contact instructor.

MATH 8601. Real Analysis. (3.0 cr.; A-F or Audit; prereq 5616 or #; fall, every year) Set theory/fundamentals. Axiom of choice, measures, measure spaces, Borel/Lebesgue measure, integration, fundamental convergence theorems, Riesz representation.


MATH 8640. Topics in Real Analysis. (3.0 cr.; max 12.0 cr.; A-F or Audit; prereq 8602 or #; offered for one yr or one sem as circumstances warrant) Offered for one yr or one semester as circumstances warrant.


MATH 8652. Theory of Probability Including Measure Theory. (3.0 cr.; prereq 8651 or #; spring, every year) 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 other stochastic sequences.


MATH 8655. Stochastic Calculus with Applications. (3.0 cr.; prereq 8654 or 8659 or #; fall, every year) Stochastic integration with respect to martingales, Ito's formula, applications to business models, filtering, and stochastic control theory.

MATH 8659. Stochastic Processes. (3.0 cr.; prereq 8652 or #; fall, every year) 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, diffusions, and stochastic integrals.

MATH 8660. Topics in Probability. (1.0-3.0 cr.; max 12.0 cr.; fall, spring, every year) Offered for one year or one semester as circumstances warrant.

MATH 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; max 12.0 cr.; No Grade Associated; 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; fall, spring, summer, every year) TBD

MATH 8668. Combinatorial Theory. (3.0 cr.; A-F or Audit; fall, offered periodically)
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. (3.0 cr.; A-F or Audit; prereq 8668 or #; spring, odd years)
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. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad math major or #; offered as one yr or one sem crse as circumstances warrant; fall, spring, every year)
Selected topics.

MATH 8701. Complex Analysis. (3.0 cr.; A-F or Audit; prereq 8616 or #; fall, every year)

MATH 8702. Complex Analysis. (3.0 cr.; A-F or Audit; prereq 8701 or #; spring, every year)

MATH 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

MATH 8790. Topics in Complex Analysis. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8702 or #; offered for one yr or one sem as circumstances warrant; ) Current research.

MATH 8801. Functional Analysis. (3.0 cr.; A-F or Audit; prereq 8802 or #; fall, every year)
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. (3.0 cr.; A-F or Audit; prereq 8801 or #; spring, offered periodically)
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. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year)
(No description)

MATH 8990. Topics in Mathematics. (1.0-6.0 cr. [max 24.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Readings, research.

MATH 8991. Independent Study. (1.0-6.0 cr. [max 24.0 cr.]; S-N or Audit; prereq #; fall, spring, summer, every year)
Individually directed study.

MATH 8992. Directed Reading. (1.0-6.0 cr. [max 24.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Individually directed reading.

MATH 8993. Directed Study. (1.0-6.0 cr. [max 24.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Individually directed study.

MATH 8994. Topics at the IMA. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, every year)
Current research at IMA.

Mathematics Education (MTHE) College of Education and Human Development

MTHE 5011. Arithmetic Structures in School Mathematics. (3.0 cr.; prereq Enrollment in math initial licensure program or tchg exper; summer, every year)
Pedagogy, content, and instructional strategies for teaching arithmetic. Content and issues relevant to the K-8 mathematics curriculum. Instructional materials and technology appropriate for elementary or middle school arithmetic. Credit hours and targeted level vary with particular classes.

MTHE 5021. Algebraic Structures in School Mathematics. (3.0 cr.; prereq Tchg exper or isnr consent; fall, every year)
Pedagogy, content, and instructional strategies for teaching arithmetic. Content and issues relevant to the algebra curriculum. Instructional materials and technology appropriate for arithmetic. Each offering of the course will focus on either elementary/middle school mathematics. Credit hours and targeted level vary with particular classes.

MTHE 5031. Geometric Structures in School Mathematics. (3.0 cr.; prereq Enrollment in math initial licensure program; spring, every year)
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 school/ secondary grade levels.

MTHE 5050. Projects in Mathematics. (3.0 cr.; 5051 or higher)
Current developments in the psychology and pedagogy of mathematics education as related to the evolving nature of mathematics education objectives. Emerging use of technology in the mathematics classroom. Techniques for the development of supervisory abilities. Characteristics of effective staff development.

MTHE 5170. Historical Topics in the Mathematics Classroom. (1.0-3.0 cr.; ) 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. (3.0 cr.; spring, summer, offered periodically)
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. (3.0 cr.; fall, odd years)
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.

MTHE 5305. Middle School Mathematics Methods. (2.0 cr.; A-F only; prereq Elem ed licensure student; fall, every year)
The unique needs of middle school students in the mathematics classroom. Mathematics content and pedagogical skills. Adolescent development/psychology. Field placement in a middle school mathematics classroom.

MTHE 5314. Teaching and Learning Mathematics. (3.0 cr.; prereq Math Ed or MEd or CI MEd or grad student or #; fall, every year)
Methods, materials, and curriculum development. Principles of learning. Review of research. Preparation/evaluation of tests, units, and materials of instruction. Recent developments in mathematics curriculum and

MTHE 5355. Mathematics for Diverse Learners. (3.0 cr.; prereq Teaching license or student in elem ed or special ed or #; fall, spring, every year) 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. (3.0 cr.; spring, every year) 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 5698. Student Teaching in Mathematics. (1.0-8.0 cr; S-N only; prereq Med or Med student or #; spring, every year) Student teaching in secondary school mathematics classes.

MTHE 5993. Directed Studies in Mathematics Education. (2.0 cr.; S-N or Audit; prereq Math ed Med student; #; fall, spring, summer, every year) Secondary school classroom teaching project to improve specific teaching skills, planned by student, approved/directed by student's adviser.

MTHE 5951. School Mathematics Curricula - 1850 to Present. (1.0-3.0 cr; A-F only; fall, every year) Historical antecedents of present day school mathematics curricula. Examine primary source materials by reviewing early mathematics texts from curriculum library.

MTHE 6071. Research in Mathematics Education. (3.0 cr.; prereq 5313, 8501; ) Designed for advanced graduate students in mathematics education. Presentation and discussion of Ph.D. thesis proposals and other contemporary research.

MTHE 6091. Seminar: Mathematics Education. (1.0-3.0 cr.; prereq Math educ PhD student; fall, every year) Problems of mathematics instruction from kindergarten through junior college; opportunity to develop proposals and design models for empirical research.

MTHE 6895. Problems: Mathematics Education. (1.0-6.0 cr. [max 12.0 cr.; prereq MA or PhD educ major with math educ concentration; fall, spring, summer, every year) Students survey most recent literature and design and prepare research reports on special topics.

**Mechanical Engineering (ME)**

**College of Science and Engineering**

**ME 5070. Topics in Mechanical Engineering.** (1.0-4.0 cr. [max 8.0 cr.; prereq CSE upper div or grad student; fall, spring, every year) Specialized topics within areas of mechanical engineering. Emphasis on topics of current interest. Topics vary each semester.

**ME 5101. Vapor Cycle Systems.** (4.0 cr.; A-F or Audit; prereq CSE upper div or grad student; summer, offered periodically) Vapor compression and absorption refrigeration systems; heat pumps; vapor power cycle analysis, regeneration, heat, compound cycle modifications, combines gas turbine–vapor cycle systems.

**ME 5103. Thermal Environmental Engineering.** (4.0 cr.; A-F or Audit; prereq 3331 or 3332, 3333, CSE upper div or grad; fall, every year) 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.** (4.0 cr.; A-F or Audit; prereq 5103, [CSE upper div or grad student]; spring, offered periodically) 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.** (4.0 cr.; A-F or Audit; prereq CSE upper div or grad student; fall, every year) 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 5116. Cleanroom Technology and Particle Monitoring.** (4.0 cr.; A-F or Audit; prereq CSE upper div or grad student; summer, offered periodically) 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 5133. Aerosol Measurement Laboratory.** (4.0 cr.; A-F or Audit; prereq CSE upper div or grad student; spring, offered periodically) Principles of aerosol measurement. Single particle analysis by optical and electron microscopy. Aerosol samplers and inertial collectors. Integral mass concentration and number concentration detectors. Size distribution by laser particle counter and differential mobility particle sizer. Aerosol generation and instrument calibration.

**ME 5221. Computer-Assisted Product Realization.** (4.0 cr.; A-F or Audit; prereq 3221, AEM 3031, CSci 1113, MatS 2001; fall, spring, every year) Injection molding with emphasis on design of manufacturing processes. Tooling design and specification of processing conditions using computer-based tools; process simulation software and computer-controlled machine tools. Simultaneous process and part design. Production of tooling and parts. Part evaluation.

**ME 5223. Materials in Design.** (4.0 cr.; prereq 3221, ME upper division or grad student; fall, every year) Fundamental properties of engineering materials. Fabrication, treatment. Physical/corrosive properties. Failure mechanism, cost/value analysis as related to material selection/specification.

**ME 5228. Introduction to Finite Element Modeling, Analysis, and Design.** (4.0 cr.; A-F or Audit; prereq CSE upper div or grad, 3221, AEM 3031, CSci 1113, MatS 2001; fall, every year) 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.** (4.0 cr.; A-F or Audit; prereq 3222, CSci 1113 or equiv, CSE upper div or grad; fall, spring, every year) 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.** (4.0 cr.; A-F or Audit; prereq CSE upper div or grad, 3222 or equiv, basic kinematics and dynamics of machines; knowledge of CAD packages such as Pro-E recommended; summer, offered periodically) Analytical methods of kinematic, dynamic, and kinetoeleodynamic analysis and synthesis of mechanisms. Computerized design for function, path, and motion generation based on Burmeister theory.


**ME 5248. Vibration Engineering.** (4.0 cr.; prereq CSE upper div or grad, 3281; summer, offered periodically) 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 5281. Analog and Digital Control.** (4.0 cr.; prereq 3281; spring, every year) Continuous and discrete time feedback control systems. Frequency response, stability, poles and zeros; transient responses; Nyquist and Bode diagrams; root locus; lead-lag and PID compensators, Nichols-Ziegler design method.
ME 5286. Robotics. (4.0 cr.; A-F or Audit; prereq [3281 or equiv], [upper div ME or AEM or CSci or grad student]; spring, every year) Manipulator forward/inverse kinematics, homogeneous transformations, coordinate frames, Jacobian/velocity control, task primitives/programming, computational issues. Determining path trajectories. Reaction forces, manipulator dynamics/control. Vehicle kinematics, dynamics, and guidance. Lab project demonstrates concepts.


ME 5351. Computational Heat Transfer. (4.0 cr.; A-F or Audit; prereq 3333, CSE upper div or grad student; fall, spring, every year) Numerical solution of heat conduction/analogueous physical processes. Develop/use computer program to solve complex problems involving steady/unsteady heat conduction, flow/heat transfer in ducts, flow in porous media.

ME 5446. Introduction to Combustion. (4.0 cr.; A-F or Audit; prereq 3331, 3332, 3333, CSE upper div or grad student; fall, every year) Thermodynamics, kinetics, energy and mass transport, pollutants in reacting systems. Reactors, laminar and turbulent flames. Ignition, quenching, and flame stability. Diffusion flames. Combustion in reciprocating engines, furnaces, and turbines, with emphasis on internal combustion engine performance and emissions.

ME 5461. Internal Combustion Engines. (4.0 cr.; A-F or Audit; prereq CSE upper div or grad student, C or better in [3332, 3333] or 3324; spring, every year) 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/complementary labs.

ME 5462. Gas Turbines. (4.0 cr.; A-F or Audit; prereq 3331, 3332, 3333, CSE upper div or grad student; fall, spring, offered periodically) Gas turbine cycles, regeneration, recuperation, reheat, intercooling, combined cycle plants, and thermochemical regeneration. Axial and radial flow compressors and turbines; combustor designs, energy analysis, emissions, and noise. Turbjet, fanjet, turboprop engine performance. Stationary power plants, vehicular propulsion, hybrid vehicles.

ME 5465. Energy-Resources, Technology and Society. (4.0 cr.; A-F or Audit; prereq 3333, [CSE upper division or grad]; fall, spring, ) Scientific/technological underpinnings described/analyzed for 21st Century. Energy systems analysis, energy conversion technologies, availability analysis, renewable/non-renewable resources, environmental impacts, societal impacts of energy use patterns/energy policies.

ME 5566. Modern Thermodynamics. (4.0 cr.; A-F only; prereq 3331 or equiv; fall, spring, every year) 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 are webcast.

ME 8001. Research Ethics and Professional Practice. (0.0 cr.; No Grade Associated; fall, spring, summer, every year) Intellectual property, data management, social responsibility, authorship, and plagiarism, conflict of interest, and reporting misconduct. Case studies. Recent newspaper articles.

ME 8113. Advanced Aerosol/Particle Engineering. (3.0 cr.; A-F or Audit; prereq CSE grad student or #; spring, offered periodically) 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. (4.0 cr.; A-F or Audit; [=ENTR 6041, BMEN 8401, ENTR 6087]; prereq CSE grad student, some design experience; fall, every year) 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. ME 8222 must be taken in sequence the same year.

ME 8222. New Product Design and Business Development II. (4.0 cr.; A-F or Audit; [=BMEN 8402]; prereq 8221; spring, every year) 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 8229. Finite Element Methods for Computational Mechanics: Transient/ Dynamic Problems. (4.0 cr.; A-F or Audit; prereq 5228 or equiv, 5341, AEM 3031, CSci 1113; spring, every year) Computational mechanics involving transient or dynamic situations; development and analysis of computational algorithms. Stability and accuracy of algorithms, convergence issues; linear/nonlinear situations. Implicit, explicit, mixed, and variable time discretization approaches; modal-based methods for engineering problems.

ME 8243. Topics in Design. (4.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, every year) Topics vary with each offering.

ME 8253. Computational Nanomechanics. (3.0 cr.; prereq CSE grad student; spring, every year) Fundamentals of mechanical properties in nanometer scale. Role of discrete structure and underlying atomic, 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 8254. Fundamentals of Microelectromechanical Systems (MEMS). (4.0 cr.; A-F only; spring, every year) Major classes, components, and applications of MEMS. Principles behind operation of MEMS devices/systems. Standard microfabrication techniques. Unique requirements, environments, and applications of MEMS. Students apply microfabrication techniques/applications to design/manufacture of a MEMS device or microsystem.
ME 8262. Topics in Modeling and Analysis of Manufacturing Processes. (4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 3221, AEM 3016; fall, spring, offered periodically) Advanced topics in Manufacturing. Analytical/numerical modeling of manufacturing processes. Use of computer-based modeling tools and computer controlled manufacturing machines. Comparison of predictions/measurements of process variables and part characteristics. Part production/testing. Processes, technologies, and topics vary with each offering.


ME 8285. Vehicle Dynamics and Control. (3.0 cr.; A-F or Audit; prereq 5281 or EE 5231 or equiv; fall, every year) Vehicle control systems, dynamic models used in their development. Cruise control, adaptive cruise control, ABS; automated lane keeping, automated highway systems; yaw stability control, active rollover prevention, engine control, active/semi-active suspensions.

ME 8287. Topics in Dynamics and Control. (2.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 5281; fall, every year) Topics vary with each offering.

ME 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)


ME 8341. Conduction. (3.0 cr.; A-F or Audit; prereq Undergrad class in heat transfer or #; fall, every year) 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. (3.0 cr.; A-F or Audit; prereq Grad level course on fundamentals of fluid mechanics that has a substantial component on viscous flows or #; spring, every year) 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. (3.0 cr.; prereq CSE grad student, upper-division transport/fluids course; [physics, biology] recommended; summer, offered periodically) Analytical/numerical tools to analyze heat/mass transfer phenomenon in cryobiological, hyperthermic, other biomedically relevant applications.

ME 8390. Advanced Topics in the Thermal Sciences. (1.0-2.0 cr. [max 12.0 cr.]; A-F or Audit, spring, every year) Topics vary according to instructor.

ME 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ME 8446. Advanced Combustion. (3.0 cr.; A-F or Audit; prereq Undergrad courses in thermodynamics, fluid mechanics, heat transfer, IT grad student; 5446 or 8641 highly recommended; ) Fundamental understanding of linkage between thermodynamics, chemical kinetics, and transport phenomena in combustion systems. Heat release rate, flame stability, and emissions. How these issues arise in furnaces, internal combustion engines, and rockets.

ME 8462. Turbomachinery. (3.0 cr.; A-F or Audit; prereq CSE grad student; 3321, 3322 or equiv or #; summer, offered periodically) 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. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

ME 8772. Advanced Transportation Technologies Seminar. (1.0 cr.; S-N or Audit; =CE 8213; fall, every year) 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. (1.0 cr.; S-N or Audit; prereq CSE grad student; fall, spring, every year) Recent developments.

ME 8774. Graduate Seminar. (1.0 cr.; S-N or Audit; prereq 8773; fall, spring, every year) Recent developments.

ME 8775. Technical Communication. (1.0 cr.; S-N or Audit; fall, offered periodically) 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. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total
required [Plan A only]; fall, spring, summer, every year)

(No description)

ME 8794. Mechanical Engineering Research. (1.0-4.0 cr.; S-N only; prereq #; fall, spring, summer, every year)

Directed research.

ME 8800. Modern Developments in Mechanical Engineering. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq CSE grad student; fall, spring, every year)

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. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

(No description)

ME 8951. Plan B. (3.0 cr.; S-N only; fall, spring, every year)

Structured framework for completing MS Plan B projects.

ME 8990. Curricular Practical Training. (1.0-2.0 cr. [max 6.0 cr.]; S-N only; fall, spring, summer, every year)

Industrial work assignment involving advanced mechanical engineering. Review/approval by faculty member and director of graduate studies. Final report covering work assignment.

Medical Device Innovation (MDI)

College of Science and Engineering

MDI 5002. Technology Foresight and Forecasting. (2.0 cr.; A-F only; prereq grad MDI major; fall, spring, summer, every year)

Tooths/techniques for technology forecasting, assessment, foresight for decision making in medical device industry. Topics include technology dynamics, research/development, portfolio management, resource allocation.

MDI 5004. Clinical Foundations of Medical Device Innovation. (3.0 cr.; A-F only; prereq MDI grad student; fall, spring, summer, every year)

Master essential topics to deepen knowledge of Clinical Environment in which products will be conceived, tested, used. Topics include surgical protocols, physician, surgeon, nursing, technical support functions. Medical terminology, anatomy/physiology, ethnology research, Healthcare Law, Medicare/Medicaid, HIPAA requirements.

MDI 5010. Product Innovation & Development Management. (3.0 cr.; A-F only; prereq Grad MDI student; fall, spring, summer, every year)


MDI 5012. Medical Industry Macro Environment. (3.0 cr.; A-F only; prereq MDI grad student; fall, spring, summer, every year)

Application of macro environmental analysis to medical device industry. Methods reviewed. Industry-relevant case studies/macro environmental analysis of firms of interest. Political, economic, social, technological, legal, ecological factors that impact medical innovation.

MDI 5013. Medical Device Center Practicum I. (2.0 cr.; A-F only; prereq Grad MDI student; fall, spring, summer, every year)

First of three part series of practicum courses for MDI program. Focus on teaching innovation steps/process using known/pre-assigned clinical needs as examples in collaboration with Medical Device Center. Essential steps in BioDesign process. Apply knowledge to specific real-world examples.

MDI 5014. Medical Device Center Practicum II. (2.0 cr.; A-F only; prereq Grad MDI student; fall, spring, summer, every year)

Second of three part series of practicum courses for MDI program. Clinical environment, including research tools/methods, filtering/ translating needs, ideation/prototype development, communication with functional managers, corporate executives/investors.

MDI 5050. Innovation Leadership and Human Dynamics. (2.0 cr.; A-F only; prereq Grad MDI student; fall, spring, summer, every year)

Develop confidence/capability to transition from technical experts to leaders of multidisciplinary innovation teams/projects. Explore mindset, skill set/tools needed to lead/manage oneself/project teams, lead change initiatives. Conflict management, effective communication, leveraging diverse strengths.

Medical Industry Leadership Institute (MILI)

Curtis L. Carlson School of Management

MILI 5589. Medical Technology Evaluation and Market Research. (2.0 cr.; A-F only; spring, every year)

Hands-on experience in creating a value proposition for new medical technologies. Leadership pathways in medical technology, insurance, and delivery industries. Personal input from industry leaders: United Health Group, Medtronic, and Mayo Clinic.

MILI 5990. The Healthcare Marketplace. (2.0 cr. [max 3.0 cr.]; A-F only; [MILI 6990]; fall, spring, every year)

Physician services, hospital services, insurance, long-term care, pharmaceuticals and medical devices, and information technology. Lectures, discussions, and presentations from healthcare business leaders.

MILI 5995. Medical Industry Valuation Laboratory. (2.0 cr.; A-F only; prereq #; fall, spring, summer, every year)

Interdisciplinary student teams create rapid production market analysis of promising medical technologies/services to determine potential for success in market. Exposure to University innovations, venture firms, inventors.

MILI 5999. Independent Study. (1.0-8.0 cr. [max 16.0 cr.]; A-F only; fall, spring, summer, every year)

Independent study.
mycobacteria, yeast from various body sites. Specimen processing, culture workup, conventional microscopy, molecular/immunological techniques.

**MLSP 5113. Advanced Concepts in Diagnostic Microbiology.** (3.0 cr.; A-F only; prereq 5111 or #; spring, every year) Physiologic/pathogenic interactions between man/microorganism. Epidemiology, prevention, recovery, conventional, immunological, molecular identification methods/treatment of microorganisms involved in human diseases.

**MLSP 5211. Fundamentals in Hematology & Hemositasis.** (3.0 cr.; A-F only; prereq PHSL 3051 or #; fall, every year) Anatomy/physiology of hematopoietic/coagulation systems. Basic blood cell morphology, common hematology/hemositasis tests. Clinical implications for health/disease.

**MLSP 5212. Application of Hematology & Hemositasis Principles.** (1.0 cr.; A-F only; prereq 5211 and admission to MLS program; fall, every year) Theory, performance, application of common hematologic/hemostatic diagnostic procedures. Interpretation/correlation of laboratory findings. Venipuncture, cell counting, white blood cell differential, red/white blood cell morphology interpretation, coagulation studies.

**MLSP 5213. Diagnostic Hematology.** (3.0 cr.; A-F only; prereq [5211, 5212] or #; spring, every year) Blood/bone marrow in assessment of hematologic function/disease. Major focus on normal development/differentiation, abnormal changes found in disease. Cytochemical stains, flow cytometry, cytogenetics, molecular diagnostics.

**MLSP 5214. Advanced Hematology Morphology.** (1.0 cr.; A-F only; prereq [5211, 5212, &5213] or #; spring, every year) Blood/bone marrow in assessment of hematologic function/presence of disease. Major focus on normal development/differentiation, abnormal changes in pathologic conditions. Cytochemical stains, flow cytometry, cytogenetics, molecular diagnostics.

**MLSP 5311. Fundamental Biomedical Laboratory Techniques.** (4.0 cr.; A-F only; prereq 8 credits General Chemistry, 6 credits Organic Chemistry, 3 credits Biochemistry; spring, summer, every year) Principles of good laboratory practice, experimental design/standard operating procedures, laboratory technical skills, safety, process control. Analytical techniques include colorimetry, chromatography, electrochemical, immunologic, nucleic acid techniques.

**MLSP 5312. Body Fluid Analysis.** (2.0 cr.; A-F only; prereq 8 credits General Chemistry, 6 credits Organic Chemistry, 3 credits Biochemistry; successful completion of 5311 with grade of C or higher; fall, every year) Formulas/assists in body fluids, changes that occur in disease, testing used for diagnosis/treatment. Correlation of test results with clinical information discussed. Laboratory skills in body fluid analysis introduced.

**MLSP 5313. Chemical Analysis in Health and Disease.** (3.0 cr.; A-F only; prereq 8 credits General Chemistry, 6 credits Organic Chemistry, 3 credits Biochemistry; spring, every year) Pathophysiology of organ systems/metabolic disorders. Liver, heart, kidney, lungs, diabetes. Health/disease states evaluated in context of clinical chemistry.

**MLSP 5511. Principles of Immunobiology.** (3.0 cr.; A-F only; prereq PHSL 3051 or #; fall, every year) Immune system function, immunologic/serologic testing. Immunologic techniques utilized in various clinical laboratory settings.

**MLSP 5513. Transfusion Medicine Principles and Methods.** (3.0 cr.; A-F only; prereq [5511, upper level genetics course]; spring, every year) Didactic material covering genetics, detection, significance of human blood group antigens/antibodies. Donor/compatibility testing. Component therapy, transfusion reactions. Hemolytic disease of fetus/newborn. Immune hemolytic anemias. Quality systems. Alternate technologies.


**MLSP 5701. Clinical Experience in Microbiology.** (2.0 cr.; S-N only; prereq Advanced standing in MLS program; fall, spring, summer, every year) Gain practical experience, apply technical competencies learned on campus to microbiology laboratory. Develop entry-level competencies/assist students in making transition to clinical practitioner. Guided by clinical preceptors/university faculty.

**MLSP 5702. Clinical Experience in Hematology and Hemositasis.** (2.0 cr.; S-N only; prereq Advanced standing in MLS program; fall, spring, summer, every year) Gain practical experience/apply technical competencies learned on campus to Hematology laboratory. Designed to develop entry-level competencies/assist students in making transition to clinical practitioner. Course guided by clinical preceptors/university faculty.

**MLSP 5703. Clinical Experience in Clinical Chemistry and Urinalysis.** (2.0 cr.; S-N only; prereq Advanced standing in MLS program; fall, spring, summer, every year) Gain practical experience/apply technical competencies learned on campus to Chemistry laboratory. Designed to develop entry-level competencies/assist student in making transition to clinical practitioner. Course guided by clinical preceptors/university faculty.

**MLSP 5704. Clinical Experience in Transfusion Medicine.** (2.0 cr.; S-N only; prereq Advanced standing in MLS program; fall, spring, summer, every year) Gain practical experience/apply technical competencies learned on campus to Transfusion Medicine lab. Designed to develop entry-level competencies/assist in making transition to clinical practitioner. Course guided by clinical preceptors/university faculty.

**MLSP 5801. Advanced Practicum Experience in Specialty Disciplines.** (1.0 cr.; S-N only; prereq Advanced standing in MLS program; fall, spring, summer, every year) Advanced practicum experience. Restricted enrollment. Students can select variety of specialty sub-disciplines of MLS including cytogenetics, flow cytometry, molecular diagnostics, toxicology, virology, education, management, research, public health, bone marrow tissue transplantation.

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**Medical Physics (MPHY) Medical School**

**MPHY 5138. Research Seminar.** (1.0-5.0 cr.; S-N or Audit; fall, every year) Topics introduce techniques/goals of biophysical sciences and medical physics. Lectures/demonstrations.

**MPHY 5139. Seminar and Journal Club.** (1.0 cr. [max 2.0 cr.]; S-N or Audit; spring, every year) Current research/topics related to goals/methods of biophysical sciences and medical physics. Lectures/discussions.

**MPHY 5170. Basic Radiological Physics.** (3.0 cr.; TRAD 7170; prereq #; fall, every year) Theoretical/experimental aspects of radiological physics. Physical properties of various ionizing radiations, interactions of ionizing radiations with matter, methods of radiation dose measurement.

**MPHY 5171. Medical and Health Physics of Imaging I.** (3.0 cr.; TRAD 7171; prereq 5170 or #; fall, every year) 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.

**MPHY 5172. Radiation Biology.** (3.0 cr.; TRAD 7172; prereq 5170 or #; fall, spring, every year) Effects of ionizing radiation on cells, tissues, and organisms. Biochemical/physiological bases of radiation effects. Biological rationale for radiation therapy practices.

**MPHY 5173. Medical and Health Physics of Radiation Therapy.** (3.0 cr.; TRAD 7173; prereq 5170 or #; spring, every year) Measurements of radiation quality, output, and depth dose distributions for clinical use. Treatment parameter calculation. Beam modification and shaping. Treatment planning for fixed field and rotational therapy in external beam, intracavitary, and interstitial therapy.

**MPHY 5174. Medical and Health Physics of Imaging II.** (3.0 cr.; preq: TRAD 7174; spring, every year)

**MPHY 5177. Radiation Therapy Physics Lab: Radiation Physics Basics.** (3.0 cr.; preq: 5170 or 5173 or #; spring, every year)
This course provides students hands-on experience with Hardware/software used in radiation therapy clinic for physics measurements.

**MPHY 8147. Advanced Physics of Magnetic Resonance Imaging (MRI).** (3.0 cr.; preq: 5174 or #; spring, every year)
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.

**MPHY 8148. Advanced Digital Imaging Science.** (3.0 cr.; preq: 5171 or #; fall, spring, every year)

**MPHY 8149. Advanced Topics in Radiation Therapy Physics.** (2.0 cr.; A-F only; preq: [5170, 5173] or #: fall, every year)

**MPHY 8293. Directed Study in Biophysical Sciences and Medical Physics.** (1.0-12.0 cr.; preq #: fall, spring, summer, every year)
Individualized study under faculty direction.

**MPHY 8294. Directed Research in Biophysical Sciences and Medical Physics.** (1.0-12.0 cr.; preq #: fall, spring, summer, every year)
Individualized research under faculty direction.

**MPHY 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; preq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**MPHY 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; preq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**MPHY 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; preq 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; fall, spring, summer, every year)

**MPHY 8777. Thesis Credits: Master’s.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; preq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

**MPHY 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; preq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

### Medicinal Chemistry (MEDC)

#### College of Pharmacy

**MEDC 5185. Principles of Biomolecular Simulation.** (3.0 cr.; preq Chem 3502 or #: )
Molecular simulation for students in medicinal chemistry, pharmacuetics, biochemistry, and chemical physics

**MEDC 5202. Research and Development Process of Pharmaceutical Products.** (2.0 cr.; S-N or Audit. )
New drug development process in the U.S. pharmaceutical industry

**MEDC 5245. Introduction to Drug Design.** (3.0 cr.; A-F or Audit; [CHEM 5245, PHAR 6245]; preq Chem; fall, every year)
Concepts that govern design/discovery of drugs. Physical, bioorganic, medicinal chemical principles applied to explain rational design, mechanism of action drugs.

**MEDC 5494. Advanced Methods in Quantitative Drug Analysis.** (2.0 cr.; A-F or Audit; fall, spring, offered periodically)
Quantitative methods (HPLC, GC, TLC, immunoassays) for analysis of drugs/metabolites in biological fluids. Advanced techniques such as capillary electrophoresis, supercritical fluid chromatography, GC-MS, LC-MS, tandem mass spectrometry. Chromatographic theory/statistical approaches to method validation.

**MEDC 5495. Vistas in Medicinal Chemistry Research.** (1.0 cr.; S-N or Audit; fall, every year)
Selected topics of contemporary interest in medicinal chemistry

**MEDC 5700. General Principles of Medicinal Chemistry.** (2.0 cr.; A-F or Audit; preq MedC grad student or #: fall, spring, every year)
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.** (2.0 cr.; A-F or Audit; preq 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 8001. General Principles of Medicinal Chemistry.** (3.0 cr.; A-F or Audit; preq Med chem grad student or #: fall, every year)
Fundamental principles of molecular recognition, physicochemical properties of drugs, drug metabolism and disposition, interaction of molecules with DNA/RNA.

**MEDC 8002. General Principles of Medicinal Chemistry.** (3.0 cr.; A-F or Audit; preq Med chem grad student or #: spring, every year)
Fundamental principles of molecular recognition, physicochemical properties of drugs, drug metabolism and disposition, interaction of molecules with DNA/RNA.

**MEDC 8050. Physical and Mechanistic Organic Chemistry.** (2.0 cr.; S-N only; preq First-year Medicinal Chemistry grad students; fall, every year)
Recitation-based organic chemistry reaction mechanisms course. Actively solve organic chemistry reaction mechanisms/related organic/medicinal chemistry problems during course meeting times with faculty guidance.

**MEDC 8100. Medicinal Chemistry Seminar.** (1.0 cr.; [max 6.0 cr.]; preq Grad major or #: fall, spring, every year)
Current topics.

**MEDC 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; preq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**MEDC 8420. Natural Products Chemistry.** (3.0 cr.; A-F only; preq [CHEM 8321, biochemistry] or equiv or course director approval; spring, even years)
Biosynthesis of natural products with an emphasis on how these biochemical principles can be used in drug discovery and design through metabolic engineering and combinatorial biosynthesis. Natural product isolation, structure determination, target identification, and the role of synthetic organic chemistry.

**MEDC 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; preq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**MEDC 8471. High Throughput Drug Discovery.** (3.0 cr.; A-F only; preq Undergraduate [chemistry or biochemistry] or #: spring, odd years)
Combinatorial chemistry, multi-compound based technologies, their use in screening bioassays to discover lead compounds. Solidphase synthesis, designing compound libraries, pharmacological assay design, data interpretation, biological target selection, compound lead optimization.

**MEDC 8500. Design of Chemotherapeutic Agents.** (2.0 cr.; A-F or Audit; preq 5600 or #: fall, offered periodically)

Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu
Modern aspects of designing chemotherapeutic agents. Strategies for enzyme inhibition and metabolic blocks in development of anticancer, antimicrobial, and antiviral agents.

MEDC 8600. Chemical Aspects of Drug Metabolism and Bioactivation. (2.0 cr.; A-F or Audit; 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. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) tbd

MEDC 8700. Advanced Concepts in Drug Design. (2.0 cr.; A-F or Audit; [CHEM 8700, PHAR 6247F]; prereq 5600 or #; spring, offered periodically) Current approaches to rational design of drugs.

MEDC 8753. MOLECULAR TARGETS OF DRUG DISCOVERY. (3.0 cr.; A-F only; prereq 5710 or 8002 or CHEM 5412 or structural biochemistry or #; fall, every year) Structure of biological macromolecules that are targets of drugs. Techniques to accelerate directed drug discovery. Protein structure/interactions. Popular target classes. Computational tools for visualizing/analyzing protein-ligand and protein-protein interactions. Structural characterization at a level sufficient to underpin critical data evaluation. Biophysical techniques to assess weak ligand binding and suitable for fragment-based lead discovery.

MEDC 8760. Design of Peptidomimetics. (2.0 cr.; A-F or Audit; prereq 5600 or #; ) Current approaches to design and synthesis of mimetics of biologically active peptides. Structural and conformational rationale used in peptidomimetic design.

MEDC 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

MEDC 8800. Medicinal Chemistry Laboratory Techniques. (1.0-2.0 cr. [max 4.0 cr.]; S-N or Audit; prereq Grad chem major or #; fall, spring, every year) Experiential rotations in medicinal chemistry research laboratories.

MEDC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

MEDC 8900. Research in Medicinal Chemistry. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Grad med chem major or #; fall, spring, every year) Study and experimental investigation.

MEST 5610. Advanced Topics in Medieval Studies. (3.0-4.0 cr. [max 15.0 cr.]; prereq One yr work in some area of Middle Ages, reading knowledge of appropriate language, #; fall, spring, every year) From late antiquity through end of Middle Ages (circa 300-1500 A.D.). Topics specified in Class Schedule.

MEST 5993. Directed Studies in Medieval Studies. (1.0-3.0 cr. [max 6.0 cr.]; prereq One yr work in some area of Middle Ages, reading knowledge of appropriate language, #; fall, spring, every year) Directed study with one of the core faculty of medieval studies program.

MICE 8010. Medieval Studies Colloquium. (3.0 cr. [max 9.0 cr.]; fall, spring, every year) Lectures by and discussions with faculty and visiting speakers.

MICE 8011. Seminar in Medieval Studies. (3.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Appropriate languages, #; fall, spring, every year) Offered when feasible.

Microbial Engineering (MICE) College of Biological Sciences

MICE 8990. Biotechnology Seminar. (1.0 cr. [max 2.0 cr.]; prereq First-yr students enroll S-N, as they do not make a presentation; second-yr students enroll A-F, as they present a seminar; fall, spring, every year) Student presentations of thesis research and presentations by invited speakers.

Microbiology, Immunology, and Cancer Biology (MICA) Medical School

MICA 5000. Practicum: Teaching. (0.0 cr.; No Grade Associated; fall, spring, every year) Supervised experience in lab instruction. Use of instructional materials, tests/measurement.

MICA 8002. Structure, Function, and Genetics of Bacteria and Viruses. (4.0 cr.; A-F or Audit; prereq [One undergrad or grad course each in [microbiology, genetics, biochemistry] or #; fall, every year) Structure, function, and metabolism of microorganisms. Microbial genetics. Molecular virology.

MICA 8003. Immunity and Immunopathology. (4.0 cr.; prereq Upper level undergrad immunology course or #; fall, every year) 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. (1.0-4.0 cr.; A-F or Audit; prereq 8012, [8002 or 8003 or 8004] or #; fall, spring, every year) Colloquium format. Readings/discussion on specialized topic.

MICA 8006. Protein Sequence Analysis. (3.0 cr.; prereq Biochem course, knowledge of UNIX operating system recommended; fall, even years) DNA and protein sequence and protein structure databases; protein sequence analysis; methods for display of sequence comparison and prediction results; Genomics Computer Group (SCG) sequence analysis programs; and current literature and research problems.

MICA 8007. Cell Biology and Biochemistry of the Extracellular Matrix. (3.0 cr.; A-F or Audit; [BIOC 8007]; prereq 8002 or 8004 or #; fall, spring, every year) 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 8009. Biochemical Aspects of Normal and Abnormal Cell Growth and Cell Death. (2.0 cr.; prereq 8004 or [BioC 3021, Biol 4004] or #; spring, every year)
Aspects of mechanisms involved in growth control at level of nuclear function. Neoplasia in hormonal cancers (such as prostate cancer) and role of protein phosphorylation in normal and abnormal growth. Mechanisms of cell death via apoptosis and its implications in normal and abnormal proliferation.

MICA 8101. Microbial Pathogenesis. (3.0 cr.; A-F or Audit; prereq MICA grad student or instr; fall, even years)
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 8101. Current Topics in Immunology. (3.0 cr.; A-F or Audit; prereq MICA 8003 or #; spring, every year)
Colloquium format. In-depth reading, discussion

MICA 8102. Writing and Reviewing a Research Proposal. (2.0 cr.; A-F only; prereq First or second year MICA grad student; fall, every year)
Assist first/second year graduate students to prepare research proposals for funding.

MICA 8103. Translational Cancer Research. (2.0 cr.; A-F only; prereq BIOC 8004 or #; spring, every year)
Clinical issues in cancer research. Discuss translational research projects as they pertain to a variety of cancers.

MICA 8104. Small RNA Biology. (2.0 cr.; A-F or Audit; prereq BIOC 8002 or MICA 8004 or equiv or #; spring, every year)
Small RNAs as major regulators of gene/protein expression. MicroRNAs and their potential use in diagnosis/prognosis of various disease conditions, including cancers. Biology of small RNAs and their role in health and disease.

MICA 8094. Research in Microbiology, Immunology, and Cancer Biology. (1.0 cr.; [max 5.0 cr.]; S-N or Audit; prereq 1st year MICA grad student; fall, spring, summer, every year)
One-on-one research training from faculty adviser during laboratory rotation.

MICA 8320. Readings in Neurobiology. (1.0-4.0 cr.; fall, every year)
Topics in neurobiology and neurophysiology.

MICA 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

MICA 8371. Mucosal Immunobiology. (3.0 cr.; A-F or Audit; [BioC 8371, MBB 8371]; prereq 8001 or #; fall, odd years)
Host immune processes at body surfaces. Innate/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 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

MICA 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.;] No Grade Associated; 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; fall, spring, summer, every year)
tbd

MICA 8777. Thesis Credits: Master’s. (1.0-18.0 cr.; [max 50.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

MICA 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.;] No Grade Associated; prereq MICA PhD student, adviser consent; fall, spring, summer, every year)
Theis credit: doctoral.

MICA 8910. Seminar: Faculty Research Topics. (0.0 cr.; No Grade Associated; prereq MICA grad student; fall, spring, every year)
State-of-the-art information presented by scientific experts within/outside the University.

MICA 8920. Seminar: Student Research Topics. (0.0 cr.; No Grade Associated; prereq MICA grad student or #; fall, spring, every year)
Current thesis topics and other aspects of microbiology, immunology, and cancer biology.

Middle Eastern Languages and Cultures (MELC)
College of Liberal Arts

MELC 5601. Persian Fiction in Translation. (3.0 cr.; =[ALL 3836, MELC 3601, ALL 5836]; fall, offered periodically)
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 Hedayat (especially Blind Owl), Chubak, Ali Ahmad, Daneshvar, and Behangi are analyzed/interpreted.

Minnesota Studies in International Development Prog (MSID)
Academic Affairs, Senior Vice President

MSID 5001. International Development: Critical Perspectives on Theory and Practice. (3.0 cr.; [max 6.0 cr.;] A-F only; fall, spring, every year)
Study abroad course.

MSID 5002. MSID Country Analysis. (3.0 cr.; [max 6.0 cr.;] A-F only; fall, spring, every year)
Study abroad course.

MSID 5004. Case Studies in International Development. (3.0 cr.; [max 6.0 cr.;] A-F only; fall, spring, every year)
Study abroad course.

MSID 5005. Advanced International Development Internship. (3.0 cr.; [max 6.0 cr.;] A-F only; fall, spring, every year)
Study abroad course.

MSID 5006. Applied Field Methods. (3.0 cr.; [max 6.0 cr.;] A-F only; fall, spring, every year)
Study abroad course.

MSID 5007. MSID Directed Research. (3.0 cr.; [max 6.0 cr.;] A-F only; fall, spring, every year)
Study abroad course.

Molecular Cellular Developmental Biol and Genetics (MCDG)
College of Biological Sciences

MCDG 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

MCDG 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

MCDG 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.;] No Grade Associated; 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; fall, spring, summer, every year)
TBD

MCDG 8777. Thesis Credits: Master’s. (1.0-18.0 cr.; [max 50.0 cr.;] No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

MCDG 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.;] No Grade Associated; prereq Doctoral student; fall, spring, summer, every year)
(No description)

MCDG 8910. Journal Presentations. (0.0 cr.; No Grade Associated; prereq Graduate student or instr; fall, spring, summer, every year)
(No description)

MCDG 8920. Seminar: Student Research Topics. (0.0 cr.; No Grade Associated; prereq MCDG grad student or #; fall, spring, every year)
Current thesis topics and other aspects of microbiology, immunology, and cancer biology.

MCDG 8930. Thesis Credits: Master’s. (1.0-6.0 cr.; [max 12.0 cr.;] No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

MCDG 8944. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.;] No Grade Associated; prereq Doctoral student; fall, spring, summer, every year)
(No description)

MCDG 8900. Student Research Seminar. (1.0 cr.; [max 10.0 cr.;] S-N or Audit; prereq Grad MCDG or MBB major %; fall, spring, every year)
Presentation/discussion of student thesis research.

MCDG 8910. Journal Presentations. (1.0 cr.; [max 2.0 cr.; S-N or Audit; prereq Grad MCDG or MBB major %; fall, spring, every year)
Discussion of original scientific literature.

MCDG 8920. Special Topics. (1.0-4.0 cr.; [max 8.0 cr.; prereq Grad MCDG or BMBB major or %; fall, every year)
Special Topics Course in the Molecular, Cellular, Developmental Biology and Genetics Program, including Itasca Research.

MCDG 8950. Teaching Practicum. (1.0 cr.; [max 2.0 cr.; S-N or Audit; prereq Grad MCDG major or %; fall, spring, every year)
Supervised experience in classroom, laboratory, and/or recitation instruction; development of skills in effective use of instructional techniques, materials, tests, and measurements.

MCDG 8993. Directed Studies. (1.0-5.0 cr.; [max 15.0 cr.; prereq MCDG grad student or %; fall, spring, every year)
Directed Studies.

MCDG 8994. Research. (1.0-5.0 cr. [max 10.0 cr.; S-N or Audit; prereq MCDG grad student or %; fall, spring, every year)
Independent research determined by student's interests, in consultation with faculty mentor.

Moving Image Studies (MIMS)
College of Liberal Arts

MIMS 5002. Advanced Film Analysis. (0.0-4.0 cr.; A-F only; prereq Grad student status; spring, every year)
Application of textual analysis to the reading of a film. Students work collaboratively to discern and interpret all component aural/visual elements of what the film says and how it says it.

MIMS 5910. Topics in Moving Image Studies. (2.0-4.0 cr. [max 8.0 cr.; A-F only; fall, spring, every year)
Special topics in moving image studies.

MIMS 8001. Theories of the Moving Image. (3.0 cr.; A-F only; fall, every year)
Study of the moving image as the intersection between critical media studies and film studies. Not a historical overview, but rather current discussions in these areas contextualized with relevant readings in classical film and media theory.

MIMS 8003. Historiography of the Moving Image. (3.0 cr.; A-F only; spring, every year)
Genealogies of the moving image. "Crisis" of film in debates about "old" and "new" media; Hollywood's role in defining commercial and oppositional forms of moving images; approaches to the writing of history in relation to media historiography.

Music (MUS)
College of Liberal Arts

MUS 5101. Piano Pedagogy I. (2.0 cr.; prereq 8 cr in MusA 1301 or MusA 1401 or %; Demonstraton and discussion of teaching techniques, methods, and materials for group and individual instruction at the elementary, early intermediate, and late intermediate levels.

MUS 5102. Piano Pedagogy II. (2.0 cr.; prereq 8 cr in MusA 1301 or MusA 1401 or %; Demonstraton and discussion of teaching techniques, methods, and materials for group and individual instruction at the elementary, early intermediate, and late intermediate levels.

MUS 5150. Body Awareness in Activity: The Alexander Technique for Musicians. (2.0 cr.; A-F only; fall, spring, every year)
Alexander technique with specific applications to music performance. Emphasis on body/mind awareness to promote technical ease and freedom.

MUS 5151. Organ Literature I. (3.0 cr.; A-F or Audit; prereq 3502, 3603, sr or grad or %) Organ literature from the 14th century to the mid-18th century. Influence of organ design of various periods and national schools on the literature and its performance.

MUS 5152. Organ Literature II. (3.0 cr.; A-F or Audit; prereq 3502, 3603, sr or grad or %) Organ literature of J. S. Bach and of other 19th- and 20th-century composers. Influence of organ design of various periods and national schools on the literature and its performance.

MUS 5160. Instrumental Accompanying Skills and Repertoire. (2.0 cr. [max 4.0 cr.; A-F or Audit; prereq Accomp major; fall, offered periodically)
Performance class in accompanying skills particular to orchestral reductions and non-senata instrumental accompanying. Repertoire to include, but not be limited to, classical and baroque string concerti, and "encore" pieces.

MUS 5181. Advanced Piano Literature I. (2.0 cr.; A-F or Audit; prereq grad piano major or %; fall, spring, every year)
Literature for piano from late Baroque period to mid-20th century.

MUS 5182. Advanced Piano Literature II. (2.0 cr.; A-F or Audit; prereq grad piano major or %; fall, spring, offered periodically) Literature for piano from late Baroque period to mid-20th century.

MUS 5230. Chorus. (1.0-2.0 cr. [max 16.0 cr.; prereq Choral and/or instrumental music background; audition; %; fall, spring, every year) 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. (1.0 cr. [max 8.0 cr.; A-F or Audit; prereq Audition; %; fall, spring, every year) Mixed chorus 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. (3.0 cr.; A-F or Audit; prereq [12 cr in MusA 1304, grad music student or %; fall, offered periodically) Vocal literature of major/minor composers from 17th century to present. Structure, style, performance practice.

MUS 5242. Vocal Literature II. (3.0 cr.; A-F or Audit; prereq 12 cr in MusA 1104 or MusA 1304, grad music major or %; spring, offered periodically) Vocal literature of major and minor composers from 17th century to present; structure, style, and performance practice.

MUS 5250. Opera Workshop and Ensemble. (2.0 cr. [max 16.0 cr.; A-F or Audit; prereq audition; %; fall, spring, every year) Preparation and performance of operatic arias, choruses, and scenes. Participation in fully staged or workshop productions of music theatre repertoire.

MUS 5271. Diction for Singers I. (2.0 cr.; A-F or Audit; prereq 12 cr in MusA 1304 or grad music major or %; fall, every year) Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used.

MUS 5272. Diction for Singers II. (2.0 cr.; A-F or Audit; prereq 12 cr in MusA 1304 or grad music major or %; spring, offered periodically) Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used.

MUS 5275. Vocal Pedagogy I. (3.0 cr.; prereq Sr vocal major or %; spring, every year)
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. (3.0 cr.; A-F or Audit; prereq Sr vocal major or #; fall, spring, every year) 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 5280. Opera Theatre. (2.0 cr. [max 16.0 cr.]; A-F or Audit; prereq audition, #; fall, spring, every year) Preparation and performance of fully-staged operatic production. Major involvement in singing, acting, and technical aspects of opera.

MUS 5331. Jazz Improvisation I. (2.0 cr.; A-F or Audit; prereq Music major or #; summer, offered periodically) Rudiments, analysis. Improvisation on blues in three major keys and on standard American popular jazz compositions from swing era to early bebop. Applications of major/minor scales. Ear training.

MUS 5333. Post-tonal Theory and Analysis II. (3.0 cr.; A-F only; prereq [4504 with a C- or better] or equiv diagnostic test; spring, odd years) Art music composed since 1945. Develop skills in analyzing and interpreting this literature.

MUS 5336. Jazz Arranging. (3.0 cr.; A-F or Audit; prereq 3502 or #; fall, spring, every year) Beginning techniques of arranging for jazz combo and jazz ensemble; vocal and instrumental.

MUS 5340. Jazz Ensemble. (1.0 cr. [max 6.0 cr.]; A-F or Audit; prereq audition, #; fall, spring, every year) A 20-member performing organization covering significant jazz compositions and arrangements written specifically for this medium.

MUS 5380. Gospel Choir. (1.0 cr. [max 4.0 cr.]; A-F only; fall, offered periodically) Performance ensemble. Students explore history of gospel music through experiential/participatory songs. Field songs, songs of struggle. Southern, traditional, and contemporary songs.

MUS 5400. University and Campus Bands. (1.0 cr. [max 10.0 cr.]; fall, spring, every year) Lab course.

MUS 5410. University Wind Bands. (1.0 cr. [max 14.0 cr.]; A-F or Audit; prereq audition, #; fall, spring, every year) Wind ensemble and symphony bands perform standard and contemporary literature; concerts and tour appearances. Players from all colleges may participate.

MUS 5420. Orchestra. (1.0 cr. [max 8.0 cr.]; A-F or Audit; prereq audition, #; fall, spring, every year) Symphony orchestra performs standard repertory and major works with chorus; concerts and tour appearances. Players from all colleges may participate.

MUS 5423. Suzuki Pedagogy Practicum. (1.0 cr. [max 2.0 cr.]; A-F or Audit; fall, spring, every year) Supervised teaching of both individual and group lessons. Instructor provides periodic critiques from observation of live or videotaped lessons. Prereq [& 5424 or & 5425], grad music student) or instr consent, grad consent.

MUS 5427. Violin Pedagogy I. (2.0 cr.; A-F or Audit; prereq Violin or viola major or #; fall, offered periodically) Private teaching of violin students at beginning, intermediate, and advanced levels. Discussion and demonstrations of pedagogical techniques.

MUS 5430. Contemporary Music Workshop. (1.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Generation/performance of new chamber works set within context to situate musical works within dynamic field of historical, philosophical, and expressive import.

MUS 5440. Chamber Ensemble. (1.0 cr. [max 8.0 cr.]; A-F or Audit; prereq audition, #; fall, spring, every year) Performance of chamber music: duos, trios, quartets, quintets, and other ensemble combinations for instruments and/or voices.

MUS 5450. Orchestral Repertoire. (1.0-3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Investigation of practical and performance problems in standard orchestral repertoire with regard to style and interpretation.

MUS 5460. World Music Ensemble. (1.0-2.0 cr. [max 16.0 cr.]; fall, spring, every year) Afro-Brazilian/Afro-Caribbean popular repertories. Samba, bossa nova, salsa, merengue, mambo. Planned master classes/clinics with local artists to complement regularly scheduled rehearsals/performances. No audition required.

MUS 5464. Cello Pedagogy. (2.0 cr.; A-F or Audit;) 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 5471. Woodwind Literature and Pedagogy I. (2.0 cr.; A-F or Audit; prereq Music major or #; fall, every even year) 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. (2.0 cr.; A-F or Audit; prereq Music major or #; spring, odd years) A study of chamber music involving one or more woodwind instruments. May include additional instruments such as piano, strings, and/or voice.

MUS 5480. University Brass Choir. (1.0 cr. [max 8.0 cr.]; prereq audition, #; fall, spring, every year) 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. (2.0 cr.; prereq Sr or grad in music or #; fall, spring, odd years) Principles of trumpet pedagogy. Discussion of literature, history, and current teaching aids.

MUS 5485. Transcription for Winds. (2.0 cr.; prereq 3502 or #; fall, offered periodically) 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. (1.0 cr. [max 10.0 cr.]; A-F or Audit; prereq #; fall, every year) Practice and performance of standard and contemporary compositions for percussion instruments in various combinations.

MUS 5491. Percussion Literature I. (2.0 cr.; A-F or Audit; prereq Jr or sr or grad or #;) Repertoire derived from orchestral and band literature for snare drum, timpami, 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. (2.0 cr.; A-F or Audit; prereq Jr or sr or grad or #; fall, spring, offered periodically) 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 5533. Music Since 1945. (3.0 cr.; A-F only; prereq 4504, #; spring, offered periodically) Art music composed since 1945. Skills in analyzing and interpreting this literature.

MUS 5541. 16th-Century Counterpoint. (3.0 cr.; A-F or Audit; prereq [3501, 3508] or pass basic skills exam; fall, spring, offered periodically) Polyphonic counterpoint 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. (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq [4504, 4514 [with C- or better]] or #; fall, spring, every year)
MUS 5561. Orchestration I. (3.0 cr.; A-F or Audit; prereq 3502; fall, every year)
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. (3.0 cr.; A-F or Audit; prereq 5561; spring, every year)
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. (3.0 cr.; A-F or Audit; prereq 3502; fall, summer, offered periodically)
Theory/analysis of tonal music using principles developed by Henrich Schenker. Basic concepts/notation, their application to excerpts/short pieces from 18th/19th centuries.

MUS 5573. Analysis of Late-Romantic Orchestral Literature. (3.0 cr.; A-F or Audit; prereq 3502 or Theory IV Exam or #; [4504 or equiv recommended; spring, offered periodically)
Advanced tonal analysis. Dramatic orchestral music by Wagner, Strauss, Tchaikovsky, Rimsky-Korsakov, Moussorgsky, and Rachmaninoff as focus for projects/discussions related to chromatic harmony, form, and orchestration.

MUS 5574. Wagner's Ring: Concepcion, Coherence, Consequence. (3.0 cr.; A-F or Audit; prereq 3502 or equiv; spring, odd years)
Enrich process of listening to Wagner's Ring by providing analytic insight into Wagner's compositional technique and the dramatic, tonal, and motivic structure of the work. Analytic approach broadened with a number of interdiscipliary forays.

MUS 5591. Introduction to Music Information Technology. (3.0 cr.; A-F or Audit; prereq Music grad student or #; fall, every year)

MUS 5592. Music Informatics Seminar. (3.0 cr.; A-F or Audit; prereq 5591 or #; spring, every year)
Filtering, formant synthesis, reverberation techniques, additive synthesis. Interactive MIDI applications.

MUS 5597. Music and Text. (3.0 cr.; A-F or Audit; fall, every year)
Designed for music majors only. Introduction to analysis of music with texts. Song/opera.

MUS 5611. Resources for Music Research. (3.0 cr.; A-F or Audit; prereq 3603; fall, spring, summer, every year)
Development of skills in identifying, locating, and evaluating resources for research in music.

MUS 5620. Topics in Opera History. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Grad music major or #; fall, even years)
Study of specific operas. Development of opera in context of other artistic, social, cultural, political events, movements, changes. Periods/countries vary each semester.

MUS 5621. Baroque Music and Its Contexts. (3.0 cr.; A-F only; prereq Grad student in music or #; fall, offered periodically)
Genres, styles, and contexts of music composed in Western Europe between 1600 and 1750. Emphasizes works typically not covered in undergraduate music history classes. Individual works as representative of larger aesthetic, social, political, and theological issues.

MUS 5624. Music of J. S. Bach. (3.0 cr.; A-F or Audit; prereq Grad student in music or #; spring, odd years)
Issues of musical style, historical context. Moves chronologically through Bach's career. Relationships between his duties and works he composed. Genesis, function, relationship of a work to genre and performing forces. Lectures, presentations, research/analysis assignments.

MUS 5647. 20th-Century European/ American Music. (3.0 cr.; prereq 3603 or equiv, 5501 or equiv, 12 undergrad cr in music or #; fall, offered periodically)
Emphasizes major artistic movements, stylistic turning points, social roles of music. Interactions between high art, popular, ethnic musics; contributions of men and woman as composers and performers.

MUS 5658. History of the Symphony in the 20th Century. (3.0 cr.; A-F or Audit; prereq 3603, 5501 or #; )
History of symphony (and related genres) in Europe and America, ca. 1890 to present. Changing aesthetic concerns, structural, harmonic, and timbral innovations. Sociocultural contexts; analysis and criticism.

MUS 5668. Beethoven's Symphonies. (3.0 cr.; A-F or Audit; 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 5701. Music, Disability, and Society. (3.0 cr.; A-F only; prereq Grad student in music or #; spring, odd years)
Study of intersection of music/disability in culture from perspective of interdisciplinary disability studies. Musician's injuries, "adaptive music" accommodations, participation in music/music education as human/civil right. Universal Instructional Design pedagogy.

MUS 5732. Free Jazz: From Structure to Gesture. (3.0 cr.; A-F only; prereq Grad student in music or #; spring, even years)
Discuss musical form of free jazz comprising flow expressivity, collaborative interaction, gestural communication from theoretical/practical point of view. Major representatives such as Ornette Coleman, Cecil Taylor, Archie Shepp, The Art Ensemble of Chicago, John Coltrane. Sound material include classical recordings but also recent free jazz CDs/DVDs.

MUS 5804. Folk and Traditional Musics: Selected Cultures of the World. (3.0 cr.; A-F or Audit; 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 5950. Topics in Music. (1.0-4.0 cr. [max 15.0 cr.]; fall, spring, summer, every year)
Each offering focuses on a single topic. Topics specified in Class Schedule.

MUS 5993. Directed Studies. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year)
Guided individual reading or study. Prereq instructor consent, dept consent, college consent.

MUS 8110. Sonata Seminar. (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Accompanying emphasis, strings and winds by audition; fall, spring, every year)
Performance in standard Baroque, Classical, and Romantic sonatas for piano and violin, cello, viola, flute, clarinet, or oboe.

MUS 8112. Instrumental Repertoire: Reduction and Realization. (2.0 cr.; A-F or Audit; prereq Grad student in accompanying/conducting; fall, spring, every year)
Reducing orchestra scores, representing orchestral reductions at piano, working with conductors. Conductors join course in mid-semester.

MUS 8131. Advanced Keyboard Skills. (2.0 cr.; A-F or Audit; 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. (3.0 cr.; A-F or Audit; 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 accompaniment skills at harpsichord/organ.

MUS 8151. Seminar in Organ Repertoire. (3.0 cr.; A-F or Audit; prereq Grad student in music or #; fall, offered periodically)
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. (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq [French, German, Italian]
MUS 8171. Song Repertoire and Performance for Pianists and Singers: German Lieder. (2.0 cr.; A-F or Audit; prereq [Grad student with major in vocal performance or in accompanying or in piano]; #; spring, offered periodically) Surveys standard German-language song repertoire: Mozart, Schubert, Schumann, Brahms, Strauss, Wolf.

MUS 8181. Operatic Accompaniment Skills and Repertoire. (2.0 cr.; A-F or Audit; prereq Grad student with major in accompanying or in conducting; fall, spring, every year) Development of skills required in operatic accompanying/coaching work. Standard opera arias, cultivation of orchestral sound at the piano, stylistic traditions, working with conductors.

MUS 8182. Opera History in Context: Monteverdi and Mozart. (3.0 cr.; A-F only; prereq Grad student in music or #; fall, every year) 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. (3.0 cr.; A-F only; prereq Grad student in music or #; spring, every year) 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. Score Study: Choral. (3.0 cr.; A-F or Audit; prereq #; fall, every year) Analysis of various choral scores ranging from Renaissance through 20th century. Reading of choral and choral/orchestral scores at piano, including scores with C clefs and transposing instrument.

MUS 8255. Choral Literature: Baroque Era to the Present. (3.0 cr.; A-F or Audit; prereq #; spring, every year) Survey of sacred and secular choral works.

MUS 8299. Performance in Choral Conducting. (3.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Preparation and performance of choral conducting recital, with supporting paper.

MUS 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

MUS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

MUS 8450. Graduate Seminar in Conducting. (3.0-4.0 cr. [max. 32.0 cr.]; A-F or Audit; prereq Grad student in conducting or #; fall, spring, every year) 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 8479. Performance and Document: Wind Ensemble/Band Conducting. (2.0 cr.; A-F or Audit; prereq 8472; #; fall, spring, every year) Preparing and performing full wind ensemble or band conducting program with supporting document.

MUS 8489. Performance and Document: Orchestral Conducting. (3.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Preparing and performing full orchestral conducting program with supporting document.

MUS 8501. Music Theory Pedagogy. (3.0 cr.; A-F or Audit; prereq Grad student in music or #; fall, spring, offered periodically) Comparison of pedagogical philosophies/methods in music theory. Pedagogical literature, practice teaching, curriculum design.

MUS 8550. Composition. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Creation of original musical works in various instrumental and vocal forms; advanced development of writing and realization of musical ideas.

MUS 8560. Readings in Music Theory. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, offered periodically) Seminars on major theoretical text or group of interrelated texts. Pre-tonal, tonal, post-tonal, or non-Western focus in individual offerings.

MUS 8570. Seminar in Composition. (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq Composition emphasis or #; fall, offered periodically) Aesthetic and professional issues in composition. Survey of professional activities, including [e]xplanation and grant writing and concert production.

MUS 8571. Composers’ Laboratory. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8570; fall, spring, offered periodically) Preparing original music composition to specification for possible radio/TV/ theatre/ film use. Analytic projects based on research into current practice of music criticism/music journalism. Philosophical and sociological research into creative process.

MUS 8580. Topics in Tonal Analysis. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically) Seminar. Sample topics: string quartets of Beethoven, chamber music of Brahms, significant works by tonal composers.

MUS 8581. Schenkerian Theory and Analysis I. (3.0 cr.; A-F or Audit; 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. (3.0 cr.; A-F or Audit; prereq 8581 or #; spring, odd years) 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. (3.0 cr.; A-F or Audit; prereq [[3502, 3512] or equiv placement exam]; #; grad-level Schenkerian analysis recommended; spring, odd years) 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. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Music grad major, #; fall, spring, every year) Seminar explores literatures of 20th-century art music.

MUS 8631. Seminar: Music in Medieval Europe. (3.0 cr.; A-F or Audit; prereq Undergrad music degree; fall, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq Undergrad music degree; fall, offered periodically) Transformation 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. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Musicology or theory emphasis or #; fall, spring, every year) Topics vary; readings, research, strategies, and methods.

MUS 8644. Seminar: Advanced Research in Historical Musicology. (3.0 cr.; A-F or Audit; prereq Undergrad music degree; fall, offered periodically) Major reference and research materials in musicology and related disciplines, including databases. Historical methods and historiography. Locating and interpreting primary sources of music and archival documents. Developing research strategies for degree papers and theses. Forms of documentation and historical writing.

MUS 8647. Seminar: The Critical Editing of Early Music—Method and Practice. (3.0 cr.;
Music Applied (MUSA)
College of Liberal Arts

A-F or Audit; prereq Undergrad music degree; fall, offered periodically
Preparation of critical editions from primary sources of vocal and instrumental music (partbooks and tablatures). Nature of musical sources, both manuscripts and prints. Stemmatic filiation, editorial judgment and method, presentation of text.

MUS 8651. Sonata Theory. (3.0 cr.; A-F or Audit; prereq #; fall, offered periodically)
Principles of the classic sonata: norms, types, and deformations. Structural analysis, analytical methodologies, and fundamentals of sonata hermeneutics.

MUS 8666. Doctoral Pre-Thesis Credits.
(1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim exam; 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; fall, spring, summer, every year)

MUS 8711. Performance Theory. (3.0 cr.; A-F only; prereq Grad student in music or #; spring, every year)
Investigate transformation process from score to its sounding instrumental realization. Discuss most important scholarly publications by B. Repp, Th. W. Adorno, et al. Theory first describes structure of such transformations, then investigates analytical, emotional, gestural rationales for expressive performance.

MUS 8777. Thesis Credits: Master's.
(1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

MUS 8864. Current Issues in Ethnomusicology. (3.0 cr.; A-F or Audit; prereq #; fall, every year)

MUS 8888. Thesis Credit: Doctoral.
(1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

MUS 8994. Directed Research. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, spring, every year)
Directed research.

MUS 8999. Recital Credits: Doctoral. (4.0 cr. [max 20.0 cr.]; A-F or Audit; prereq DMA student, #; fall, spring, summer, every year) Registration for recital credits coincides with performance of D.M.A. recital (five recitals for 20 credits).

MUSA 5010. Piano: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5012. Harpsichord: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)
Private instruction.

MUSA 5013. Organ: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)
Private instruction.

MUSA 5014. Voice: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5015. Violin: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5016. Viola: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)
Private instruction.

MUSA 5017. Cello: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)
Private instruction.

MUSA 5018. Double Bass: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5019. Flute: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5011. Oboe: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5012. Clarinet: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)
Private instruction.

MUSA 5013. Saxophone: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)
Private instruction.

MUSA 5014. Bassoon: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5015. French Horn: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5016. Trumpet: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5017. Trombone: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)
Private instruction.

MUSA 5018. Euphonium: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)
Private instruction.

MUSA 5019. Tuba: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5021. Percussion: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5023. Guitar: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)
Private instruction.

MUSA 5041. Piano: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)
Private instruction.

MUSA 5042. Harpsichord: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)
Private instruction.

MUSA 5043. Organ: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year)
Private instruction.

MUSA 5044. Voice: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)
Private instruction.

MUSA 5045. Violin: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)
Private instruction.

MUSA 5046. Viola: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)
Private instruction.

MUSA 5047. Cello: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)
Private instruction.

MUSA 5048. Double Bass: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)
Private instruction.
MUSA 5409. Flute: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5411. Oboe: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5412. Clarinet: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5413. Saxophone: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5414. Bassoon: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5415. French Horn: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5416. Trumpet: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5417. Trombone: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5418. Baritone: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5419. Tuba: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5421. Percussion: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5423. Guitar: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 8301. Piano: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8302. Harpsichord: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8303. Organ: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8304. Voice: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8305. Violin: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8306. Viola: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8307. Cello: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8308. Double Bass: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8309. Flute: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8311. Oboe: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8312. Clarinet: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8313. Saxophone: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8314. Bassoon: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8315. French Horn: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8316. Trumpet: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8317. Trombone: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8318. Euphonium: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8319. Tuba: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8321. Percussion: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8322. Harp: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8323. Guitar: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8324. Accompanying/Coaching: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

Music Education (MUED)
College of Liberal Arts

MUED 5313. Youth Music: Preferences, Influences, and Uses. (3.0 cr.; A-F or Audit; prereq Grad student in music or music education or #; fall, even years) Youth music preferences and their determinants. How music influences youth behavior. Students/teachers’ uses of commercial styles.

MUED 5350. Student Teaching in Classroom Music. (4.0-8.0 cr.; A-F or Audit; prereq Music ed major; #; fall, spring, every year) 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.

MUED 5450. Student Teaching in Vocal Music. (4.0-8.0 cr.; A-F or Audit; prereq Music ed major; #; fall, spring, every year) 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. (4.0-8.0 cr.; A-F or Audit; prereq Music ed major; #; fall, spring, every year)
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 5621. African Performing Arts in Education. (3.0 cr.; A-F only; prereq Grad student in [music or other arts or education] or #; spring, offered periodically) 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. (2.0 cr.; A-F or Audit; fall, spring, offered periodically) Contemporary approaches for teaching percussion in the schools; development of curricular materials and practice in performance techniques.

MUED 5650. Student Teaching Seminar. (2.0 cr.; A-F or Audit; prereq At least C- in all required [music, music education, professional education] courses; fall, spring, every year) Reflective practice during student teaching. Developing materials for professional employment (e.g., resume, portfolio).

MUED 5664. Teaching Music with Technology. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Home page development techniques, software/materials, audio/video utilities, research applications.

MUED 5669. Psychology of Music. (3.0 cr.; A-F or Audit; prereq Psy 1001 or Psy 3604 or #; fall, every year) 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. (1.0-4.0 cr.; max 16.0 cr.; A-F or Audit; prereq Grad student in [music education/therapy or education] or #; fall, spring, summer, every year) Focuses on single topic, specified in Class Schedule.

MUED 5800. Group Music Leadership Skills. (3.0 cr.; A-F or Audit; prereq [Completion of [MUS 1151, MUS 1152] or MUS 1155], music therapy major] or #; spring, every year) 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. (4.0 cr.; A-F only; prereq [5804, 5805] or #; fall, every year) 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 5804. Music Therapy Methods and Procedures I. (4.0 cr.; A-F or Audit; prereq 5800 or #; fall, every year) Methods/procedures for developing basic music therapy competencies/professionalism. Music therapy populations, their clinical needs. How to use music therapy in an evidence-based approach to meet client objectives.

MUED 5805. Music Therapy Methods and Procedures II. (4.0 cr.; A-F only; prereq 5804 or #; spring, every year) 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. (4.0 cr.; A-F or Audit; prereq 5805 or #; spring, every year) Ethics, grant writing, resume/CV preparation, supervision, board certification, professional responsibilities. Students design evidence-based research-based music therapy program, present their proposals to class/community.

MUED 5807. Psychiatric Music Therapy. (3.0-4.0 cr.; A-F only; prereq Grad music therapy student or #; fall, every year) 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. (3.0-4.0 cr.; A-F only; prereq Grad music therapy major or #; spring, every year) Role/scope of music therapy in medical treatment. Medical diagnoses. How to program appropriate music therapy interventions to address patient needs.

MUED 5855. Music Therapy Internship. (1.0-13.0 cr.; S-N or Audit; prereq Music therapy major; fall, spring, every year) Six-month resident internship in music therapy at an affiliated, approved hospital or clinic.

MUED 5991. Independent Study. (1.0-4.0 cr.; max 8.0 cr.; A-F or Audit; prereq Music ed or music therapy major or grad, #; fall, spring, summer, every year) Independent study project organized by the student in consultation with the appropriate instructor.

MUED 8112. Introduction to Research Methods and Design in Arts Education. (3.0 cr.; A-F or Audit; prereq Grad student in [music or music education], %; fall, spring, odd years) 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. (3.0 cr.; A-F or Audit; prereq Grad student in [music or music education], %; fall, spring, odd years) 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. (3.0 cr.; A-F or Audit; prereq Grad student in [arts or education], %; fall, spring, even years) 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 8210. Advanced Music Teaching Seminar. (1.0 cr. [max 3.0 cr.]; A-F only; prereq Grad student in music education or with music teaching license; fall, spring, every year) Advanced music teaching techniques. Assessment, comprehensive musicianship, action research, international education. Readings/assignments vary depending on topic. Focus on promising practices with immediate application in music classroom.

MUED 8211. Foundations of Music Education. (3.0 cr.; A-F or Audit; prereq Grad student in [music or music education] or #; fall, summer, every year) Major historical, philosophical, sociological, and psychological foundations of music education. Primary literature in the field. Role and current state of music education.

MUED 8212. Curriculum Design in Music Education. (3.0 cr.; A-F only; prereq Grad student in music education or #; fall, spring, every year) Examines and/or analyzes curricular models from multiple perspectives, consider influence on music teaching/learning. Design/construct curricula with view towards promoting musical growth.

MUED 8280. Seminar: Current Trends in Music Education. (3.0 cr. [max 30.0 cr.]; A-F only; prereq %; fall, spring, summer, every year) Current issues/trends in music education: philosophical, historical, psychological, and pedagogical. Course's focus varies reflecting the dynamic nature of the field.

MUED 8284. Seminar: Research and Scholarly Issues. (3.0 cr.; A-F or Audit; prereq Doctoral student in music or music education or #; spring, odd years) 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. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

MUED 8880. Master's Research Project. (3.0-6.0 cr. [max 12.0 cr.]; A-F only; prereq Grad music ed major; #; fall, spring, summer, every year) Individual projects for MM in Music Education emphases (Research/Pedagogical).

MUED 8900. Seminar: Music Education Doctoral Seminar. (1.0 cr. [max 8.0 cr.]; A-F only; prereq %; fall, spring, every year) 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. (1.0-8.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) TBD

Nanoparticle Science and Engineering (NPSE)
Institute of Technology

NPSE 8001. Introduction to Nanoparticle Science and Engineering. (3.0 cr.; A-F or Audit; ) 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. (3.0 cr.; A-F or Audit; prereq 8001; [CSE grad student or #; summer, offered periodically]) 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. (1.0 cr.; S-N or Audit; prereq CSE grad student or; fall, spring, every year) 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.

College of Food, Agricultural and Natural Resource Sciences

NR 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

NR 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

NR 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

NR 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

NR 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required. Must be doctoral student with advisor's consent to register.; fall, spring, summer, every year) (No description)

Neurology (NEUR)
Medical School

NEUR 5121. Descriptive Neurology. (2.0 cr.; O-N or Audit; prereq enrolled OT or PT; spring, every year) Central and peripheral nervous system. Correlation of neuroanatomy, neurophysiology, clinical neurology, and pathology of the nervous system.

NEUR 5230. Cerebrovascular Hemodynamics and Diseases I. (4.0 cr.; A-F only; prereq PHSL 3051 or PHSL 3063; [MATH 1271 or MATH 1371], [MATH 1272 or MATH 1372], [PHYS 1201W or PHY'S 1301W], #) or [grad student; PHSL 5061 or #]; fall, every year) Principles of cerebrovascular disease/pathophysiology, hemodynamics, diagnostic imaging, and endovascular devices. Bench-to-bedside experiments. Clinical trials, including design constraints and biostatistics.

NEUR 5240. Cerebrovascular Hemodynamics and Diseases II. (4.0 cr.; A-F only; prereq 5230, #; spring, every year) Principles of cerebrovascular disease/pathophysiology, hemodynamics, diagnostic imaging, and endovascular devices. Bench-to-bedside experiments. Clinical trials, including design constraints and biostatistics. Treatment options, endovascular devices, design of new clinical studies.

NEUR 8201. Clinical Pediatric Neurology. (1.0-15.0 cr.; )

Neuroscience (NSC)
Medical School

NSC 5031W. Perception. (3.0 cr.; prereq Psy 3031 or Psy 3051 or #; fall, offered periodically) 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. (3.0 cr.; prereq Psy 3031 or #; fall, spring, every year) 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 5040. Brain Networks: From Connectivity to Dynamics. (4.0 cr.; A-F or Audit; fall, odd years) Brain networks. Application of emerging science of complex networks to studies of the brain. Network approaches that provide fundamental insights into the integrative nature of brain function and its relation to the brain structure. Organization of brain networks and dynamics at multiple spatial scales, ranging from the microscale of single neurons and synapses, to mesoscale of anatomical cell groupings and their projections, and to the macroscale of brain regions and pathways. Experimental studies, including electrophysiology, voltage-sensitive dye imaging, electroencephalography, magnetoencephalography, and functional magnetic resonance imaging, that allow mapping network elements and structural/functional connectivity between them at different temporal and spatial scales will be considered. Experimental/theoretical perspectives.


NSC 5203. Basic and Clinical Vision Science. (3.0 cr.; prereq #; fall, odd years) Basic and clinical vision science.

NSC 5461. Cellular and Molecular Neurosciences. (4.0 cr.; A-F or Audit; prereq NSc grad student or #; fall, every year) Lectures by team of faculty, problem sets in important physiological concepts, discussion of original research papers.
NSC 5462. Neuroscience Principles of Drug Abuse. (2.0 cr.; [PHCL 5462]; prereq #: spring, offered periodically)
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. (3.0 cr.; A-F or Audit; fall, spring, every year)
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. Survey of Biomedical Neuroscience. (2.0 cr.; A-F or Audit; prereq #; intended for members of biomedical community or students with advanced scientific backgrounds; summer, every year)
Current topics in biomedical neuroscience, accompanied by supporting, fundamental concepts. Intensive, one week course.

NSC 5551. Itasca Cell and Molecular Neurobiology Laboratory. (4.0 cr.; S-N or Audit; prereq Neuroscience grad or #; summer, every year)
Intensive lab introduction to cellular and molecular aspects of research techniques in contemporary neurobiology; held at Itasca Biological Station. Electrophysiological investigations of neuronal properties, neuropharmacological assays of transmitter action, and immunohistochemical studies in experimental preparations.

NSC 5561. Systems Neuroscience. (4.0 cr.; A-F or Audit; prereq NSc grad student or #; fall, every year)

NSC 5661W. Behavioral Neuroscience. (3.0 cr.; A-F or Audit; prereq Grad NSC major or grad NSC minor or #; spring, every year)
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 of Disease. (2.0-3.0 cr.; S-N or Audit; [NSU 5667]; prereq #: fall, even years)
Basic clinical/pathological features, pathogenic mechanisms. Weekly seminar course.

NSC 5668. Neurodegeneration and Repair. (2.0 cr.; prereq #: spring, every year)
Pathogenic mechanisms of neuronal death, neurodegenerative disease, neuronal repair. Weekly seminar course.

NSC 8014. Small RNA Biology. (2.0 cr.; A-F or Audit; prereq BIOC 8002 or MICA 8004 or equiv or #; spring, every year)
Small RNAs as major regulators of gene/protein expression. MicroRNAs and their potential use in diagnosis/prognosis of various disease conditions, including cancers. Small RNAs and their role in health and disease.

NSC 8026. Neuro-Immune Interactions. (3.0 cr.; [PSY 8026]; prereq 5561, MicB 4131; fall, spring, offered periodically)
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 8041. Cognitive Neuroscience. (4.0 cr.; A-F only; [CGS 8041]; prereq #: fall, every year)

NSC 8207. Seminar: Psychopharmacology. (1.0-3.0 cr. [max 12.0 cr.]; [PSY 8070, PHCL 8207]; #; fall, spring, every year)
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 8208. Neuropsychopharmacology. (3.0 cr.; A-F or Audit; prereq 5212, 6112, PSY 5021, PSY 5061 or #; fall, every year)
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, dependence on drugs of abuse; stimulants, hallucinogens, depressants, opiates. Student presentations.

NSC 8211. Developmental Neurobiology. (3.0 cr.; A-F or Audit; prereq Neuroscience grad student or #; spring, every year)
How neuronal types develop. Emphasizes general mechanisms. Experimental data demonstrating mechanisms.

NSC 8216. Selected Topics in Autonomic and Neuroendocrine Regulation. (1.0 cr.; S-N or Audit; #; spring, fall, every year)
Advanced seminar. Course is offered fall and spring semesters.

NSC 8217. Systems and Computational Neuroscience. (2.0 cr.; S-N or Audit; prereq 5561 or #; fall, spring, every year)
Advanced seminar.

NSC 8221. Neurobiology of Pain and Analgesia. (3.0 cr.; #; fall, spring, offered periodically)
Pain and analgesia. Course is triennial.

NSC 8222. Central Regulation of Autonomic Function. (3.0 cr.; A-F or Audit; prereq 5561; fall, spring, every year)
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. (3.0 cr.; [OTOL 8247]; spring, every year)
Structure/function of auditory/vestibular systems. Network analysis of middle/inner ear mechanics, 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. (1.0-2.0 cr.; [OTOL 8248]; fall, spring, every year)
Current research on biophysics and physiology of auditory system; topics selected for each student. Written reviews prepared and discussed.

NSC 8320. Readings in Neurobiology. (1.0-4.0 cr.; fall, spring, every year)
Topics in neurobiology and neurophysiology.

NSC 8321. Career Skills and Understanding Responsibilities as a Neuroscientist. (0.5 cr. [max 2.0 cr.]; S-N or Audit; prereq Neuroscience grad major or #; fall, spring, every year)
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. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser approval; fall, summer, every year)
FTE: Master’s

NSC 8334. Laboratory Neuroscience. (1.0-3.0 cr. [max 10.0 cr.]; S-N or Audit; prereq Grad NSC major; fall, spring, every year)
Guided research.

NSC 8411. Teaching in Neuroscience. (1.0 cr.; [max 4.0 cr.]; S-N or Audit; prereq instr approval; spring, offered periodically)
Grad students serve as primary instructors in 4151 and work with fellow students and faculty mentors to design curriculum, classroom sessions, exams, and course evaluations.

NSC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

NSC 8481. Advanced Neuropharmacuetics. (4.0 cr.; A-F or Audit; [PHM 8481, CMB 8481]; #; fall, even years)
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.

NSC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; Doctoral student or adviser and DGS consent; fall, spring, summer, every year)
(No description)
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 BrainU staff/faculty classroom presentations, use of training materials, and peer mentoring sessions.

NSCI 5915. BrainU 303: Neuroscience in the Classroom. (2.0 cr.; A-F or Audit; prereq [5913 or Biol 5190], 5914, #; application, fall, spring, every year)

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 BrainU 303 participants. use of training materials and implementation of neuroscience investigations.

NSCI 5916. BrainU 101: Neuroscience in the Classroom. (3.0 cr.; A-F or Audit; prereq #; intended for high school teachers; fall, spring, every year)


Neuroscience Department (NSCI)

NSCI 5101. Introduction to Neuroscience for Graduate Students. (3.0 cr.; A-F or Audit; prereq BioC 3021 or BioC 4331); %; intended for grad students outside neuroscience program who require comprehensive intro; fall, spring, every year)

Basic principles of cellular/molecular neurobiology and nervous system. A term paper supplements lectures. Multiple-choice exams.

NSCI 5110. Dental Neuroscience for Graduate Students. (2.0 cr.; A-F or Audit; prereq = 6110; BioC 3021, Biol 4004, #; intended for grad students who require a comprehensive grad-level neuroscience course; spring, every year)

Structure/function of human nervous system. Lectures and reading assignments emphasize topics pertinent to dentistry.

NSCI 5111. Medical Neuroscience for Graduate Students. (5.0 cr.; A-F or Audit; prereq = 6111; BioC 3021, Biol 4004, #; intended for grad students who require a comprehensive medically-oriented neuroscience course; spring, every year)

Survey of molecular, cellular, and systems neuroscience as related to medicine. Lecture/lab.

NSCI 5913. BrainU 101: Neuroscience in the Classroom. (3.0 cr.; A-F or Audit; prereq [Elementary or middle school or high school or preservice] teacher, #, application; fall, spring, every year)

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 BrainU staff/faculty classroom presentations and use of training materials.

NSCI 5914. BrainU 202: Neuroscience in the Classroom. (3.0 cr.; A-F or Audit; prereq [5913 or Biol 5190], #, application; fall, spring, every year)

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 BrainU staff/faculty classroom presentations, use of training materials, and peer mentoring sessions.

NSCI 5915. BrainU 303: Neuroscience in the Classroom. (2.0 cr.; A-F or Audit; prereq [5913 or Biol 5190], 5914, #; application; fall, spring, every year)

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 BrainU 303 participants. use of training materials and implementation of neuroscience investigations.

NSCI 5916. BrainU 101: Neuroscience in the Classroom. (3.0 cr.; A-F or Audit; prereq #; intended for high school teachers; fall, spring, every year)


Neurosurgery (NSU)

NSU 5667. Neurobiology of Disease. (2.0-3.0 cr. ; =[NSC 5667]; fall, every year)

Basic clinical/pathological features, pathogenic mechanisms. Weekly seminar.

NSU 8318. Neuroradiological Conference. (1.0 cr.; S-N or Audit; fall, spring, summer, every year)

Neuroradiological conference.

NSU 8320. Neurosurgical Conference. (1.0 cr.; S-N or Audit; fall, spring, summer, every year)

Neurosurgical conference.

NSU 8324. Fundamentals of Neuroscience for Neurosurgery. (1.0-15.0 cr.; S-N only; fall, spring, summer, every year)

Provide neuroscience foundation needed for practice of clinical neurosurgery. Prereq 8104, college consent.

Nursing (NURS)

NURS 5010. Foundations of Interprofessional Communication and Collaboration. (1.0 cr.; S-N only; prereq Nursing student; fall, every year)

Exploration of nature/need for interprofessional communication among health care professionals. Qualities of successful interprofessional teams/interactions. Introduction to professional identity, ethics, integrity, values. Strategies for communication/decision making.

NURS 5011. Interprofessional Diabetes Experience. (2.0 cr.; A-F only; prereq 2nd or 3rd year in nursing curriculum; spring, every year)

Explore diabetes mellitus through active, hands-on learning in an interprofessional environment. Week-long simulated experience of living with diabetes. Online learning activities focused on interprofessional teamwork for optimal care to patients with diabetes.

NURS 5012. Phillips Neighborhood Clinic: Interprofessional Service. (0.0 cr.; No Grade Associated; prereq Sophomore in School of Nursing, [2 year commitment or MN student]; fall, spring, summer, every year)

Apply for position as nursing student volunteer at Phillips Neighborhood Clinic. Provide nursing care under guidance of licensed faculty mentors. Meet Board of Nursing requirements for nursing students engaged in direct patient care.

NURS 5014. Examining the Evidence: Forensic Health Care Practices and Opportunities. (2.0 cr.; prereq Grad student or undergraduate senior or #; fall, offered periodically)

Forensic health care, including sexual assault forensic examiners/death investigators. Examine current research regarding these roles. Opportunity for relevant community-based field experiences.

NURS 5016. Critical Reading of Scientific Literature in Adolescent Health. (1.0 cr.; prereq [Grad-level research methods course, inferential statistics course] or #; fall, every year)

Develop skills for critically reading experimental literature within field of adolescent health. Written/oral critiques of core elements of research articles, including literature review, conceptual framework, research questions/hypotheses, methods, results, discussion, conclusions.

NURS 5029. Introduction to Nursing Interventions. (4.0 cr.; A-F only; prereq Admission to master's in nursing (MN) program, &5030; fall, every year)

Evidence-based interventions for safe, culturally appropriate, and ethical nursing practice. Experiential learning activities in laboratory and clinical settings build skills in assessment, planning, implementation, and evaluation.

NURS 5030. Foundational Concepts of Professional Nursing. (3.0 cr.; A-F or Audit; prereq Admission to master's in nursing program; fall, every year)

Foundation of knowledge for culturally appropriate, ethical, evidence-based nursing practice across the life span. Research/theory that underlie the art/science of professional nursing. Concepts of person, environment, health, and nursing.

NURS 5031. Human Response to Health and Illness: Adults and Elders. (6.0 cr.; A-F or Audit; prereq Professional master of nursing [MN] student; spring, every year)

Individual responses to health/illness, in context of families/environments. Clinical component emphasizes application of nursing process in adult/elderly populations.

NURS 5033. Population Response to Health and Mental Illness. (5.0 cr.; A-F or Audit; prereq Nursing postbaccalaureate certificate program; summer, every year) Population-based nursing practice. Emphasizes application of nursing process in promoting mental health and public health, and in preventing illness across life span. Clinical experiences include interactions with individuals, families, communities, and systems.

NURS 5034. Nursing Care of Complex Clients and Diverse Populations. (2.0 cr.; A-F or Audit; prereq 5033; fall, offered periodically) Critical analysis of current/emergent nursing care issues. Essential role of nursing in providing care for complex/diverse populations.

NURS 5035. Practical Nursing Care for Complex Health Conditions. (4.0 cr.; A-F or Audit; prereq Nursing postbaccalaureate certificate program or master of nursing program; fall, every year) 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. (3.0 cr.; A-F only; prereq Grad student or Nursing Honors student or CLA Upper division honors student or #; fall, every year) Global health issues from interdisciplinary perspective. Ethical/cultural sensitivity, complexities. Students propose realistic actions to resolve issues.

NURS 5113. Web-based Teaching and Learning Strategies. (2.0 cr.; S-N or Audit; spring, every year) Skills necessary to design, produce, implement, and evaluate effective technology enhanced learning environments. Pedagogical/technological issues surrounding teaching with technology.

NURS 5115. Interprofessional Health Care Informatics. (3.0 cr.; A-F or Audit; fall, spring, every year) Implications of informatics for 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 Health Informatics. (1.0 cr.; A-F only; prereq Grad student or #; fall, spring, every year) Examines issues from consumer's perspective in acquisition, understanding, use or provision of health information. Online strategies for improving health. Impact on consumer-provider relationships/ethical and legal issues.

NURS 5117. Consumer Health Informatics Practicum. (1.0 cr.; S-N only; prereq [Grad student, [5116 or &5116]) or #; fall, every year) Apply student knowledge to analysis of health needs and consumer health principles, theories, and research to a consumer health informatics project.

NURS 5120. Palliative Care for Children. (1.0 cr.; prereq #; summer, every year) Physical, psychosocial, and spiritual needs of children with life-limiting conditions. Family centered approach. Holistic assessment/intervention for child/family, within interdisciplinary health care team.

NURS 5170. Research Topics. (1.0-10.0 cr.; #PUBH 6170); fall, spring, offered periodically) Exploration of research topic to meet individual student needs.

NURS 5183. Scholarly Leadership. (1.0 cr.; S-N or Audit; prereq Advanced doctoral nursing student, #; spring, every year) Implications of dissertation research on advancing science, clinical practice, and leadership in nursing and health care. Principles of scholarly collaboration.

NURS 5190. Essentials of Holistic Health Assessment. (3.0 cr.; A-F only; prereq Admission to MN Program; fall, spring, every year) Health assessment knowledge/skills for nursing practice across life span. History taking, interviewing techniques, technical skills to perform complete, systematic health assessment, focused assessments for acute care settings.

NURS 5200. Holistic Health Assessment and Therapeutics for Advanced Practice Nurses. (3.0 cr.; A-F only; prereq Admission to advanced practice nursing area of study [DNP or Post-Graduate certificate program], #; fall, summer, every year) Health assessment knowledge/skills for advanced nursing practice with patients across age span, including pregnancy. Selected nursing interventions, complementary therapies for application to specific populations/illnesses.

NURS 5221. Refugee Health: Trauma, Stress, and Coping. (3.0 cr.; prereq Grad student or #; fall, spring, summer, offered periodically) 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. (3.0 cr.; A-F only; fall, every year) 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. (4.0 cr.; prereq Nurs grad or #; spring, every year) 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 5225. Psychopharmacology Advanced Practice Psychiatric/Mental Health Nursing. (3.0 cr.; prereq 5228 or #; fall, spring, every year) Advanced concepts in neuroscience, psychopharmacology, and clinical management related to psychopharmacologic treatment of psychiatric disorders/symptoms. Application to problems in various clinical settings.

NURS 5228. Pharmacology for Advanced Practice Nursing. (2.0 cr.; A-F or Audit; prereq Grad nursing student or #; fall, every year) Overview of pharmacological principles for commonly used medication classes. Each drug class, related physiology. Pharmacodynamics and pharmacokinetics of drug classes and specific medications.

NURS 5229. Clinical Pharmacotherapeutics. (2.0-4.0 cr.; A-F only; prereq 5222, [5228 or PHAR 5800], DNP student, #; spring, every year) Pharmacokinetics, pharmacodynamics, therapeutic dosages for various age groups. Client patterns of drug use. Prescriptive privileges. Prescription writing for advanced practice nurses.

NURS 5241. Nursing Leadership for Effective Practice. (3.0 cr.; A-F or Audit; prereq Final sem of MN Program; fall, every year) Leadership theory/application. System issues affecting nursing practice and patient outcomes.

NURS 5501. Professional Issues in Nurse-Midwifery. (1.0-2.0 cr.; S-N or Audit; prereq Nurs grad major, #; spring, every year) 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 5505. Assessment and Support of Women in Labor. (2.0 cr.; S-N only; prereq Admission to DNP Program; spring, every year) Self-directed study with goal of working with experienced labor nurses/learning knowledge/skills required to perform labor. Clinical experience. Completion of selected online modules related to nursing care of women in labor.

NURS 5604. Advanced Health Assessment and Interventions with Adolescents. (2.0 cr.; prereq CPsy 5303 or equiv or #; summer, every year) 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. (1.0-4.0 cr. [max 8.0 cr.]; prereq #; fall, spring, summer, every year)
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 5808. American Indian Health and Health Care. (2.0 cr.; prereq Upper div or grad student or #; fall, spring, every year)
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 5812. Global Health Through Study Abroad. (2.0-3.0 cr.; S-N only; prereq #; spring, summer, every year)
Nursing as a global profession and the issues that impact health of populations worldwide.

NURS 5820. Foundations of Infection Control. (3.0 cr.; prereq Baccalaureate degree in health related field or #; fall, spring, summer, offered periodically)
Integrates microbiology, epidemiology, and patient care practices applied to a population-focused practice. Focuses on risk identification, prevention strategies.

NURS 5830. Advanced Clinical Nursing. (1.0-6.0 cr.; prereq Grad nursing major; #; fall, spring, summer, every year)
Independent study or faculty seminar on special clinical topic.

NURS 5925. Grant Writing and Critique. (1.0 cr.; prereq Grad student or #; spring, every year)
Self-paced course. Online modular format. How to write/critique grant. Students select a research or program grant to critique, applying knowledge obtained through learning modules.

NURS 5940. Contemporary Issues in Nurse Anesthesia. (2.0 cr.; S-N only; prereq 5930; spring, every year)
Analysis of economic, legal, political, ethical, and social factors that influence the practice and profession of CRNAs.

NURS 8100. The Discipline of Nursing. (3.0 cr.; prereq Grad nurs major or #; fall, spring, summer, every year)
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. (3.0 cr.; prereq 8100 or equiv, knowledge of phil of sci; fall, every year)
Paradigms in nursing and related methods of inquiry, knowledge structures, and projection of needs for further knowledge development and testing.

NURS 8113. Theory Development in Nursing. (3.0 cr.; S-N or Audit; 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. (3.0 cr.; A-F or Audit; prereq Doctoral student; #; fall, every year)
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. (3.0 cr.; A-F only; prereq 5115 or [HINF 5430, HINF 5431] or #; spring, every year)
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 8121. Health Behaviors and Illness Responses. (3.0 cr.; A-F or Audit; prereq Doctoral student or #; fall, spring, offered periodically)
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 8124. Family Health Theory. (2.0-3.0 cr.; prereq 8100 or #; fall, every year)
Emerging theory in family nursing science. Related theories. Research on family systems for structuring a systemic framework to examine clinical problems related to family health care. Applications to selected phenomena of interest to health care.

NURS 8134. Interventions and Outcomes Research. (3.0 cr.; A-F or Audit; prereq 8121, PhD student; #; spring, every year)
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. (3.0 cr.; prereq Grad nurs major or #; fall, spring, summer, every year)
Synthesis of ethical positions, from nursing perspective, on health-related issues at individual, group, population, and policy levels. Normative ethics, theoretical basis for positions taken, and contextual implications for subsequent action.

NURS 8152. Scholarship in Health Care Ethics. (3.0 cr.; A-F only; prereq Doctoral student or #; fall, every year)
Analyze the underlying values in the concepts and discourses of health/disease. Evaluate ethical frameworks regarding their capability to address issues in health care. Analyze/discuss issues related to the responsible and ethical conduct of research.

NURS 8170. Research in Nursing. (3.0 cr.; prereq & 8170 or inferential stat course taken within two yrs; fall, spring, summer, every year)
Research process/methods appropriate for problems relevant to nursing. Critique of research studies, proposal development.

NURS 8171. Qualitative Research Design and Methods. (3.0-4.0 cr.; prereq 8170 or equiv; spring, every year)
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 8172. Theory and Theory Development for Research. (3.0 cr.; prereq Doctoral student; fall, spring, offered periodically)
Paradigms in nursing/health, associated methods of scientific/scholarly inquiry. Inductive/deductive techniques for theory development Theory-testing using data obtained under controlled conditions.

NURS 8173. Principles and Methods of Implementing Research. (3.0 cr.; [SAP] 8173); prereq 8114 or other 8xxx grad research methods course, 2 grad stat courses; spring, every year)
Integrates scientific, statistical, and practical aspects of research. Inter-relationships among design, sample selections, 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. (3.0 cr.; A-F or Audit; prereq [PhD student in nursing, advanced applied statistics] or #; fall, every year)

NURS 8176. Research on Decision Making in Health Care. (3.0 cr.; prereq One graduate-level research course; #, fall, offered periodically)
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. (2.0 cr.; S-N or Audit; prereq PhD nursing student, #, adviser consent; fall, spring, summer, every year)
Students collaborate with research team under supervision of faculty mentor in designing/conducting a health-related research project.

NURS 8178. Methods for the Study of Family Health Phenomena. (3.0 cr.; prereq 8124, 8110 or equiv or #)
Conceptual and methodological approaches in study of family health phenomena from nursing perspective. Research designs formulated to study questions in this area.
NURS 8179. Biophysiological Measurement and Instrumentation in Clinical Research. (3.0 cr.; prereq [8173, 8175 or equiv., advanced level stat or & advanced level stat) or #; fall, every year)

Critical issues in measurement and instrumentation for clinical research. Methodological issues and critical appraisal of instruments in the study of biophysiological phenomena. Field observation experiences.

NURS 8180. Doctoral Proseminar I: Scholarly Development. (1.0 cr.; S-N or Audit; prereq Doctoral nursing student; fall, spring, offered periodically)
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. (1.0 cr.; S-N only; prereq Nursing doctoral student or #; spring, every year)
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. (3.0-4.0 cr.; prereq 8171 or grad course in qualitative research methods; summer, every year)
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. (2.0 cr.; A-F or Audit; prereq Advanced statistics course, #; spring, every year)
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. (1.0-6.0 cr.; prereq #; fall, spring, summer, every year)
Seminar and/or individual study of research design, methodologies, or instruments.

NURS 8194. Problems in Nursing - Plan B. (1.0-6.0 cr.; S-N or Audit; prereq [8100 or & 8100], [8170 or & 8170], #; fall, spring, summer, every year)
Using a scholarly process to address a specific issue relevant to science/practice of nursing

NURS 8195. Mixed Methods in the Social, Behavioral, and Applied Health Sciences. (3.0 cr.; A-F only; prereq #, spring, every year)
Integrate qualitative strategies with quantitative approaches in research designs. Strengths/ challenges of using mixed-methodological frameworks when studying the etiology of phenomena or evaluating clinical interventions.

NURS 8240. Advanced Practice Nursing: Roles and Issues. (2.0 cr.; prereq Admission to advanced practice area of study or #; fall, spring, summer, every year)

Current most relevant professional/healthcare issues affecting diverse advanced practice nursing roles. Role theory, practice models, interdisciplinary team function, reimbursement, certification, scope of advanced nursing practice.

NURS 8241. Health Care Leadership for a Changing World. (2.0 cr. [max 3.0 cr.]; prereq AHC-grad student or #; fall, spring, every year)
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. (2.0 cr.; prereq Grad nurs student or #; fall, spring, summer, every year)
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/services.

NURS 8311. Specialized Focus in Research-based Clinical Reasoning and Management in Acute Care. (3.0-4.0 cr.; prereq 5200, 5222, 8100, 8140, 8170, 8240, 8303, 8305, 8309, advanced pharmacology, [pathophysiology or immunobiology]; fall, spring, offered periodically)
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 8314. Intervention Models for Adults/Elders with Chronic Health Conditions. (3.0-4.0 cr.; A-F or Audit; prereq 5222, 5800, 8100, 8140, 8170, #; fall, spring, every year)
Development of theory/research-based nursing interventions/models for adults/elders with chronic health conditions. Students implement/evaluate intervention models in an advanced practice role with chronically ill adults/elders.

NURS 8315. Advanced Practice Nursing for Adults. (4.0-5.0 cr.; A-F or Audit; prereq 5222, 5800, 8100, 8140, 8170, #; fall, spring, offered periodically)
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. (4.0 cr.; A-F or Audit; prereq 5222, 5800, 8100, 8140, 8170, 8314, 8315; spring, every year)
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. (3.0 cr.; spring, offered periodically)
Literature/policy on key social aspects of aging, emphasizing service, policy, and ethical implications; generation of research questions.

NURS 8321. Advanced Nursing Care of the Elderly I. (4.0-6.0 cr.; A-F or Audit; prereq Grad student in nursing, #; spring, every year)

NURS 8322. Primary Health Care for Elders. (3.0-6.0 cr.; A-F or Audit; prereq 8321, #; fall, every year)
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 Nurse Practitioners. (5.0-6.0 cr.; A-F or Audit; prereq 8322, 8xxx advanced gerontological nurs course, grad nurs major, #; spring, every year)
Synthesis and application of theory and research 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 Specialists. (6.0 cr.; A-F or Audit; prereq Grad nurs major, #; spring, every year)
Synthesis and application of theory and research to effectively implement an advanced gerontological nurse. Comprehensive client care management across settings, evaluation of care, role implementation, and influences of contextual factors on health care services for the elderly.

NURS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; fall, spring, summer, every year)
(No description) Prereq Master's student, adviser and DGS consent.

NURS 8340. Advanced Practice Psychiatric/Mental Health Nursing with Individuals and Their Families. (7.0 cr.; prereq 5200, 5223, 5225, 8100, 8121, 8140, 8170; fall, every year)
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. (7.0 cr.; prereq 5340, 8340, & 8240; spring, every year)
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. (1.0-6.0 cr.; prereq Grad nurs major; #; fall, spring, summer, every year) Independent study or faculty seminar on special clinical topic when interest exists.

NURS 8361. Special Topics in Nursing. (1.0-4.0 cr.; prereq Grad nurs major; #; fall, spring, summer, every year) Students select and study a topic of interest.

NURS 8402. Primary Care: Assessment and Management of Health for Advanced Practice Nurses. (2.0-4.0 cr.; A-F or Audit; spring, summer, every year) 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. Prereq-5200, 5222, 5224, 8242.

NURS 8403. Primary Care Practice for Family Nurse Practitioners: Assessment and Management of Health. (4.0 cr.; S-N or Audit; prereq 5200, 5222, 8402; fall, spring, offered periodically) 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 families across life span.

NURS 8404. Family Practice Practicum I. (2.0 cr.; A-F or Audit; prereq 5200, 5222, 5224, 8402, 8601; fall, every year) Comprehensive advanced nursing assessment for acute/chronic health conditions of primary care population across life span. Synthesis/ application of nursing theory/research in implementing/evaluating safe/effective nursing interventions to promote health and prevent illness.

NURS 8405. Family Practice Practicum II. (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq 5200, 5222, 5224, 8402, 8601; fall, every year) Synthesis of advanced practice nursing theory in data collection and in assessment of client in his/her environment. Implementation/evaluation of interventions for disease management in primary care setting. Nursing theory/research used in developing nursing practice models for health promotion, disease prevention, and intervention.

NURS 8406. Health Care of Children for the Family Nurse Practitioner. (3.0 cr.; A-F or Audit; prereq #; fall, every year) 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. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

NURS 8450. Primary Care: Health Assessment and Care of Well Children. (3.0 cr.; prereq 5200, 5222, & 8451; spring, every year) 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 the 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. (2.0-3.0 cr.; A-F or Audit; prereq 5200, & 8450, #; spring, every year) 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. (2.0 cr.; prereq 8501, 8451, & 8453, #; fall, every year) 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. (3.0 cr.; prereq 8411, 8442, & 8452, #; fall, every year) 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 diagnostics, therapeutics, education, and follow-up evaluation of outcomes.

NURS 8455. Health Care for Children and Youth with Special Health-Care Needs. (2.0 cr.; prereq 8454; fall, every year) 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 8457. Assessment and Intervention Models in Families of Children with Special Health Care Needs. (4.0 cr.; prereq 8124 or equiv, 8100, 8456, #; spring, every year) In-depth, systemic, and theory-based study of family health assessment methods and intervention models. Practicum to assess, intervene, and evaluate intervention models related to patterns of functioning in families of children with complex health-care needs.

NURS 8459. Advanced Nursing Care of Children With Acute Illness for Pediatric Clinical Nurse Specialists. (2.0 cr.; prereq Nursing grad student admitted to pediatric clinical nurse specialist area of study or #; fall, spring, offered periodically) Synthesis/application of theory/research to effectively implement pediatric clinical nurse specialist role. Focuses on comprehensive care management across settings, evaluation of care, role implementation, and contextual factors affecting health care for children with special health needs and families.

NURS 8500. Reproductive Health Care for Women Practicum for the Family Nurse Practitioner. (2.0 cr.; S-N or Audit; prereq Concurrent registration with Nurs 8501, 8405; spring, every year) Synthesis/utilization of nursing knowledge/research in clinical decision making process related to women's reproductive/sexual health throughout life cycle. Evaluation of patient outcomes using nursing standards/criteria.

NURS 8501. Reproductive Health Care for Women. (3.0-8.0 cr.; prereq 5200, #; spring, every year) Theory, current research underlying clinical practice in assessing/managing issues related to women's reproductive/sexual health throughout life cycle.

NURS 8502. Reproductive Health Care for Women at Risk. (2.0-6.0 cr.; prereq 8503 or 8520; spring, every year) 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 gynecological and neonatal conditions.

NURS 8503. Nurse-Midwifery Care of the Childbearing Family. (4.0-10.0 cr.; A-F or Audit; prereq 8501, #; fall, every year) Theoretical/research based coordinated nurse-midwifery intrapartum care, management, support of women and their families. Labor, birth, immediate postpartum period, and newborn care. Development/implementation of nurse-midwifery care. Draws from research that provides basis for practice.

NURS 8504. Nurse Midwifery and Women's Health Care Nurse Practitioner Primary Care
Practice. (2.0-3.0 cr.; S-N or Audit; prereq 5200, 5222, 8402; summer, every year) 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 8520. Advanced Concepts in Women’s Health for the Nurse Practitioner. (3.0-8.0 cr.; A-F or Audit; prereq 8501, #; fall, every year) Theoretical and research basis for women’s healthcare nurse practitioner practice building on foundations of gynecological and antepartum care. Preparation of childbearing family for birth and selected complex health concerns for women.

NURS 8600. Advanced Public Health Nursing Practicum. (2.0 cr.; prereq Grad nursing major; fall, spring, every year) Conceptual frameworks for advanced public health nursing practice. Analysis of population-focused nursing research and of public health nursing management strategies.

NURS 8601. Interventions for Health of Populations. (3.0 cr.; prereq 8040; spring, every year) Synthesis of behavior formation/change, public health, and nursing models, theories, and research for critiquing and designing population-focused interventions. Developing, implementing, evaluating, and proposal writing for culturally competent public health interventions in community-based settings.

NURS 8602. Public Health Nursing Leadership Practicum. (3.0 cr.; S-N or Audit; prereq 8242, 8601; fall, spring, every year) Applying principles, theory, and research about epidemiology/public health/public health nursing interventions to population-focused health issues. Collaborating with community-based preceptors to achieve public health objectives.

NURS 8603. Public Health Nursing Leadership Practicum. (3.0 cr.; S-N or Audit; prereq 8100, 8170, 8241, 8242, 8600; fall, spring, every year) 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. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) Written report for master’s plan B project.

NURS 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

NURS 8800. Methods for the Study of Family Health Phenomena. (2.0 cr.; 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. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Nutrition (NUTR) College of Food, Agricultural and Natural Resource Sciences


NUTR 5625. Nutritional Biochemistry. (3.0 cr.; prereq BioC 3021 or #; fall, every year) Overview of biochemical molecules and pathways important in nutritional events.

NUTR 5626. Nutritional Physiology. (3.0 cr.; A-F or Audit; prereq NUTR 5625; spring, every year) Whole body macronutrient metabolism as it relates to etiology of metabolic diseases. Signaling between tissues to control homeostasis. How dysregulation of crosstalk can lead to metabolic diseases. How diet, exercise, or starvation impact metabolism. Regulation of food intake and energy expenditure. Designing/analyzing/interpreting research data.

NUTR 5627. Nutritional and Food Toxicology. (3.0 cr.; A-F only; = [FSCN 4622]; prereq BioC 3021; designed for students majoring in [nutrition or food science or toxicology]; spring, every year) Toxic agents, organisms, and toxic effects that are important in the toxic events, with a focus on food toxicants and nutrient-toxicant interaction.

NURS 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

NURS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

NURS 8620. Advances in Nutrition. (2.0 cr.; prereq M.S. or Ph.D. student, two semesters in the nutrition program; fall, spring, every year) Recent research or special topics (e.g., obesity, vitamin biochemistry, nutrition education).

NUTR 8621. Presentation Skills. (1.0 cr.; S-N or Audit; prereq %; fall, every year) Orientation to nutrition graduate program. Presenting scientific seminars, using electronic presentation programs/equipment.

NUTR 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) tbd

NUTR 8695. Independent Study: Nutrition. (1.0-10.0 cr. [max 30.0 cr.]; No Grade Associated; prereq #; fall, spring, summer, every year) Written report for master’s plan B project.

NURS 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

NUTR 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Obstetrics and Gynecology (OBST) Medical School

OBST 8224. Gynecological Endocrinology I. (1.0-15.0 cr.; prereq prereq 8223; fall, spring, every year)
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

**Occupational Therapy (OT)**

**Academic Health Center Shared**

**OT 5121. Issues in Mental Health.** (1.0 cr.; S-N or Audit; prereq One course gen psych, one course abnorm psych; fall, every year)
Psychiatric/neuropsychological assessment/treatment. Issues related to medical/community management and to roles of OT/PT with respect to clients with mental health needs. Interaction between physical/mental health and disability.

**OT 5122. Descriptive Neurology.** (2.0 cr.; A-F or Audit; prereq OT student or #; fall, every year)
Relates neuroanatomical/neurophysiological principles to neurological conditions commonly seen in occupational/physical therapy practice.

**OT 5161. Theory of Physical Medicine and Rehabilitation Applied to Medical Sciences.** (2.0 cr.; A-F or Audit; prereq OT student or #; fall, every year)
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 Neuropsychology.** (4.0 cr.; A-F or Audit; prereq Registered occupational therapy student or #; spring, every year)
Neuroanatomical structures as functional systems, basic neurophysiologic concepts. Emphasizes applications for understanding/treating physical dysfunctions.

**OT 5300. Concepts for Occupational Therapy Practice.** (4.0 cr.; A-F or Audit; prereq enrolled OT student or #; fall, every year)
Critical thinking, ethics, professional resources/organizations, patient-therapist relationship.Level I fieldwork experience.

**OT 5313. Therapeutic Occupation.** (4.0 cr.; A-F or Audit; prereq enrolled OT student or #; fall, every year)
Occupational therapy philosophy, history, and frames of reference. Activity analysis applied to purposeful, therapeutic activities for individuals and groups.

**OT 5341. Introduction: Evaluation and Intervention I.** (4.0 cr.; A-F or Audit; prereq [5393 or #; spring, every year)
Assessment concepts/techniques. Application to patient populations with both mental/physical disabilities. Treatment planning/documentation.

**OT 5342. Compensatory Rehabilitation: Evaluation and Intervention II.** (4.0 cr.; A-F or Audit; prereq 5300, 5313 or #; spring, every year)
Assessment of daily living performance areas; adaptation techniques to compensate for performance deficits. Level I fieldwork experience.

**OT 5343. Specialty Topics: Evaluation and Intervention III.** (4.0 cr.; A-F or Audit; prereq 5342 or #; fall, every year)
Applies critical thinking model to assessment/intervention of selected patient populations with mental/physical problems requiring specialized approaches. Focus on habilitation/rehabilitation of populations with multiple performance component deficits. Fieldwork.

**OT 5344. Neurorehabilitation: Evaluation and Intervention IV.** (5.0 cr.; A-F or Audit; prereq 5343 or #; spring, every year)
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.** (2.0 cr.; A-F or Audit; prereq 5313 or #; fall, every year)
Application of group/team dynamics in diverse professional settings.

**OT 5370. Theory of Occupation.** (1.0 cr.; A-F or Audit; prereq enrolled OT student or #; fall, every year)
Occupational therapy frames of reference, role of activity, and historical development of profession.

**OT 5375. Community Resources and Health-Care Issues.** (2.0 cr.; A-F or Audit; prereq [5300, 5342] or #; fall, every year)
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.** (1.0 cr.; A-F or Audit; prereq 5313 or #; spring, every year)
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 therapeutic interventions. Student teaching unit, community based activity.

**OT 5380. Management of Occupational Therapy Services.** (3.0 cr.; A-F or Audit; prereq [5360, 5375, 5376] or #; spring, every year)
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.** (3.0 cr.; A-F or Audit; prereq [5375, 5376] or #; spring, every year)
The well elderly, school therapy, work-related injuries/industrial rehabilitation. Fieldwork.

**OT 5392. Research in Occupational Therapy.** (3.0 cr.; A-F or Audit; prereq 5313 or #; spring, every year)
Analysis of scientific literature, development of research proposals.

**OT 5393. Functional Anatomy and Kinesiology.** (4.0 cr.; A-F or Audit; prereq enrolled OT student or #; fall, every year)
Gross human anatomy emphasizing skeletal, muscular, circulatory, and peripheral nervous systems of the extremities and trunk. Includes cadaver lab sections. Analyzing functional human movement from a biomechanical perspective.

**OT 5394. Orthotics.** (3.0 cr.; A-F or Audit; prereq 5341 or #; fall, every year)
Analysis, design, and construction of orthotic devices.

**OT 5395. Independent Study in Occupational Therapy.** (1.0-4.0 cr. [max 16.0 cr.]; prereq Enrolled OT student or #; fall, spring, summer, every year)
Independent Study in Occupational Therapy

**OT 8300. Research Seminar in Occupational Therapy.** (1.0 cr.; S-N or Audit; prereq 5392 or #; fall, spring, every year)
Critical review of research literature in occupational therapy. Issues related to ethical/successful conduct/publication of research. Development of Plan B project outline.

**OT 8310. Research Problems in Occupational Therapy.** (1.0-6.0 cr.; S-N or Audit; prereq [5392, Plan B OT student] or #; fall, spring, every year)
Individual, concentrated study of a problem in occupational therapy. Completion of Plan B project.

**OT 8320. Fieldwork Education in Occupational Therapy I.** (1.0-6.0 cr.; S-N or Audit; prereq Occupational therapy student or #; fall, spring, summer, every year)
Supervised clinical practice in affiliated hospitals and community agencies. Students apply critical thinking through supervised application of theory/skills.

**OT 8321. Fieldwork Education in Occupational Therapy II.** (1.0-6.0 cr.; S-N or Audit; prereq Occupational therapy student or #; fall, spring, summer, every year)
Supervised clinical practice in affiliated hospitals and community agencies. Students apply critical thinking through supervised application of theory/skills.

**OT 8322. Fieldwork Education in Occupational Therapy III: Optional.** (1.0-6.0 cr.; S-N or Audit; prereq Occupational therapy student or #; fall, spring, summer, every year)
Supervised clinical practice in affiliated hospitals and community agencies. Students apply critical thinking through supervised application of theory/skills.
OT 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

OT 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

Ojibwe (OJIB)
College of Liberal Arts

OJIB 5106. Advanced Ojibwe Language I. (3.0 cr.; [max 12.0 cr.]; A-F or Audit; fall, every year) Focuses on immersion method.

OJIB 5109. Advanced Ojibwe Language II. (3.0 cr.; [max 12.0 cr.]; A-F or Audit; spring, every year) Focuses on immersion method.

Ophthalmology (OPH)
Medical School

OPH 5501. Orthoptics I. (4.0 cr.; S-N only; prereq Admission to Orthoptics Certificate program; summer, every year) First semester of Orthoptics Certificate program.

OPH 5601. Orthoptics II. (5.0 cr.; S-N only; prereq Enrollment in Orthoptics Certificate program; fall, every year) Second semester of Orthoptics training program.

OPH 5701. Orthoptics III. (5.0 cr.; S-N only; spring, every year) Third semester of Orthoptics certificate program.

OPH 8101. Clinical Ophthalmology. (5.0 cr.; fall, spring, summer, every year)

OPH 8103. Pediatric Ophthalmology, Strabismus, and Hereditary Disorders. (2.0 cr.; fall, summer, every year)

OPH 8106. Strabismus Management. (1.0 cr.; prereq Med or grad in vet med; fall, every year)

OPH 8110. Optics, Refraction, and Contact Lens. (2.0 cr.; fall, every year)

OPH 8111. Intraocular Inflammation, Uveitis, Ocular Tumors. (2.0 cr.; prereq Grad physician or grad in vet science; )

OPH 8112. Retina and Vitreous. (2.0 cr.; fall, every year)

OPH 8113. Basic and Clinical Neuro-ophthalmology. (2.0 cr.; spring, every year)

OPH 8116. Glaucoma, Lens, and Anterior Segment Trauma. (2.0 cr.; prereq Grad physician or grad in vet science; spring, every year)

OPH 8117. Orbit, Plastics, and Trauma. (2.0 cr.; prereq Physician or vet med student; spring, every year)

OPH 8118. General Medical Problems. (2.0 cr.; prereq Grad physician or grad in vet science; spring, every year)

OPH 8119. Clinical Pathological Correlations in Ophthalmology. (1.0 cr.; prereq Physician or vet med student; spring, every year)

OPH 8120. Scope of Ophthalmic Pathology. (1.0 cr.; prereq Physician or vet med student; spring, summer, every year)

OPH 8125. Diseases of the Cornea and External Eye. (2.0 cr.; spring, summer, every year)

OPH 8126. Diseases of the Cornea and External Eye. (2.0 cr.; spring, summer, every year)

OPH 8131. Practical Ocular Surgery. (2.0 cr.; fall, spring, summer, every year)

OPH 8142. Ophthalmic Pathology Laboratory. (1.0 cr.; fall, spring, summer, every year)

OPH 8153. Research in Ophthalmology. (0.0 cr.; )

OPH 8154. Seminar: Ophthalmology. (0.0 cr.; )

OPH 8155. Special Topics in Ophthalmology. (1.0 cr.; )

OPH 8701. Neuro-ophthalmology. (1.0 cr.; )

Oral Biology (OBIO)
School of Dentistry

OBIO 5001. Methods in Research and Writing. (2.0 cr.; fall, every year) Skills necessary to begin a research project, including literature review, hypothesis formation, research design, and writing. Each student develops a research protocol.

OBIO 8012. Basic Concepts in Skeletal Biology. (2.0 cr.; A-F or Audit; spring, every year) Cells (osteoblasts, osteoclasts, chondrocytes) that make up skeleton. Transcription/signaling networks that regulate cell growth/differentiation. Mechanisms of bone remodeling. Regulation of bone by such agents such as hormones. Prereq Grad student or instr consent.

OBIO 8018. Topics in Oral Pathobiology. (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq All students must be degree-seeking graduate students or dental fellows and should hold a PhD or DDS. # for 4th year dental students and PhD students. CDE available for practitioners.; fall, every year)

Clinical understanding of oral disease. Correlates about underlying basic mechanisms in microbiology, immunology, cancer biology, developmental biology, neuroscience. Dialog between clinic/bench to improve preventative/treatment modalities.


OBIO 8022. Oral Neuroscience. (2.0 cr.; prereq Dental specialist or oral research trainee or #; spring, even years) 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. (1.0 cr.; prereq Dental specialist or oral research trainee or #; spring, every year) 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. (2.0 cr.; A-F or Audit; prereq Dental specialist or oral research trainee or #; spring, odd years) 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.

OBIO 8026. Salivary Glands and Secretions. (2.0 cr.; A-F or Audit; prereq Dental specialist or oral research trainee or #; fall, even years) Salivary gland structure/development. Mechanisms/control of macromolecule/electrolyte secretion. Salivary protein structure/function, interactions with bacteria. Salivary pellicle, salivary gland disease. Clinical studies, readings, student presentations. Each student develops a research proposal.

OBIO 8027. Structural and Biological Aspects of Dental Biomaterials. (1.0 cr.;)
prereq Dental specialist or oral research trainee or #; summer, odd years
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. (2.0 cr.; A-F or Audit; prereq Dental specialist or oral research trainee or #; spring, even years)
Biochemical basis of adhesion phenomena. Cells of immune system, development of organs, tissue formation, bacterial colonization of the human.

OBIO 8030. Oral Biology Seminar. (1.0 cr. [max 10.0 cr.]; S-N or Audit; prereq Dental specialist or oral research trainee or #; fall, spring, every year)
Faculty and student discussion of current topics in oral biology.

OBIO 8093. Tutorial in Oral Biology. (1.0-2.0 cr.; S-N only; prereq #; fall, spring, every year)
Semester-long apprenticeship with faculty members to familiarize students with faculty research interests. Individual study of selected topics.

OBIO 8094. Directed Research. (1.0-10.0 cr.; S-N or Audit; prereq #; fall, spring, every year)
tbd

OBIO 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

OBIO 8371. Mucosal Immunobiology. (3.0 cr.; A-F or Audit; =MICA 8371, CBM 8371; prereq MICA 8001 or equiv or #; fall, every year)
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. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

OBIO 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.; ] No Grade Associated; 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; fall, spring, summer, every year) tbd

OBIO 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

(No description)

OBIO 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.; ] No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

**Oral and Maxillofacial Surgery (OSUR)**

**School of Dentistry**

**OSUR 5257. Ambulatory General Anesthesia for the Oral and Maxillofacial Surgeon.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Clinical rotation involving experience in outpatient management and using intravenous sedation and general anesthesia.

**OSUR 5276. Medicine Rotation for the Oral and Maxillofacial Surgeon.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Clinical rotation at Fairview-University Medical Center under the direction of the Internist/Medicine Department. Involves workup, admission, and daily management of patients on medical service, specifically cardiology and pulmonary.

**OSUR 5277. Physical Diagnosis for Oral Surgery Residents.** (0.0-6.0 cr.; A-F or Audit; prereq Participation in oral and maxillofacial surgery training program; spring, summer, every year)
Six-week didactic course coupled with evaluation of patients.

**OSUR 8250. Oral and Maxillofacial Surgery Rotation for the Oral and Maxillofacial Surgeon.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Rotations at assigned oral and maxillofacial surgery clinics and operating rooms at Fairview-University Medical Center, Hennepin County Medical Center, Veterans Administration Medical Center.

**OSUR 8251. Oral and Maxillofacial Surgery Core Curriculum.** (0.0-2.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Standardized curriculum of fundamental concepts of surgery and medicine. Fourteen core curriculum topics covered in a two-year cycle.

**OSUR 8253. Case Presentations and Chief Conferences.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Topic-oriented journal reviews. Guest oral surgeons, specialists, or chief resident present topics in case-based format.

**OSUR 8254. Oral and Maxillofacial Surgery Resident Presentations.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Contemporary subjects researched and presented by current residents.

**OSUR 8255. General Surgery Rotation for the Oral and Maxillofacial Surgeon.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Clinical rotation on general surgery, neurosurgery, and surgical intensive care unit at Hennepin County Medical Center. Seminars, clinics, and operating room experience.

**OSUR 8256. Contemporary Anesthesia Literature Review.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Seminars presentation format of current publications that address anesthesia management for the oral and maxillofacial surgery patient.

**OSUR 8260. Surgical Rounds for the Oral and Maxillofacial Surgeon.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Pre- and post-operative case discussions of patients currently being managed for surgery at all affiliated institutions. As they relate to individual patients, discussions involve medical, anesthesia, surgical, and management of postsurgical and sequelae complications.

**OSUR 8262. Plastic Surgery Rotation for the Oral and Maxillofacial Surgeon.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Clinical rotation at HealthPartners St. Paul Ramsey Medical Center under direction of plastic and reconstructive surgery faculty. Elective or trauma cosmetic and esthetic surgery experience.

**OSUR 8267. Anesthesia Rotation for the Oral and Maxillofacial Surgeon.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Clinical rotation at Fairview University Medical Center under direction of anesthesia faculty. After a suitable period of supervision determined by anesthesia faculty, residents are assigned their own anesthesia room and are given responsibility for pre-operative patient evaluation and inter-operative management of patient's general anesthetic.

**Organizational Leadership, Policy and Development (OLPD)**

**College of Education and Human Development**

**OLPD 5001. Formal Organizations in Education.** (3.0 cr.; fall, spring, summer, every year)
Classical/current theories of organizations. Applications to education and related fields.
OLPD 5002. Independent Colleges as Formal Organizations. (3.0 cr.; A-F or Audit; prereq: Bachelor's degree must be completed before starting this course; fall, spring, summer, every year)

Provide certificate students with an introduction to contemporary thinking on organizations/administration. Primary focus on organizational theory.

OLPD 5011. Leading Organizational Change: Theory and Practice. (3.0 cr.; fall, every year)

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.

OLPD 5021. Historical Foundations of Modern Education. (3.0 cr.; =HUM 4021, HUM 3021; )

Analysis and interpretation of important elements in modern education derived from pre-classical sources: Greeks, Romans, Middle Ages, Renaissance, Reformation, Enlightenment, and Industrial Revolution.

OLPD 5028. Education Imagery in Europe and America. (3.0 cr.; )

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, caricature.

OLPD 5041. Sociology of Education. (3.0 cr.; =SOC 5455; spring, every year)

Structures and processes within educational institutions; linkages between educational organizations and their social contexts, particularly related to educational change.

OLPD 5044. Introduction to the Economics of Education. (3.0 cr.; fall, spring, offered periodically)

Costs and economic benefits of education, with a focus on K-12; educational markets, prices, and production relationships; investment and cost-benefit analysis.

OLPD 5048. Cross-Cultural Perspectives on Leadership. (3.0 cr.; fall, summer, every year)

Introduction to cultural variables of leadership that influence functioning of cross-cultural groups. Lectures, case studies, discussion, problem-solving, simulations. Intensive workshop.

OLPD 5056. Case Studies for Policy Research. (3.0 cr.; A-F or Audit; fall, spring, summer, every year)

Qualitative case study research methods and their applications to educational policy and practice. Emphasis on designing studies that employ open-ended interviewing as primary data collection technique.

OLPD 5057. Research in International Education. (3.0 cr.; summer, every year)


OLPD 5061. Ethnographic Research Methods. (3.0 cr.; fall, spring, every year)

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.

OLPD 5080. Special Topics: Organizational Leadership, Policy, & Development. (1.0-3.0 cr. [max 24.0 cr.]; fall, spring, summer, every year)

Topical issues in organizational leadership, policy, development.

OLPD 5087. Seminar: Organizational Leadership, Policy, and Development. (1.0-3.0 cr. [max 24.0 cr.]; fall, spring, summer, every year)

Shared responsibility of students/instructor in presentation of topics.

OLPD 5095. Problems: Organizational Leadership, Policy, and Development. (1.0-3.0 cr. [max 24.0 cr.]; fall, spring, summer, every year)

Course or independent study on specific topic within department program emphasis.

OLPD 5096. Internship: Organizational Leadership, Policy, and Development. (1.0-9.0 cr. [max 24.0 cr.]; fall, spring, every year)

Internship in elementary, secondary, general, postsecondary administration, or other approved field related setting.

OLPD 5102. Knowledge Constructions and Applications in International Development Contexts. (3.0 cr.; spring, every year)

Interrelationships of knowledge capital (noetic symbolic resources) and culture through intrinsic, cross/multicultural perspectives. Distinguishing knowledge from information/data. National/international developments occurring along basic/applied knowledge paths.

OLPD 5103. Comparative Education. (3.0 cr.; fall, every year)

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.

OLPD 5104. Strategies for International Development of Education Systems. (3.0 cr.; A-F or Audit; 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.

OLPD 5107. Gender, Education, and International Development. (3.0 cr.; A-F or Audit; fall, every year)

Role of gender/gender relations in international development/education. Interdisciplinary body of literature from development studies, political science, economics, anthropology, cultural studies, gender/women's studies.

OLPD 5121. Educational Reform in International Context. (3.0 cr.; spring, every year)

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.

OLPD 5124. Critical Issues in International Education and Educational Exchange. (3.0 cr.; spring, every year)

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 pedagogy.

OLPD 5128. Anthropology of Education. (3.0 cr.; =ANTH 5128; spring, offered periodically)

Insights from educational anthropology for educators to address issues of culture, ethnicity, and power in schools.

OLPD 5132. Intercultural Education and Training: Theory and Application. (3.0 cr.; spring, every year)

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.

OLPD 5141. Global Youth Policy and Leadership: Comparative Youth Policy and Leadership. (3.0 cr.; A-F only; fall, every year)

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 in providing programs/services.

OLPD 5142. Youth Futures in International and Global Contexts. (3.0 cr.; A-F only; prereq: CIDE student or ; spring, every year)

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.

OLPD 5144. Cultural Models, Simulations, and Games. (3.0 cr.; UPPER Div or grad student; fall, every year)

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.

OLPD 5200. Special Topics in Adult Education. (1.0-8.0 cr. [max 12.0 cr.]; spring, summer, offered periodically)

Exploration of issues, methods, and knowledge in areas of adult education. Content varies.

OLPD 5201. Strategies for Teaching Adults. (3.0 cr.; A-F or Audit; prereq: Grad student only; fall, spring, summer, offered periodically)
Psychological theories of adult learning; learning styles and personality types; teaching styles; group and team learning; moderating and study circles; teaching technologies and distance learning; gender, race, and cultural communication. Applications of strategies.

OLPD 5202. Perspectives of Adult Learning and Development. (3.0 cr.; fall, summer, offered periodically)
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.

OLPD 5203. Methods of Teaching Adult Literacy. (3.0 cr.; spring, summer, every year)

OLPD 5204. Designing the Adult Education Program. (3.0 cr.; A-F or Audit; spring, offered periodically)
Designing and implementing educational programs for adults. Application of concepts, theories, and models in different adult learning situations.

OLPD 5211. Introduction to the Undereducated Adult. (1.0 cr.; A-F or Audit; summer, every year)
Definitions of literacy in workplace, community, and family. Issues: poverty/welfare, ethnicity, cultural diversity, social class, language/learning, immigrants.

OLPD 5212. Introduction to Adult Literacy in the Workplace. (1.0 cr.; A-F or Audit; prerequisite 5211 or ADED 5211; summer, every year)
Review workplace literacy programs, funding, program planning, and needs assessment. Reaching/recruiting workers. Role of employers and the unions. Writing for low literacy employees.

OLPD 5213. Introduction to Adult Literacy in the Community. (1.0 cr.; A-F or Audit; prerequisite 5211 or ADED 5211; summer, every year)
Community programs in United States. Literacy building. Family literacy skills. Correcional education in reintegrating offenders back into community. Integrating people with disabilities through community literacy programs. Literacy/development in developing countries. Reaching/recruiting indigenous, migrant, immigrant groups. Social action approaches to literacy education.

OLPD 5224. Formal Assessment of Adult Literacy. (1.0 cr.; A-F or Audit; prerequisite 5211 or ADED 5211; fall, offered periodically)
Assessment of adult English/literacy skills for work, family, and community, and continuing education. Formal testing policy, techniques, standardized tests. Assumptions about testing, cultural bias, and interpretation of formal tests. Test preparation programs.

OLPD 5225. Informal Assessment of Adult Literacy. (1.0 cr.; A-F or Audit; prerequisite 5211 or ADED 5211; fall, offered periodically)
Informal assessment of adult English/literacy skills for work, family, community, and further education. Informal testing techniques, setting educational goals, formal versus informal assessment.

OLPD 5226. Advanced Assessment of Adult Literacy. (1.0 cr.; A-F or Audit; prerequisite 5211 or ADED 5211; fall, offered periodically)
Applications/case studies. Educational planning for work, family, community.

OLPD 5233. Methods of Teaching Beginning Adult Literacy. (1.0 cr.; A-F or Audit; prerequisite 5211 or ADED 5211; fall, offered periodically)
Learning English/literacy as an adult. Initial approaches to teaching reading, writing, and communications skills. Theories of learning/curriculum design. Technology as teaching tool. Teaching students with disabilities or with cultural/gender differences.

OLPD 5234. Methods of Teaching Intermediate Adult Literacy. (1.0 cr.; A-F or Audit; prerequisite 5211 or ADED 5211; prerequisite 5233 or ADED 5233; fall, offered periodically)
Learning English/literacy as an adult. Approaches to teaching reading, writing, and communications skills. Communication/comprehension in oral/written English. English reading/oral communication skills for workplace. Evaluating commercial materials/software.

OLPD 5235. Methods of Teaching Advanced Adult Literacy. (1.0 cr.; A-F or Audit; prerequisite 5211 or ADED 5211; fall, offered periodically)
Approaches to teaching reading, writing, study, communication skills. Preparing students for college/continuing education. English in workplace/on Internet. Problem solving, analytical thinking. Technology as teaching tool. Evaluating commercial materials/software.

OLPD 5296. Field Experience in Adult Education. (1.0-6.0 cr.; S-N or Audit; fall, spring, summer, every year)
Supervised fieldwork and practice. Presentations and evaluations of adult education practices.

OLPD 5302. Educational Policy: Context, Inquiry, and Issues. (3.0 cr.; fall, spring, summer, every year)
Review of social science concepts/research in considering educational policies/issues, process of inquiry that affect policy development, implementation, evaluation. Focus on pre-K-12. Role of educational leaders, administrators.

OLPD 5310. Data-Driven Decision Making I. (1.0 cr.; prerequisite Broadband Internet access, a newer computer, spring, every year)
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.

OLPD 5311. Data-driven Decision Making II. (1.0 cr.; prerequisite 5310 or EdPA 5310)
OLPD 5341. The American Middle School. (3.0 cr.; fall, summer, every year)

OLPD 5344. School Law. (3.0 cr.; spring, summer, every year)
Legal foundations of elementary/secondary education. Statutory themes, relevant case law, emergent policy issues. Implications for educational organizations and for administrative practice.

OLPD 5346. Politics of Education. (3.0 cr.; A-F or Audit; prerequisite postbac, MEd, or grad student; fall, spring, every year)
Political dimensions of policy formulation/implementation in education. Use of power/influence in shaping educational policies and in resolving conflicts over educational issues. Analysis of consequences/cross-impacts.

OLPD 5348. Leaders of Human Resources Administration. (3.0 cr.; prerequisite Designed for students working on licensure for [dir of community educ or superintendent or...
K-12 principal or dir of special educ; spring, summer, every year)
Skills for administrator/leader. Human resources administration, employee recruitment, selection, orientation/support, supervision, performance appraisal of school district personnel.

OLPD 5356. Disability Policy and Services. (3.0 cr.; spring, summer, every year)
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.

OLPD 5361. Project in Teacher Leadership. (3.0 cr.; Student Option No Audit; =CI 5178; prereq MEd student in Teacher Leadership Program; fall, spring, summer, every year)
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.

OLPD 5364. Context and Practice of Educational Leadership. (3.0 cr.; A-F or Audit; fall; summer, every year)
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.

OLPD 5368. Leadership for Special Education Services. (3.0 cr.; prereq Administrator or supervisor or professional responsible for managing general or special or alternative education program; fall, spring, every year)
Legislative, procedural, executive, and judicial actions that affect services, families, and children with special needs at federal, state, and local levels.

OLPD 5372. Youth in Modern Society. (3.0 cr.; fall, every year)
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.

OLPD 5374. Leadership for Professional Development. (4.0 cr.; prereq Postbaccaulaeate, at least 3 yrs teaching experience; fall, every year)
Designing, implementing, evaluating staff development in preK-12 settings. Research-based standards for effective staff development. Need for embedded time for collaborative learning, evaluating staff/student outcomes.

OLPD 5381. The Search for Children and Youth Policy in the U.S.. (3.0 cr.; spring, every year)
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.

OLPD 5385. Licensure Seminar: Program Policies and Inclusionary Leadership. (1.0 cr.; S-N or Audit; fall; spring, summer, every year)
Preparation for licensure program. Program overview, preassessment, reflective practice, APA writing, exit panel review, administrative employment interview.

OLPD 5386. Leadership Portfolio Seminar. (1.0 cr.; S-N or Audit; prereq 5385 or &5385 or EDPA 5385; fall, spring, summer, every year)
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.

OLPD 5387. Leadership for Teaching and Learning. (3.0 cr.; spring, summer, every year)
Multiple aspects of administrating teaching/learning. Administration of teaching/learning as system in inclusive schools. Questions administrator must ask as leader of learning for students/adults.

OLPD 5388. Leadership for Master(ful) Scheduling. (2.0 cr.; fall, summer, every year)
Work of high-performing professional learning communities. Implications for moving from building master schedule to leadership for masterful scheduling of time, space, motion, people. Hands-on work with infinite campus software/scheduling-building logic.

OLPD 5389. Community Education Leadership. (3.0 cr.; spring, every year)
Competencies of leadership, community relations, communication, community assessment, program development, program evaluation. Philosophy/administration of community/alternative education programs.

OLPD 5391. Special Education Law for Leaders. (1.0 cr.; prereq Designed for students working on licensure in PK-12 administration; fall, summer, every year)
Competencies of leadership, policy, and political influence. Legal/regulatory applications focusing on special education law.

OLPD 5392. Special Education Finance: Program Models, Policy, and Law. (2.0 cr.; prereq [5324 or &5324 or EDPA 5324 or &EDPA 5324]. Knowledge of special education; summer, every year)
How special education revenue is a resource to accomplish student-related objectives. Revenue sources, compliance, budget monitoring. Key policy, case law, program models from perspective of director of special education.

OLPD 5393. Leading School Finance Elections. (1.0 cr.; S-N or Audit; spring, every year)
Comprehensive planning model for conducting school finance elections. Emphasizes systems, strategies, and campaign tactics.

OLPD 5394. Leadership in Community Education Finance and Law. (1.0 cr.; S-N or Audit; prereq [5324 or EDPA 5324] recommended; summer, every year)
Interplay between finance and laws directly applicable to community education. MN Statute 124D, revenues/expenditures, and UFARS approached from frame of resource development.

OLPD 5396. Field Experience in PK-12 Administration: Authentic Practice in Leadership. (3.0 cr. [max 12.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Field experience or internship arranged for students seeking licensure as PK-12 principal/superintendent. Content/credit depend on licensure requirements specified in individual field experience agreement.

OLPD 5402. Education and Human Resource Development Through Tourism. (3.0 cr.; A-F or Audit; spring, offered periodically)
Policies/practices of education and human resource development in tourism industry.

OLPD 5403. Tourism Studies Capstone Seminar. (3.0 cr.; S-N or Audit; prereq Tourism studies major; fall, offered periodically)
Students present, critique, and discuss implications of supporting programs for tourism.

OLPD 5404. The Business of Tourism. (3.0 cr.; A-F or Audit; fall, offered periodically)
Introduction to major theories, concepts, skills, and techniques influencing tourism business/industry.

OLPD 5405. Critical Issues in Business and Industry. (3.0 cr.; spring, every year)
Identification and analysis of major current issues in business and industry education.

OLPD 5411. Teaching Marketing Promotion. (3.0 cr.; A-F or Audit; spring, summer, every year)
Materials, methods, and approaches to teaching marketing promotion. Covers the basic elements of the marketing mix: advertising, promotion, public relations, direct selling, visual merchandising, and direct marketing.

OLPD 5452. Methods of Teaching Business and Marketing Concepts. (3.0 cr.; A-F or Audit; fall, every year)
Recent research/developments in teaching business concepts related to economics, business organization/management, business law, entrepreneurship, marketing, international business, information systems, accounting, risk management, and personal finance.

OLPD 5454. Technical Development: Specialized. (1.0-12.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year)
Students select/study technical processes/ principles based on subjects they plan to teach, integrate specialized technical instruction in advanced/emerging areas.

OLPD 5457. Methods of Teaching Business Employment and Marketing Employment. (3.0 cr.; A-F or Audit; spring, every year)
Recent research/developments in teaching for business employment. Administrative support positions, accounting/information processing,
marketing, sales, computer operations, other occupations using desktop computing.

OLPD 5475. Curriculum Development for Business and Marketing Education. (3.0 cr.; A-F or Audit; fall, summer, every year) Introduction to conceptual models for design/delivery of business/marketing education programs in secondary/postsecondary schools, in adult education settings, and in business/industry. Preparing programs of instruction for secondary/postsecondary level. Making decisions regarding course content.

OLPD 5476. Field Based Projects in Business and Industry. (1.0-4.0 cr.; S-N or Audit; fall, spring, summer, every year) Curricular, instructional, developmental, or evaluative problems and projects applicable to local school or business and industry situations.

OLPD 5480. Special Topics in Business and Industry Education. (1.0-4.0 cr.; spring, summer, every year) Content varies by offering.

OLPD 5493. Directed Study in Business and Industry. (1.0-4.0 cr.; fall, spring, summer, every year) In-depth individual inquiry in the content areas related to business and industry.

OLPD 5496. Occupational Experience in Business and Industry. (1.0-10.0 cr.; S-N or Audit; prereq #; fall, spring, summer, every year) Observation/employment in business/industry to develop technical/occupational competencies. Includes 100 clock hours of supervised work experience per credit.

OLPD 5501. Principles and Methods of Evaluation. (3.0 cr.; [EPSY 5243]; fall, spring, summer, every year) Introduction to program evaluation. Planning an evaluation study, collecting and analyzing information, reporting results; evaluation strategies; overview of the field of program evaluation.

OLPD 5502. Theory and Models of Evaluation. (3.0 cr.; [EPSY 5243] or PA 5311 or PUBH 6034 or another introductory evaluation course approved by instructor; fall, summer, every year) Evaluation theories/models currently available to practitioners. Communication with clients about value/utility of program. Systems theory.

OLPD 5521. Cost and Economic Analysis in Educational Evaluation. (3.0 cr.; fall, every year) Use and application of cost-effectiveness, cost-benefit, cost-utility, and cost-feasibility in evaluation of educational programs and programs.

OLPD 5524. Evaluation Colloquium. (1.0 cr. [max 24.0 cr.]; S-N or Audit; [EPSY 5246]; [EPSY 5243]; fall, spring, every year) Informal seminar of faculty/students. Issues/problems of program evaluation.

OLPD 5528. Focus Group Interviewing Research Methods. (3.0 cr.; fall, every year) Skills needed to conduct focus group interviews. Students conduct focus group study and report results at final class session.

OLPD 5601. Foundations of Human Resource Development. (1.0 cr.; fall, spring, summer, every year) Introduction to human resource development as a field of study and practice.

OLPD 5602. Economic Foundation of Human Resource Development. (1.0 cr.; prereq 5601 or HRD 5101; fall, spring, summer, every year) Introduction to economics as core discipline supporting theory/practice of human resource development.

OLPD 5603. Psychological Foundation of Human Resource Development. (1.0 cr.; prereq 5601 or HRD 5101; fall, spring, summer, every year) Introduction to psychology as core discipline supporting theory/practice of human resource development.

OLPD 5604. Systems Foundation of Human Resource Development. (1.0 cr.; prereq 5101; fall, spring, summer, every year) Introduction to system theory as a core discipline supporting the theory and practice of human resource development.

OLPD 5605. Strategic Planning through Human Resources. (3.0 cr.; A-F or Audit; prereq 5607 or 5615 or HRD 5201 or HRD 5301; spring, offered periodically) Strategic nature of organizations. How HRD can align its goals with those of organization. Strategic planning, systems thinking. Ways HRD managers can become strategic players in organization.

OLPD 5606. Evaluation in Human Resource Development. (3.0 cr.; A-F or Audit; spring, summer, every year) Evaluation of human resource development efforts from the perspective of impact on organizations, work processes, and individuals, plus follow-up decisions.

OLPD 5607. Organization Development. (3.0 cr.; A-F or Audit; prereq Grad student only; fall, spring, summer, offered periodically) Introduction to major concepts, skills, and techniques for organization development/change.

OLPD 5610. Survey of Research Methods and Emerging Research in Human Resource Development. (3.0 cr.; A-F or Audit; prereq [Registered, in attendance] at conference of Academy of HRD; spring, offered periodically) 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.

OLPD 5611. Facilitation and Meeting Skills. (1.0 cr.; fall, spring, summer, every year) 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.

OLPD 5612. International Human Resource Development. (3.0 cr.; prereq Grad students only; ugrd seniors with instr consent; fall, spring, summer, every year) Problems, practices, programs, theories, and methodologies in human resource development as practiced internationally.

OLPD 5613. Training and Development of Human Resources. (3.0 cr.; A-F or Audit; prereq Grad student only; spring, summer, offered periodically) Training/development of human resources in organizations. Process phases of analysis, design, development, implementation, and evaluation.

OLPD 5616. Training on the Internet. (3.0 cr.; prereq Grad student only; spring, summer, every year) Major concepts, skills, and techniques for giving and receiving training on the Internet.

OLPD 5619. Planning and Decision-Making Skills. (1.0 cr.; fall, spring, summer, every year) 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.

OLPD 5625. Technical Skills Training. (3.0 cr.; summer, offered periodically) 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.

OLPD 5670. Special Topics in Human Resource Development. (1.0-3.0 cr. [max 24.0 cr.]; fall, spring, summer, every year) Issues, methods, and knowledge in HRD areas. Topics vary.

OLPD 5696. Internship: Human Resource Development. (1.0-10.0 cr.; S-N or Audit; prereq [[5001 or HRD 3601] or [3696 or HRD 3196] or [3620 or 3640 or HRD 3201 or HRD 3301] or [3202 or ADED 3101, undergraduate] or [5607 or 5615 or HRD 5201 or HRD 5301] or [5801 or WHRE 5001, grad student]]; #; fall, spring, offered periodically) Students apply/contract for human resource development positions.

OLPD 5697. International Field Study in Human Resource Development. (3.0 cr. [max 6.0 cr.]; A-F only; prereq 5001; spring, summer, every year) Engage in international travel/study for one week with an HRD faculty leader. Visit a variety of sites in business and industry to become aware of how HRD is practiced outside the United States.

OLPD 5701. U.S. Higher Education. (3.0 cr.; fall, summer, every year) U.S. higher/postsecondary education in historical/contemporary perspective. Emphasizes structure, history, and purposes of system as a whole.
OLPD 5704. College Students Today. (3.0 cr.; =EPSY 5451; spring, summer, every year) Issues involving population of students in colleges/universities. College student development theory, students' expectations/interests. How college affects student outcomes. Role of curricular/extracurricular activities. Student-faculty interaction.


OLPD 5721. Race and Ethnicity in Higher Education. (3.0 cr.; fall, spring, summer, every year) Review of research. Theoretical frameworks, methodological perspectives, and research strategies used to study students, staff, and faculty. Historical perspectives.

OLPD 5724. Leadership and Administration of Student Affairs. (2.0-3.0 cr.; =EPSY 5421; fall, spring, offered periodically) Scope, administration, coordination, and evaluation of programs in college and university student affairs.

OLPD 5728. Two-Year Postsecondary Institutions. (2.0-3.0 cr.; fall, spring, offered periodically) Present status, development, functions, organization, curriculum, and trends in postsecondary, but nonbaccalaureate, institutions.

OLPD 5732. The Law and Postsecondary Institutions. (3.0 cr.; fall, spring, offered periodically) Analysis of court opinions and federal regulations affecting postsecondary educational institutions.

OLPD 5734. Institutional Research in Postsecondary Education. (2.0-3.0 cr.; A-F or Audit; prereq [5701, EPSY 5231 or EPSY 8261], grad student) or #; fall, offered periodically) Scope, role, administration, research strategies, and evaluation of institutional research in postsecondary institutions. Methodologies, disciplinary foundations of research. Use of institutional, state, and national databases in addressing institutional missions/functions.

OLPD 5736. Public Engagement and Higher Education. (3.0 cr.; A-F only; spring, every year) Study/practice of public engagement in higher education. Civic roles of post-secondary education institutions.

OLPD 5795. Plan B Research Design. (3.0 cr. [max 6.0 cr.]; A-F or Audit; 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.

OLPD 5801. Survey: Human Resource Development and Adult Education. (3.0 cr.; prereq Grad student only; fall, spring, summer, every year) Overview of fields of human resource development and adult education. Societal context, theories, processes, definitions, philosophies, goals, sponsoring agencies, professional roles, participants, and resources. Unique characteristics and ways fields overlap and enhance one another.

OLPD 5804. Leadership in OLPD. (2.0 cr.; spring, summer, every year) Leadership, leadership roles/responsibilities. Application to Organizational Leadership, Policy, Development.


OLPD 5808. Student and Trainee Assessment. (2.0 cr.; A-F or Audit; =HRD 5601; fall, spring, summer, every year) Developing learning progress reporting systems/tests for skills instruction in business/industry. Evaluating instructional effectiveness. Applying tests/evaluation instruments to assess/report learning. Students develop each type of test and evaluation plan for a course.

OLPD 5811. Education for Work. (3.0 cr.; spring, offered periodically) Examination of contextual bases underlying education for work; implications for practice.


OLPD 5813. Enhancing Work-based Learning Through Collaboration. (2.0 cr.; summer, every year) Interagency planning issues/practices relating to special populations for educational, business, and human service organization personnel, family members, and advocates.

OLPD 5814. Developmental Writing and the College Student: Theory and Practice. (3.0 cr.; prereq Bachelor's degree; fall, offered periodically) Basic grounding in theory/practice of college-level developmental writing instruction. History of "basic writing," development of notions of "academic discourse," error/grammar in student writing, best classroom practices, current issues.

OLPD 5815. Research in Postsecondary Developmental Education. (3.0 cr.; prereq Bachelor's degree, courses in [intro psychology, basic statistics]; fall, spring, offered periodically) 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.

OLPD 5816. Distance Learning in Adult Education and Training. (3.0 cr.; A-F or Audit; fall, spring, every year) Distance learning concepts, theory, history, present practice, delivery systems, course design, major issues, future directions.

OLPD 5819. Evaluating and Using Research in Organizations and Education. (3.0 cr.; A-F or Audit; prereq Grad student; fall, spring, summer, every year) Role of educational research in professional practice. Problems of practice for research. Alternative modes of research. Synthesis/application of results of research.


OLPD 5823. Work-Based Learning Policies. (2.0 cr.; fall, summer, offered periodically) Aims/purposes of federal, state, and local policies, related to work-based learning.

OLPD 5824. Diversity and Organizational Transformation in Organizational Leadership, Policy, and Development. (3.0 cr.; spring, offered periodically) Developing models for understanding impact of diversity on individual, organizational, community outcomes. Discuss organizational change in relation to diversity.


OLPD 5829. Course Development for Business and Industry. (2.0 cr.; A-F or Audit; fall, spring, summer, every year) 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.

OLPD 5841. Evaluation of OLPD. (3.0 cr.; fall, spring, every year) Designing/conducting project, program, systems evaluations in work/human resource education contexts/settings.

OLPD 5842. Global Program Delivery Techniques and Technology of Extension. (2.0 cr.; A-F or Audit; fall, offered periodically) 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.

OLPD 5845. The Entrepreneurial Independent College. (3.0 cr.; A-F or Audit; prerequisite Must have completed Bachelors degree before taking this course.; fall, spring, summer, every year) Financial management/entrepreneurial strategies for independent college. Enrollment management, revenue generating strategies, branding/marketing, fundraising, developing/sustaining entrepreneurial institutions. Design strategies for independent colleges.

OLPD 5851. Methods for Change in Developing Countries. (3.0 cr.; A-F or Audit; fall, offered periodically) 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.

OLPD 5861. Instructional Methods for Business and Industry. (2.0 cr.; spring, every year) 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.

OLPD 5871. Teaching Entrepreneurship: Small Business Management. (3.0 cr.; fall, offered periodically) Methods, organization, curriculum development and modification, and implementation of educational programs for entrepreneurs.

OLPD 5890. Special Topics in Organizational Leadership, Policy, and Development. (1.0-4.0 cr.; fall, spring, summer, every year) Topics vary.

OLPD 5893. Directed Study in OLPD. (1.0-4.0 cr.; fall, spring, summer, every year) Self-directed study, with faculty advice, in areas not covered by regular courses.

OLPD 5896. Teaching Internship: Introduction. (1.0 cr.; S-N only; prerequisite Admission to initial licensure program; fall, summer, every year) Initial experiences in teaching profession. Observation of school organization/administration, seminars, relationship building with cooperating teachers, reflection on personal involvement as a beginning student teacher.

OLPD 5897. Teaching Internship: School and Classroom Settings. (2.0 cr.; prerequisite 5696 or WHRE 5696; fall, every year) Part-time supervised teaching experience in school. Seminars on managing student learning in context of work/human resource education programs in contemporary schools. Becoming a reflective educator.

OLPD 5898. Teaching Internship. (3.0-8.0 cr.; prerequisite Admission to initial licensure program; spring, every year) Teaching experience in a school system that provides programs for grades 5-12.

OLPD 5899. Teaching Internship: Extended. (1.0 cr.; prerequisite 5898 or WHRE 5698; spring, summer, every year) Teaching experience in school systems that provides programs for grades 5-12.

OLPD 5902. Leading Change in Independent Colleges. (3.0 cr.; A-F or Audit; prerequisite Must have Bachelors degree awarded prior to taking this course.; fall, spring, summer, every year) Theories of organizational change process/application for leading independent colleges with unique cultures/distinctive missions. Factors impacting change process/implementations for leading independent colleges.

OLPD 8002. Critical Issues in Contemporary Education. (3.0 cr.; prerequisite EdD or PhD student; fall, spring, every year) 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.

OLPD 8011. Doctoral Research Seminar I. (1.0 cr.; S-N or Audit; prerequisite EdPA or WHRE doctoral student; fall, summer, every year) 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.

OLPD 8012. Doctoral Research Seminar II. (1.0 cr.; S-N or Audit; prerequisite EdPA doctoral student; spring, summer, every year) Introduction to quantitative/qualitative research approaches/methods. Nature of research, role of researcher, philosophical perspectives on research, ethical issues in conducting research.

OLPD 8013. Doctoral Research Seminar III. (1.0 cr.; S-N or Audit; prerequisite EdPA doctoral student; fall, spring, every year) Introduction to most important quantitative/ qualitative approaches employed in educational policy research.

OLPD 8014. Doctoral Research Seminar IV. (1.0 cr.; S-N or Audit; prerequisite EdPA doctoral student; spring, every year) Preparation of thesis prospectus.

OLPD 8015. Research Design and Educational Policy. (3.0 cr.; A-F only; prerequisite [8011 or EDPA 8011], OLPD PhD student; fall, every year) Logic of research design, from research questions and audience considerations to selecting a design for collecting/analyzing quantitative, qualitative, and mixed-method data.

OLPD 8016. Research Design and Educational Policy. (3.0 cr. [max 6.0 cr.]; prerequisite [8015 or EDPA 8015], CEHD doctoral student; #; fall, every year) Logic of research design, from research questions to selecting a design for collecting/analyzing quantitative, qualitative, and mixed-method data. Writing proposals that build a reasoned statement of research problem.

OLPD 8020. Leadership: From Theory to Reflective Practice. (3.0 cr.; A-F or Audit; prerequisite [5001 or EDPA 5001 or equiv], doctoral student or #; fall, offered periodically) Leadership theory. Emphasizes seminal scholars' work from related social science disciplines. Implications of theory for practice of leadership. Knowledge, behaviors, values, and skills needed in educational and other public settings.

OLPD 8022. Education and Globalization: Anthropological Perspectives. (3.0 cr.; A-F or Audit; spring, every year) Anthropological/comparative perspectives used to understand educational processes in a globalized world. What can be gained by adopting translocal view of educational phenomena.

OLPD 8087. Seminar: Organizational Leadership, Policy, and Development. (1.0-3.0 cr.; max 24.0 cr.; fall, spring, summer, every year) Topical issues.

OLPD 8095. Problems: Organizational Leadership, Policy, and Development. (1.0-3.0 cr.; max 24.0 cr.; fall, spring, summer, every year) Independent study on issues of educational policy/administration. Arranged with instructor.

OLPD 8096. Internship: Organizational Leadership, Policy, and Development. (1.0-9.0 cr.; max 24.0 cr.; fall, spring, every year) Internship on issues of educational policy/administration. Arranged with instructor.

OLPD 8101. International Education and Development. (3.0 cr.; A-F or Audit; prerequisite Doctoral student or #; fall, every year) History of international development in post-World War II era. Theories of how education affects economic, political, social development. Case studies of contemporary international development/education issues.

OLPD 8103. Comparative Education. (3.0 cr.; A-F or Audit; prerequisite Doctoral student or #; fall, every year)
OLPD 8143. Integrative Seminar in Global Youth Policy and Leadership. (1.0 cr. [max 3.0 cr.]; A-F only; prereq CIDE student or #; fall, spring, every year) 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.

OLPD 8301. Contexts of Learning. (3.0 cr.; fall, spring, offered periodically) Study of long-term contextual understanding of education as a social institution. Development of perspective-driven explanation.


OLPD 8303. Modeling the Learning Organization. (3.0 cr. [max 4.0 cr.]; fall, spring, offered periodically) 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.

OLPD 8311. Understanding and Using Research for Educational Improvement. (3.0 cr.; A-F only; prereq Statistics; summer, odd years) Research design principles to identify when findings best contribute to local decisions. Frameworks for evaluating/synthesizing findings to incorporate research in personal/team decision-making.

OLPD 8312. Inquiry for School Improvement Part I. (3.0 cr.; A-F only; prereq 8311 or EDPA 8311; fall, spring, summer, every year) First of two-course sequence. How to draw upon data sources, select/design data-collection instruments, and synthesize data to guide action planning. Role of leader in creating conditions for collaborative inquiry.

OLPD 8313. Inquiry for School Improvement Part II. (3.0 cr.; A-F only; prereq 8312 or EDPA 8312; fall, spring, summer, every year) Continuation of 8312. Data collection/analysis techniques that carry out realistically/effectively alongside improvement efforts within school/district. Role of leader in sustaining collaborative inquiry.

OLPD 8314. Data Analysis for Educational Management. (3.0 cr.; fall, spring, summer, offered periodically) 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.

OLPD 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, every year) (No description)

OLPD 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, every year) (No description)

OLPD 8495. Research Problems: Business and Industry. (3.0-6.0 cr.; S-N or Audit; prereq Adviser approval; fall, spring, summer, every year) Individual research in business and industry education.

OLPD 8502. Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives. (3.0 cr.; prereq 5501 or EDPA 5501 or EPSY 5243; spring, every year) Concepts, approaches, models, and theoretical frameworks for program evaluation that have developed since the 1960s.

OLPD 8595. Evaluation Problems. (1.0-6.0 cr. [max 24.0 cr.]; =[EPSY 8295]; prereq [5501 or EDPA 5501 or EPSY 5243]; #; fall, spring, summer, every year) Independent study of an issue in theory or practice of program evaluation.

OLPD 8596. Evaluation Internship. (1.0-9.0 cr. [max 24.0 cr.]; prereq [5501 or EDPA 5501 or EPSY 5243]; #; fall, spring, summer, every year) Hands-on experience in conducting program evaluation in real-world setting under supervision of evaluation professional.

OLPD 8601. Advanced Training and Development of Human Resources. (3.0 cr.; A-F or Audit; prereq 5615 or HRD 5201; fall, offered periodically) Personnel training/development research. Critical review of selected/innovative practices.

OLPD 8602. Advanced Organization Development. (3.0 cr.; A-F or Audit; prereq 5607 or HRD 5301; spring, offered periodically) Organization development research. Critical review of selected, innovative practices.

OLPD 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, every year) Pre-thesis credit

OLPD 8702. Administration and Leadership in Higher Education. (3.0 cr.; prereq [5001 or EDPA 5001], [5701 or EDPA 5701]; fall, spring, every year) Leadership, governance, and administration in higher education through theoretical perspectives and practical analysis. Planning, change, decision making, organizational culture, budgets, conflict.

OLPD 8703. Public Policy in Higher Education. (3.0 cr.; A-F or Audit; prereq [5001 or EDPA 5001], [5701 or EDPA 5701]; fall, every year) 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.


OLPD 8724. Strategic Planning in Higher Education. (2.0-3.0 cr.; prereq 5701 or EDPA 5701; fall, offered periodically) Strategic planning principles, their application to higher education. Pitfalls encountered by planners. Tools of strategic planning/management. Case studies.

OLPD 8728. Economics of Higher Education. (2.0-3.0 cr.; fall, offered periodically) Institutional responses to changing national and governmental policies. Economic effects resulting from higher education’s output in teaching, research, and service. Research on institutional and governmental policies.

OLPD 8732. Financing Higher Education. (3.0 cr.; prereq 5701;) Theories and critical issues in financing postsecondary education. Budgeting, cost-effectiveness, state/federal funding policies, tuition policies, student financial aid, financing educational opportunity.

OLPD 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester
or summer; 10 cr total required [Plan A only]; spring, summer, every year) (No description) OLPD 8800. Organizational Leadership, Policy, and Development Colloquium. (1.0-3.0 cr.; [max 12.0 cr.]; fall, spring, summer, every year) Selected topics regarding work/human resource education professionals. Topics based on interest/demand.

OLPD 8801. Advanced Theory in Human Resource Development and Adult Education. (3.0 cr.; A-F or Audit; prereq 5801 or ADED 5001 or WHRE 5001; fall, offered periodically) Theory of individuals/organizations as adaptive entities. Roles of human resource development and adult education in mediating complex demands.

OLPD 8811. Foundations of Inquiry in Organizational Leadership, Policy, and Development. (3.0 cr.; A-F or Audit; fall, spring, every year) Practice of inquiry in Organizational Leadership, Policy, Development. Identify research problem/research questions. Quantitative/qualitative methods of research. Issues related to ethics of research.

OLPD 8812. Quantitative Research in Education. (3.0 cr.; fall, every year) Assumptions, procedures for, considerations in planning/conducting quantitative research in education.

OLPD 8815. Ethics and Responsible Research. (1.0 cr.; A-F or Audit; fall, spring, summer, offered periodically) Introduction to ethical/legal issues involved in practicing responsible educational research. Key issues, formal/informal codes of conduct, ethical reasoning.

OLPD 8841. Foundations of Organizational Leadership, Policy, and Development. (3.0 cr.; fall, offered periodically) Key historical/philosophical concepts in work, career, adult development. Individual/organizational change. Learning through experience.

OLPD 8842. Comparative Systems in Organizational Leadership, Policy, and Development. (3.0 cr.; prereq 8141 or WHRE 8141; spring, offered periodically) Looking critically across/within countries/regions at structures intended to deliver work-career-related education/training.

OLPD 8843. Contemporary Workforce and Workplace Issues. (3.0 cr.; A-F or Audit; spring, offered periodically) Workforce preparation/retraining. Impact of cultural, political, and economic changes.

OLPD 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description) OLPD 8890. Research Seminar. (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq [8911 or WHRE 8911], [8812 or OLPD 8913 or OLPD 8914 or WHRE 8912] or #; fall, offered periodically) Developing, reporting, and evaluating research. Participants make/react to presentations.

OLPD 8896. Internship. (1.0-10.0 cr.; S-N or Audit; fall, spring, summer, every year) Student applies for position in professional practice; individual arrangements describe specific responsibilities during internship. Ed.D. program requirement.

**Orthodontics (OTHO) School of Dentistry**

**OTHO 8121. Orthodontic Seminar.** (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; summer, every year) Evaluating orthodontic literature, including preparation and presentation of literature reviews.

**OTHO 8122. Orthodontic Seminar.** (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; fall, every year) Evaluating orthodontic literature, including preparation and presentation of literature reviews.

**OTHO 8123. Orthodontic Seminar.** (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; spring, every year) Evaluating orthodontic literature, including preparation and presentation of literature reviews.

**OTHO 8131. Topics in Orthodontics.** (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; spring, summer, every year) Theoretical aspects of kinematics and biological reactions to orthodontic forces, risk management and jurisprudence, public health aspects of orthodontics, practice management.

**OTHO 8132. Topics in Orthodontics.** (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; fall, spring, every year) Theoretical aspects of kinematics and biological reactions to orthodontic forces, risk management and jurisprudence, public health aspects of orthodontics, practice management.

**OTHO 8133. Topics in Orthodontics.** (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; spring, every year) Theoretical aspects of kinematics and biological reactions to orthodontic forces, risk management and jurisprudence, public health aspects of orthodontics, practice management.

**OTHO 8141. Research in Orthodontics.** (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; fall, spring, every year) Required for all degree candidates. Preparation, execution, and evaluation of all ongoing research projects and pertinent literature.

OTHO 8142. Research in Orthodontics. (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; fall, spring, every year) 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 8233. Plastic and Reconstructive Surgery: Head and Neck. (1.0 cr.; A-F or Audit; prereq Otol major; fall, spring, summer, every year)

Otolaryngologic cosmetic surgery emphasizing rhinoplasty and otoplasty.

OTOL 8234. Anatomy of the Head and Neck and Temporal Bone Dissection. (2.0 cr.; prereq Grad otol major or #; fall, spring, summer, every year)

Head and neck anatomy studied from cadaver through programmed learning. Temporal bones dissected to learn anatomy and to practice otologic surgical procedures. S/N for nonmajors only.

OTOL 8235. Roentgenology of the Head and Neck. (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Principles and procedures in roentgenology for otolaryngologic and head and neck problems.

OTOL 8236. Pharmacology in Otolaryngology. (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Principles of pharmacology as they relate to otolaryngology.

OTOL 8237. Endoscopy. (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Didactic and practical instruction in laryngoscopy, esophagoscopy, bronchoscopy, and mediastinoscopy. General management principles emphasized.

OTOL 8238. Pathology of the Ear, Nose, and Throat. (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Gross pathology and histopathology of diseases of the ear, nose, throat, and related regions.

OTOL 8239. Oto-neurology. (1.0-2.0 cr. [max 12.0 cr.]; prereq Grad otol major or #; fall, spring, summer, every year)

Instruction and experience in diagnosis and management of otoneurologic problems, including training in electronystagmographic analysis of vestibular function.

OTOL 8240. Allergy. (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Concepts and management of otolaryngologic allergy.

OTOL 8241. Cancer of the Head and Neck. (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Clinical head and neck oncology; etiology, treatment (both surgical and nonsurgical), and other principles of management.

OTOL 8242. Audiology and Speech Pathology. (2.0 cr.; prereq Grad otol major or #; fall, spring, every year)

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. (1.0 cr.; prereq Grad otol major or #; fall, spring, every year)

Statistical methods, experimental design, and execution of otolaryngologic research. Ethics of research with human and animal subjects.

OTOL 8244. Seminar: Current Literature. (1.0 cr.; prereq Grad otol major or #; fall, spring, summer, every year)

Presentation and discussion of selected articles. Required for all otolaryngology graduate students.

OTOL 8247. Anatomy and Physiology of Hearing and Balance. (3.0 cr.; =[NSC 8247]; prereq #: spring, every year)

Review of recent progress in biochemical aspects of auditory end organs. Required for all otolaryngology graduate students.

OTOL 8248. Directed Readings in Auditory Physiology. (1.0-2.0 cr.; =[NSC 8248]; prereq #: fall, spring, every year)

Current research on biophysics and physiology of auditory system; topics selected for each student. Written reviews prepared and discussed.

OTOL 8249. Current Topics in Cochlear Anatomy. (1.0 cr.; prereq #: fall, spring, every year)

Review of current research papers concerning cochlear anatomy and pathology.

OTOL 8250. Advanced Biochemistry of the Auditory System. (1.0 cr.; prereq MdBc 6100, MdBc 6101 or equiv or #: fall, spring, summer, every year)

Review of recent progress in biochemical aspects of auditory end organs.

OTOL 8251. Molecular Carcinogenesis of Head and Neck Squamous Cell Carcinoma. (2.0 cr. [max 6.0 cr.]; prereq MICA 8009 or &MICA 8009 or #: fall, spring, summer, every year)

Current topics in molecular carcinogenesis of head and neck squamous cell carcinoma.

OTOL 8262. Advanced Clinical Audiology. (2.0 cr.; prereq Grad otol major, 8242 or #: fall, spring, summer, every year)

Comprehensive reading and practicum in audiology evaluation of patients. Assesses basic knowledge of clinical audiology. Each session devoted to aspect of audiology evaluation or aural rehabilitation, including behavioral audiometry, electrophysiologic evaluation, hearing aid selection, and cochlear implants.

OTOL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

OTOL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

OTOL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)

Doctoral Pre-Thesis Credits

OTOL 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

(No description)

OTOL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

(No description)

Pediatric Dentistry (PDEN)
School of Dentistry

PDEN 8010. Pediatric Dentistry Diagnosis and Treatment Planning. (1.0 cr. [max 5.0 cr.]; S-N only; fall, spring, summer, every year)

Systematic approach to diagnosis of and treatment planning for various pediatric dentistry problems. Faculty/peer review of selected patient cases managed by students. Patient care is reviewed/discussed to ensure appropriate treatment protocols and quality of care.

PDEN 8031. Independent Study in Pediatric Dentistry. (2.0 cr.; S-N only; fall, spring, summer, every year)

Independent readings from pediatric dentistry textbooks in preparation for an oral exam. May include additional clinical experiences.

PDEN 8100. Hospital Pediatric Dentistry. (1.0 cr.; S-N or Audit; fall, spring, summer, every year)

Faculty-supervised diagnosis/treatment of pediatric dentistry problems at Fairview-University Medical Center and Hennepin County Medical Center. Rotation seminars in pediatrics/anesthesia. Pre-post-operative discussion/evaluation of treatment plans.

PDEN 8110. Pediatric Dentistry Outreach Experiences. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, summer, every year)

Faculty-supervised diagnosis and treatment of pediatric dentistry problems at Hennepin County Medical Center, the CUHCC Clinic, and other off-site locations. Participation on a rotation basis in seminars in pediatrics.
and anesthesia. Pre/postoperative seminar discussion and evaluation of treatment plans.

Periodontics (PERO)  
School of Dentistry

PERO 5123. Practice Management Extenship. (1.0 cr.; prereq: Resident in advanced education program in periodontology; spring, every year)  
Familiarizes periodontal students with the private practice environment and prepares them to select the type of practice they want to purchase or build and successfully manage their office.

PERO 8000. Advanced Clinical Periodontology. (1.0-3.0 cr.; A-F or Audit; prereq: Resident in advanced education program in periodontology; fall, spring, summer, every year)  
Clinical training in examination, diagnosis, treatment planning, and various phases of prevention and treatment of periodontal diseases in patients.

PERO 8200. Clinical Seminars. (1.0 cr.; prereq: Resident in advanced education program in periodontology; fall, spring, summer, every year)  
tbd

PERO 8250. Anatomy of the Periodontium. (1.0 cr.; A-F or Audit; prereq: Resident in advanced education program in periodontology; spring, summer, every year)  
Gingival tissues, cementum, periodontal ligament, and alveolar bone discussed from histological, physiological, and pathological point of view.

Pharmacology (PHCL)  
Medical School

PHM 5200. New-Drug Development Process. (1.0 cr.; fall, spring, offered periodically)  
New-drug development process in the U.S. pharmaceutical industry.

PHM 8100. Seminar: Pharmacodynamics. (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq: Grad Phm major; fall, spring, every year)  
tbd

PHM 8110. Readings in Pharmacodynamics. (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq: Grad Phm major; fall, spring, every year)  
Current literature.

PHM 8120. Readings in Central Nervous System (CNS) Drug Delivery. (1.0 cr. [max 4.0 cr.]; S-N only; prereq: PhD major; fall, spring, every year)  
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. (1.0 cr. [max 12.0 cr.]; S-N or Audit; =PHAR 6223; prereq: Grad Phm major; fall, spring, every year)  
Current concepts and literature review.

PHM 8295. Research Problems in Pharmacodynamics. (1.0-12.0 cr. [max 72.0 cr.]; S-N or Audit; prereq: #; fall, spring, summer, every year)  
Experimental investigation of problems in pharmacodynamics.

PHM 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq: Master’s student, adviser and GDS consent; fall, spring, summer, every year)  
(No description)

PHM 8411. Stabilization of Pharmaceuticals. (3.0 cr.; 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. (4.0 cr.; A-F or Audit; fall, spring, offered periodically)  
Topics in kinetics of drug absorption, distribution, metabolism, and excretion.

PHM 8431. Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models. (4.0 cr.; A-F or Audit; = [BMEN 8431]; prereq: Differential equations course including introduction to partial differential equations or #; spring, every year)  
Physical, chemical, physiological, cell biological, mathematical principles underlying design of delivery systems for drugs. Small molecules, proteins, genes.

PHM 8441. Solubility and Solid-State Properties of Drugs. (3.0 cr.; A-F or Audit; prereq: Physical chem survey course or #; fall, odd years)  
Physical/physicochemical properties of drugs in solid state as related to drug delivery.

PHM 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq: Doctoral student, adviser and GDS consent; fall, spring, summer, every year)  
(No description)

PHM 8481. Advanced Neuropharmacodynamics. (4.0 cr.; A-F or Audit; = [NSC 8481, CMG 8481]; prereq: PhD major; fall, every year)  
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. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)  
tbd

PHM 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq: PhD major; fall, spring, summer, every year)  
10 cr total required [Plan A only]; fall, spring, every year)  
(No description)
potential use in diagnosis/prognosis of various disease conditions, including cancers. Biology of small RNAs and their role in health and disease.

**PHCL 8026. Neuro-Immune Interactions.** (3.0 cr.; prereq MICA 8001 or equiv or #; fall, every year) Regulatory systems (neuroendocrine, cytokine, autonomic nervous systems) linking brain/immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation.

**PHCL 8100. Laboratory Research in Pharmacology.** (4.0 cr.; [max 8.0 cr.]; S-N only; prereq Grad student or #; fall, spring, every year) Supervised independent research in pharmacology. Modern biomedical/pharmacology research methodology, data generation/analysis. Formulation/testing of basic science hypotheses.

**PHCL 8200. Seminar: Selected Topics in Pharmacology.** (1.0 cr. [max 8.0 cr.]; A-F only; prereq 5212 or #; fall, spring, every year) Course offered triennially.

**PHCL 8201. Advanced Medical Pharmacology I.** (5.0 cr.; A-F only; prereq 5110, [grad student or #]; spring, every year) Online content focused on organ system-based study of medical therapeutics. In-class content focused on current biomedical literature. Develop critical reasoning skills needed to interpret/critique basic science, translational, clinical research papers/presentations. Prereq 8211 or instr consent.

**PHCL 8217. Problems in Investigative Pharmacology.** (0.0 cr.; S-N or Audit; fall, every year) Presentation and discussion of contemporary research problems, investigative approaches, and methodologies in experimental pharmacology. Related to cardiovascular, renal, endocrine, and autonomic pharmacology; neuropharmacology; psychopharmacology; chemotherapy; toxicology; and molecular pharmacology.

**PHCL 8221. Neurobiology of Pain and Analgesia.** (3.0 cr.; prereq #; fall, spring, offered periodically) Course offered triennially.

**PHCL 8222. Transdisciplinary Tobacco Research.** (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq #; fall, odd years) Transdisciplinary science, its application to nicotine/tobacco research. Transdisciplinary theories/methods, examples of their application/integration. Draws on TTURC/local investigators, public health advocates. Offered every other year.

**PHCL 8320. Readings in Neurobiology.** (1.0-4.0 cr.; prereq #; fall, spring, every year) Topics in neurobiology/neuropsychology.

**PHAR 5207. Applied Leadership in Health Care.** (2.0 cr.; A-F only; = [PHAR 3207]; fall, spring, every year) Leadership skills/theories to create positive change in health care settings.

**PHAR 5208. Neuropsychopharmacology.** (3.0 cr.; A-F or Audit; prereq [5212, Psy 5021, Psy 5061] or #; fall, even years) Relationships between drugs/biochemical, behavioral, neurophysiological consequences. Functional biogenic amine, peptidergic. How manipulations alter neuronal function or behavior. Feedback mechanisms, induction, inhibition. Reinforcement of, tolerance to, or dependence on drugs.

**PHAR 5209. Substance Abuse at the Bedside.** (1.0 cr.; S-N only; prereq Grad student in any basic-science program; fall, spring, every year) Clinical management of addictive diseases. Students discuss how observed clinical interactions can influence a basic science project in which they are involved.

**PHAR 5211. Advanced Medical Pharmacology I.** (5.0 cr.; A-F only; prereq 5110, [grad student or #]; spring, every year) Online content focused on organ system-based study of medical therapeutics. In-class content focused on current biomedical literature. Develop critical reasoning skills needed to interpret/critique basic science, translational, clinical research papers/presentations.

**PHAR 5212. Advanced Medical Pharmacology II.** (0.0-3.0 cr.; A-F only; summer, every year) Online content focused on organ system-based study of medical therapeutics. In-class content focused on current biomedical literature. Develop critical reasoning skills needed to interpret/critique basic science, translational, clinical research papers/presentations. Prereq 8211 or instr consent.

**PHAR 5200. Drugs and the U.S. Health Care System.** (3.0 cr.; A-F only; = [PHAR 5200, PHAR 4200W, PHAR 4200]; prereq grad or professional student; fall, spring, every year) How to be informed/responsible participant in debates related to medication use.

**PHAR 5201. Applied Health Sciences Terminology.** (2.0 cr.; prereq Basic knowledge of human anatomy/physiology; fall, spring, summer, every year) Identify/describe various medical conditions/processes. Medical abbreviations, surgical procedures, medical terminology. Analyzing words at roots.

**PHAR 5205. Obesity: Issues, Interventions, Innovations.** (2.0 cr.; A-F only; fall, spring, summer, every year) Information necessary for prevention, treatment, management of obesity, from individual adipose tissue to entire public health community.

**PHAR 5206. Applied Health Literacy and Communication.** (3.0 cr.; A-F only; = [PHAR 3206]; fall, spring, summer, every year) Issues associated with health literacy. Dimensions associated with misunderstandings that occur in health-related communication.

**PHAR 5207. Applied Leadership in Health Care.** (3.0 cr.; A-F only; = [PHAR 3207]; prereq advanced undergraduates or professional health care students or grad students; fall, spring, summer, every year) Leadership skills/theories to create positive change in health care settings.

**PHAR 5210. Diminishing Health Disparities Through Cultural Competence: Community Engagement.** (2.0 cr.; A-F only; fall, every year) Various dynamics of health disparities, cultural competencies. Uses sociological framework.

**PHAR 5212. Survey of Pediatric Metabolic, Genetic, and Oncologic Disease.** (2.0 cr.; A-F only; prereq Second year or higher in College of Pharmacy or #; fall, summer, every year) Appraisal of major genetic/metabolic disorders and oncologic diseases of childhood. Disease state epidemiology, pharmacotherapy, monitoring, practical applications.

**PHAR 5230. Principles of Clinical Pharmacology Research.** (2.0 cr.; A-F only; prereq 3rd Year Pharmacy Student or #; fall, every year) Drug therapy investigation. Topics include experimental design of drug studies in human research subject volunteers. Topics related to individualization of therapy including effects of genetic polymorphisms, demographic variables, physiologic variables, age on drug disposition treatment outcomes.

**PHAR 5270. Therapeutics of Herbal and Other Natural Medicinals.** (2.0 cr.; A-F or Audit; prereq organic chemistry, pathophysiology of disease states, 3rd or 4th yr PHAR; spring, every year) Herbal products/supplements. Pharmacology/clinical indications/drug interactions of common products in nontraditional complementary
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<th>Course Code</th>
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<tr>
<td>PHIL 5010</td>
<td>Ancient Philosophers. (3.0 cr.; max 6.0 cr.; prereq 3001 or #; spring, offered periodically)</td>
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<td>Major work of selected ancient philosophers (e.g., Plato's Parmenides, Plato's Sophist, Aristotle's Metaphysics). Works discussed vary.</td>
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<td>PHIL 5040</td>
<td>Rationalists. (3.0 cr.; max 6.0 cr.; prereq 3005 or #; fall, spring, offered periodically)</td>
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<td>Major work of selected early modern rationalists (e.g., Descartes' Principles of Philosophy, Spinoza's Ethics, Conway's Principles of the Most Ancient and Modern Philosophy, Leibniz's Discourse on Metaphysics). Works discussed may vary from offering to offering.</td>
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<td>PHIL 5050</td>
<td>Empiricists. (3.0 cr.; max 6.0 cr.; prereq 3005 or #; fall, spring, offered periodically)</td>
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<td>Major work of selected early modern empiricists (e.g., Locke's Essay Concerning Human Understanding, Berkeley's Principles of Human Knowledge, Hume's Treatise of Human Nature). Works discussed may vary from offering to offering.</td>
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<td>PHIL 5085</td>
<td>Wittgenstein. (3.0 cr.; [PHIL 4085]; prereq 3005 or 4231 or #; fall, spring, offered periodically)</td>
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<td>Major work (e.g., Philosophical Investigations).</td>
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<td>PHIL 5201</td>
<td>Symbolic Logic I. (4.0 cr.; prereq 1001 or #; fall, spring, every year)</td>
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<td>Study of syntax and semantics of sentential and first-order logic. Symbolization of natural-language sentences and arguments. Development of deductive systems for first-order logic. Metatheoretic proofs and methods, including proof by mathematical induction and proof of consistency and completeness.</td>
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<td>PHIL 5202</td>
<td>Symbolic Logic II. (4.0 cr.; prereq 5201 or #; spring, every year)</td>
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<td>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.</td>
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<td>PHIL 5211</td>
<td>Modal Logic. (4.0 cr.; prereq 5201 or #; spring, even years)</td>
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<td>Axiomatic and semantic treatment of propositional and predicate modal logics; problems of interpreting modal languages.</td>
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<td>PHIL 5221</td>
<td>Philosophy of Logic. (3.0 cr.; prereq 5202 or #; )</td>
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<td>Attempts to answer, &quot;What is logic?&quot; Scope of logic. Disputes about alternative logics. Theories concerning logical truth (e.g., conventionalism: view that logical truths are contingent).</td>
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<td>PHIL 5222</td>
<td>Philosophy of Mathematics. (3.0 cr.; prereq College level logic or mathematics course or #; fall, spring, offered periodically)</td>
<td></td>
<td>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.</td>
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<tr>
<td>PHIL 5323</td>
<td>Education and Social Change. (4.0 cr.; A-F or Audit; [PHIL 4325]; fall, offered periodically)</td>
<td></td>
<td>Connections between education, social change. Theories of democratic/popular education, their application through in-depth practicum in community education setting.</td>
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<tr>
<td>PHIL 5326</td>
<td>Lives Worth Living: Questions of Self, Vocation, and Community. (4.0 cr.; [PHIL 4326]; prereq #; summer, offered periodically)</td>
<td></td>
<td>Immersion experience. Students live together as a residential community of learners. Works of philosophy, history, and literature form backdrop for exploring such questions as How is identity constructed? What is vocation? What experiences of community are desirable in a life? Each student creates a life-hypothesis for a life worth living.</td>
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<tr>
<td>PHIL 5330</td>
<td>Catching Lives Worth Living: Participation in the Growth of a Living-Learning Community. (1.0-3.0 cr.; max 6.0 cr.; prereq Application; #; summer, every year)</td>
<td></td>
<td>Involvement in a democratic living-learning community built by students/instructors. Students participate in community activities and daily instructor meetings. Four seven-day offerings each summer.</td>
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<tr>
<td>PHIL 5415</td>
<td>Philosophy of Law. (3.0 cr.; prereq 1003 or 1004 or 3302 or social science major or #; spring, offered periodically)</td>
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<td>Analytical accounts of law and legal obligation.</td>
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<tr>
<td>PHIL 5510</td>
<td>Philosophy of the Individual Arts. (3.0 cr.; [PHIL 4510]; prereq 3502; fall, spring, offered periodically)</td>
<td></td>
<td>Aesthetic problems that arise in studying or practicing an art.</td>
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<tr>
<td>PHIL 5602</td>
<td>Scientific Representation and Explanation. (3.0 cr.; prereq #; )</td>
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<td>Contemporary issues concerning representation and explanation of scientific facts.</td>
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<tr>
<td>PHIL 5603</td>
<td>Scientific Inquiry. (3.0 cr.; spring, offered periodically)</td>
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<td>Philosophical theories of methods for evaluating scientific hypotheses. Role of experimentation in science. How hypotheses are accepted within scientific community.</td>
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<tr>
<td>PHIL 5605</td>
<td>Space and Time. (3.0 cr.; [PHIL 4605]; prereq Courses in [philosophy or physics] or #; )</td>
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<td>Philosophical problems concerning nature/structure of space, time, and space-time.</td>
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<tr>
<td>PHIL 5606</td>
<td>Philosophy of Quantum Mechanics. (3.0 cr.; )</td>
<td></td>
<td>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.</td>
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<tr>
<td>PHIL 5622</td>
<td>Philosophy and Feminist Theory. (3.0 cr.; [PHIL 4622, GWSS 4122, GWSS 5122]; prereq 8 crs in [philosophy or women's studies] or #; )</td>
<td></td>
<td>Encounters between philosophy/feminism. Gender's influence in traditional philosophical problems/methods. Social role of theorist theorizing as they relate to politics of feminism.</td>
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<tr>
<td>PHIL 5760</td>
<td>Selected Topics in Philosophy. (3.0 cr.; max 9.0 cr.; prereq 3xxx-5xxx course in phil or #; fall, spring, offered periodically)</td>
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<td>Philosophical problems of contemporary interest. Topics specified in Class Schedule.</td>
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<tr>
<td>PHIL 5993</td>
<td>Directed Studies. (1.0-3.0 cr.; max 6.0 cr.; prereq #, %, @; fall, spring, every year)</td>
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<td>Guided individual reading or study.</td>
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<tr>
<td>PHIL 8010</td>
<td>Workshop in History of Philosophy. (1.0 cr.; max 4.0 cr.; prereq &amp; 4xxx hist of phil course; #; fall, spring, every year)</td>
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<td>Topics vary by offering.</td>
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<tr>
<td>PHIL 8080</td>
<td>Seminar: History of Ancient and Medieval Philosophy. (3.0 cr.; max 6.0 cr.; prereq #; fall, spring, every year)</td>
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<td>Topics vary by offering.</td>
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<tr>
<td>PHIL 8081</td>
<td>Seminar: History of Philosophy--Ancient Philosophers. (3.0 cr.; )</td>
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<td>Major developments in ancient Greek philosophical thought; methods and role of history of philosophy in discipline of philosophy.</td>
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<tr>
<td>PHIL 8085</td>
<td>Seminar: History of Philosophy--Modern Philosophers. (3.0 cr.; prereq #; )</td>
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<td>Major developments in modern philosophic thought; methods and role of history of philosophy in discipline of philosophy.</td>
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<tr>
<td>PHIL 8090</td>
<td>Seminar: History of Modern Philosophy. (3.0 cr.; max 6.0 cr.; prereq #; fall, spring, every year)</td>
<td></td>
<td>Topics vary by offering.</td>
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PHIL 8100. Workshop in Epistemology and Metaphysics. (1.0 cr. [max 4.0 cr.]; prereq & 4xxx [epistemology or metaphysics] course; #; fall, spring, every year)
Topics vary by offering.

PHIL 8110. Seminar: Metaphysics. (3.0 cr. [max 6.0 cr.]; prereq 4101 or #; fall, spring, offered periodically)
Topics vary by offering.

PHIL 8130. Seminar: Epistemology. (3.0 cr. [max 6.0 cr.]; prereq 4105 or #; fall, spring, every year)
Problems in the theory of knowledge. Topics specified in [Class Schedule].

PHIL 8131. Epistemology Survey. (3.0 cr.; ) Survey, against background of traditional issues, of contemporary developments in theory of knowledge.

PHIL 8133. Feminist Theories of Knowledge. (3.0 cr.; fall, offered periodically)
Interdisciplinary seminar; feminist approaches to knowledge and criticism of paradigms of knowledge operative in the disciplines. Feminists’ use of concepts of subjectivity, objectivity, and intersubjectivity; feminist empiricism, standpoint theory, and contextualism, and postmodern and postcolonial theorizing.

PHIL 8180. Seminar: Philosophy of Language. (3.0 cr. [max 6.0 cr.]; prereq 4231 or #; fall, every year)
Topics vary by offering.

PHIL 8182. Formal Semantics of Natural Language. (3.0 cr.; A-F or Audit; =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. (1.0 cr. [max 4.0 cr.]; prereq & 4xxx logic or 4xxx phil of math; #; fall, spring, offered periodically)
Topics vary by offering.

PHIL 8210. Seminar: Logical Theory. (3.0 cr. [max 6.0 cr.]; prereq [5201, 5205] or #; fall, spring, every year)
Topics vary by offering.

PHIL 8220. Seminar: Philosophy of Mathematics. (3.0 cr. [max 6.0 cr.]; prereq 5202 or [4xxx or 5xxx] math course or #; fall, spring, every year)
Topics such as significance of limitative metamathematics (Goedel, 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. (1.0 cr. [max 4.0 cr.]; prereq & 4xxx moral phil or 4xxx pol phil #; fall, spring, every year)
Topics vary by offering.

PHIL 8310. Seminar: Moral Philosophy. (3.0 cr. [max 9.0 cr.]; prereq 4310 or 4320 or 4330 or #; fall, spring, every year)
Concepts/problems relating to ethical discourse.

PHIL 8320. Seminar on Medical Ethics. (3.0 cr. [max 6.0 cr.]; prereq [4xxx or 5xxx] ethics course or #; spring, offered periodically)
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. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

PHIL 8410. Seminar: Philosophy of Law. (3.0 cr. [max 6.0 cr.]; prereq 5415 or #; fall, spring, every year)
Primarily for law students and advanced political science, history, or sociology majors or minors.

PHIL 8420. Seminar: Political Philosophy. (3.0 cr. [max 6.0 cr.]; prereq 4321 or 4414 or #; fall, spring, offered periodically)
Topics vary by offering.

PHIL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

PHIL 8500. Workshop in Aesthetics. (1.0 cr. [max 4.0 cr.]; prereq & 4xxx aesthetics course, #; fall, spring, every year)
Topics vary by offering.

PHIL 8510. Seminar: Aesthetics. (3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Topics vary by offering.

PHIL 8550. Seminar: Philosophy of Religion. (3.0 cr. [max 6.0 cr.]; prereq 4521 or #; fall, spring, every year)
Topics vary by offering.

PHIL 8600. Workshop in the Philosophy of Science. (1.0 cr. [max 6.0 cr.]; prereq & 4xxx phil of sci course, #; fall, spring, every year)
Topics vary by offering.

PHIL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
TBD

PHIL 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year)
(No description)

PHIL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

PHIL 8994. Directed Research. (1.0-3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, summer, every year)
tbd

PHIL 8994. Directed Research. (1.0-3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, summer, every year)
tbd

PHIL 8994. Directed Research. (1.0-3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, summer, every year)
tbd

Physical Medicine and Rehabilitation (PMED)

PMED 8200. Physical Medicine and Rehabilitation Service. (1.0-15.0 cr.; prereq enrolled in PMed residency training program; fall, spring, summer, every year)

PMED 8207. Basic and Applied Psychiatry. (1.0 cr.; prereq enrolled in PMed residency training program; fall, spring, summer, every year)
PMED 8210. Research in Physical Medicine. (1.0-15.0 cr.; prereq enrolled in PMed residency training program; fall, spring, every year)

PMED 8212. Electromyography. (1.0-15.0 cr.; prereq enrolled in PMed residency training program; fall, spring, summer, every year)

PMED 8214. Readings in Electromyography. (1.0-3.0 cr.; prereq enrolled in PMed residency training program; fall, spring, summer, every year)

PMED 8220. Seminar: Physical Medicine and Rehabilitation. (1.0-15.0 cr.; prereq enrolled in PMed residency training program; fall, spring, summer, every year)

PMED 8277. Thesis Credits: Master's. (1.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Master's student, adviser and Rehabilitation. Type of research project or literature review. Current literature. Features of research design. Elements of evaluating treatment efficacy. Students interact with their research adviser and with research faculty in various specialties.

PT 8131. Research Seminar I. (1.0 cr.; S-N or Audit; prereq Grad PT major; fall, every year) 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 II. (1.0 cr.; A-F or Audit; prereq 8131, grad PT major; fall, spring, every year) Scientific thinking in physical therapy. Preparation for research project or literature review. Current literature. Features of research design. Evaluating treatment efficacy. Students interact with research adviser and faculty in various specialties.

PT 8193. Research Problems in Physical Therapy. (1.0-7.0 cr.; A-F or Audit; prereq Grad PT major; fall, spring, summer, every year) 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. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

PT 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year) (No description)

Physics (PHYS)

Physics Institute of Technology


PHYS 5002. Quantum Mechanics II. (4.0 cr.; prereq 5001 or equiv; spring, every year) 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. (4.0 cr.; prereq 4001, 4002 or #; fall; every year) Classical mechanics: Lagrangian/Hamiltonian mechanics, orbital dynamics, rigid body motion, special relativity.

PHYS 5012. Classical Physics II. (4.0 cr.; prereq 5111 or #; spring; every year) Classical electromagnetism: electrostatics, magnetostatics, Maxwell's equations, electromagnetic waves, radiation, interaction of charged particles with matter.


PHYS 5041. Mathematical Methods for Physics. (4.0 cr.; prereq 2601 or grad student; fall, every year) Survey of mathematical techniques needed in analysis of physical problems. Emphasizes analytical methods.

PHYS 5042. Analytical and Numerical Methods of Physics II. (4.0 cr.; prereq 5041 or #) Survey of mathematical techniques, both analytic and numerical, needed for physics. Application to physical problems.

PHYS 5071. Physics for High School Teachers: Experimental Foundations and Historical Perspectives. (3.0 cr.; 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. (1.0-3.0 cr. [max 5.0 cr.]; fall, spring, every year) Pedagogies for introductory physics classes. Topics from educational research/practice as applied to classroom.

PHYS 5081. Introduction to Biopolymer Physics. (3.0 cr.; [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 5401. Physiological Physics. (4.0 cr.; prereq One semester of introductory calculus-based physics, such as PHYS1301W. Students not sure if they meet prerequisites should consult instructor.; fall, even years) Musculoskeletal system, circulatory system/membrane transport, biological control systems, propagation/action potential in nervous system, biomagnetism, electromagnetism at cellular level.

PHYS 5402. Radiological Physics. (4.0 cr.; prereq Two semesters of introductory calculus-based physics, such as PHYS1302W. Students not sure if they meet prerequisites should consult instructor.; spring, odd years) Signal analysis, medical imaging, medical x-rays, tomography, radiation therapy, nuclear medicine, MRI, similar topics.

PHYS 5621. Introduction to Plasma Physics. (3.0 cr.; prereq CSE grad student, working knowledge of waves/electromagnetism; fall, offered periodically) Basic properties of collisionless, magnetized plasmas, single particle motion, plasmas as fluids, magnetohydrodynamics, waves in plasmas, equilibrium, instabilities, kinetic theory/shocks.

PHYS 5701. Solid-State Physics for Engineers and Scientists. (4.0 cr.; prereq Grad or advanced undergrad in physics or engineering or the sciences; fall, spring, offered periodically) 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. (4.0 cr.; prereq 5701 or #; ) Diamagnetism and paramagnetism; ferromagnetism and antiferromagnetism; optical phenomena; lasers; superconductivity; surface properties; ferroelectricity.

PHYS 5950. Colloquium Seminar. (1.0 cr.; S-N or Audit; prereq [Grad student or advanced undergrad in physics]; %; fall, spring, every year) Colloquium of School of Physics and Astronomy.

PHYS 5970. Physics Journal Club. (1.0-3.0 cr.; S-N only; prereq 2601, 2605 or equiv; intended for 2nd-yr grad students in physics; fall, spring, every year) Weekly student-led presentation, discussion, and critical analysis of important papers.

PHYS 5980. Introduction to Research Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit;
Experimental data summarized and compared with theoretical predictions.

**PHYS 8200. Seminar: Cosmology and High Energy Astrophysics.** (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Current topics in cosmology and high energy astrophysics.

**PHYS 8300. Seminar: Biological and Medical Physics.** (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Current research in biological and medical physics

**PHYS 8301. Symmetry and Its Application to Physical Problems.** (3.0 cr.; prereq 5002 or #;)
Fundamental invariance principles obeyed by laws of physics. Group theory as tool for using symmetry and invariance to help understand behavior of physical systems. Applications made to atomic, molecular, nuclear, condensed-matter, and elementary particle physics.

**PHYS 8311. Biological Physics of Single Molecules.** (3.0 cr.; prereq [5201 or Chen 4707], 5011 or #; spring, every year)

**PHYS 8312. Biological Physics of Macroscopic Systems.** (3.0 cr.; prereq [5201 or Chen 4707], 5011 or #; spring, odd years)
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.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**PHYS 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**PHYS 8500. Plan B Project.** (4.0 cr.; prereq #; may be taken once to satisfy Plan B master's project requirement; no cr toward PhD; fall, spring, summer, every year)
Project topic arranged between student and instructor. Written report required.

**PHYS 8501. General Relativity and Cosmology I.** (3.0 cr.; prereq 5012 or #; fall, spring, offered periodically)
Tensor analysis and differential geometry. Special relativity leading to formulation of principles of general relativity and Einstein's equations. Tests of general relativity and thorough discussion of various black hole solutions, including Schwarzschild, Reisner-Nordstrom, and Kerr solutions.

**PHYS 8502. General Relativity and Cosmology II.** (3.0 cr.; prereq 8501 or #;)

**PHYS 8600. Seminar: Space Physics.** (1.0 cr. [max 6.0 cr.]; S-N or Audit; fall, spring, every year)
Current topics in space physics and plasma physics.

**PHYS 8601. Plasma Physics I.** (3.0 cr.; prereq 4621, 5012 or #;)
Theory of plasma waves and instabilities in plasmas, magnetohydrodynamics, nonlinear waves in plasmas, wave propagation in inhomogeneous plasmas.

**PHYS 8602. Plasma Physics II.** (3.0 cr.; prereq 8601 or #;)
Theory of plasma waves and instabilities, collisions, radiation, transport, nonlinear wave-particle and wave-wave interactions, instabilities in inhomogeneous plasmas.

**PHYS 8611. Cosmic Rays and Plasma Astrophysics.** (3.0 cr.; prereq 5012 or #; fall, spring, offered periodically)
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.** (3.0 cr. [max 9.0 cr.]; prereq 8602 or 8611 or #;)
Topics in plasma waves and instabilities, solar physics, cosmic ray physics, atmospheric physics or planetary physics.

**PHYS 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
(TBD)

**PHYS 8700. Seminar: Condensed Matter Physics.** (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
Current research.

**PHYS 8702. Statistical Mechanics and Transport Theory.** (3.0 cr.; prereq 5201 or #; spring, every year)
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.** (3.0 cr.; prereq 4211, 5002 or #; fall, every year)

**PHYS 8712. Solid-State Physics II.** (3.0 cr.; prereq 8711 or #; spring, every year)

PHYS 8911. Introduction to Supersymmetry. (3.0 cr.; A-F only; prereq 8011 or #; spring, odd years)

PHYS 8950. Advanced Topics in Elementary Particle Physics. (3.0 cr. [max 9.0 cr.]; prereq 8902 or #; ) Research topics.

PHYS 8994. Research in Physics. (1.0-12.0 cr. [max 24.0 cr.]; prereq #; fall, spring, summer, every year) Research under faculty direction.

PHYS 8750. Advanced Topics in Condensed Matter Physics. (3.0 cr. [max 9.0 cr.]; prereq 8712 or #; )
Sample research topics: magnetism, superconductivity, low temperature physics, superfluid helium.

PHYS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year)

No description.

PHYS 8800. Seminar: Nuclear Physics. (1.0 cr. [max 6.0 cr.]; S-N or Audit; fall, spring, every year)
Current research topics.

PHYS 8801. Nuclear Physics I. (3.0 cr.; prereq 5001, 5002, 5011, 5012, 5201; AST 4001 recommended; fall, spring, offered periodically)

PHYS 8802. Nuclear Physics II. (3.0 cr.; prereq 8801 or #; ) Properties of nuclei based on hadronic and quark-gluon degrees of freedom. Relativistic field theory at finite temperatures and density applied to many-body problems, especially nuclear matter and quark-gluon plasma. Applications to lepton and hadron scattering, nucleus-nucleus collisions, astrophysics and cosmology.

PHYS 8850. Advanced Topics in Nuclear Physics. (3.0 cr. [max 9.0 cr.]; prereq 8802 or #; fall, odd years) Research topics.

PHYS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

No description.

PHYS 8900. Seminar: Elementary Particle Physics. (1.0 cr. [max 6.0 cr.]; S-N or Audit; fall, spring, every year)
Elementary particle physics, high energy physics, particle astrophysics and cosmology.

PHYS 8901. Elementary Particle Physics I. (3.0 cr.; prereq 8801 or #; fall, every year)

PHYS 8902. Elementary Particle Physics II. (3.0 cr.; prereq 8901 or #; spring, every year)

None of the above text is visible at the provided page number.
of neuromuscular junction physiology. Lectures, laboratories, workshops, anatomical dissections. Intense, one week course.

PHSL 5525. Anatomy and Physiology of the Pelvis and Urinary System. (1.0-2.0 cr.: A-F only; [ANAT 5525]; prereq One undergrad anatomy course, one undergrad physiology course, #; spring, every year) Two-day intensive course. Pelvis, perineum, and urinary system with cadaveric dissection. Structure/function of pelvic and urinary organs, including common dysfunction and pathophysiology. Laboratory dissections, including kidneys, ureters, urinary bladder, pelvic viscera and perineum (male or female), pelvic floor, vascular and nervous structures. Grand rounds section.

PHSL 5540. Advanced Exercise Medicine: Physiology and Bioenergetics. (1.0-2.0 cr.; 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.

PHSL 5700. Cell Physiology. (4.0 cr.: A-F only; prereq [Two semesters of physics/chemistry, calculus, one semester of systems-level physiology] or #; fall, every year) 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.

PHSL 5701. Physiology Laboratory. (1.0-2.0 cr.: A-F or Audit; prereq #; fall, spring, every year) Experiments in physiology. Emphasizes quantitative aspects, including analysis of organ systems.

PHSL 8216. Selected Topics in Autonomic and Neuroendocrine Regulation. (1.0 cr.; S-N or Audit; Advanced seminar.

PHSL 8222. Central Regulation of Autonomic Function. (3.0 cr.; A-F or Audit; prereq NSC 5561 or #; ) 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. Offered fall of odd-numbered years.

PHSL 8232. Critical Reading of Journal Articles in Physiology. (2.0 cr. [max 4.0 cr.; A-F only; prereq &PHSL 5101; #; spring, every year) Integrative physiology, critical reading of current scientific literature related to lecture topics in the Human Physiology course.

PHSL 8242. Professional Skills Development For Biomedical Scientists. (1.0 cr.; A-F only; prereq #; spring, every year) Strategies/mechanics of writing grant proposal. NIH study section of grant review. Scientific presentations, dissecting scientific literature, PubMed/NIHReptor tools.

PHSL 8294. Research in Physiology. (1.0-18.0 cr.; prereq Grad cellular and integrative Phsl major, #; fall, spring, summer, every year) Directed laboratory research.

PHSL 8310. Advanced Topics in Cellular Physiology. (1.0 cr. [max 4.0 cr.; prereq #; fall, spring, every year) Discussion of primary research publications. Topics vary by semester.

PHSL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

PHSL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

PHSL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

PHSL 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

PHSL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Plant Biological Sciences (PBS)

College of Biological Sciences

PBS 8081. Integrative Plant Biology: Connecting Molecules to Ecosystems . (3.0 cr.; A-F only; prereq Plant biological sciences grad student or #; fall, every year) Fundamental questions in plant/fungal biology. Research approaches. Students read/evaluate primary literature. Critical analysis, written summaries, oral presentations. Research in plant/fungal biology, ranging from molecular to ecosystem levels.

PBS 8082. Current Topics in Plant Biology: Structure-Evolution-Ecology. (1.0 cr.; S-N or Audit; spring, every year) Background information and review of selected current literature. For first-year students in plant biological sciences and other biological science graduate programs.

PBS 8123. Research Ethics in the Plant and Environmental Sciences. (0.5 cr.; S-N or Audit; prereq Grad student in [applied plant sciences or plant pathology or plant biological sciences or soil science]; spring, every year) History/values relating to research/scholarship. Social responsibility/reporting misconduct. Authorship plagiarism. Peer review. Copyright/intellectual property. Conflicts of interest. Research data management. Fiscal responsibility/management. Environmental health/safety. Research involving humans/animals. Mentorship presentations by faculty and invited speakers. Meets first seven weeks of spring semester.

PBS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) FTE: Master's

PBS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

PBS 8666. Doctoral Pre-Thesis Credits. (1.0-4.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) Thesis Credits: Master's

PBS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year) Thesis Credits: Master's

PBS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Passed prelim oral or adviser approval; fall, spring, summer, every year) Thesis credit: doctoral.

PBS 8900. Seminar. (1.0-2.0 cr. [max 4.0 cr.]; S-N or Audit; fall, spring, every year) Current scientific research.

PBS 8901. Preparation of Research Proposals. (1.0 cr.; S-N only; prereq Plant biological sciences PhD student; fall, every year) Grant writing process. Strategies and ethical standards for research proposal preparation/review. Students prepare an original proposal and critique work of others.

PBS 8910. Journal Club. (1.0 cr. [max 4.0 cr.; S-N or Audit; fall, spring, summer, offered periodically) Critical evaluation of selected current literature.

PBS 8993. Directed Studies. (1.0-5.0 cr. [max 15.0 cr.; prereq PBio grad student, #; fall, spring, summer, every year) Directed Studies

PBS 8994. Research. (1.0-5.0 cr. [max 10.0 cr.; prereq PBio grad student, #; fall, spring, summer, every year)
Independent research determined by student's interests, in consultation with faculty mentor.

**Plant Biology (PBIO)
College of Biological Sciences**


**PBIO 5301. Plant Genomics.** (3.0 cr.; =[PBIO 5301]; prereq [Intro course in genetics, intro course in biochemistry] or #; fall, every year) 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.

**PBIO 5412. Plant Physiology.** (3.0 cr.; prereq Biol 2022 or Biol 3002 or Biol 3007, Biol/BioC 3021 or BioC 4331; fall, every year) Physiological and biochemical bases of plant systems with emphasis on higher plants.

**PBIO 5514. Plant Molecular Genetics and Development.** (3.0 cr.; prereq BIOC 3021 or BIOL 3021 or BIOL 4003 or BIOC 4332 or equiv; fall, every year) 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.

**PBIO 5516. Plant Cell Biology.** (3.0 cr.; =PBIO 4516W; prereq [Biol 2022 or Biol 3007 or Biol 3022], [Biol 3021 or BioC 3021 or Biol 4003]; ) 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.

**PBIO 5601. Topics in Plant Biochemistry.** (3.0 cr.; A-F or Audit; prereq [BIOL 1002 or BIOL 1009 or BIOL 2003], CHEM 2301, spring, every year) Biochemical analysis of processes unique to 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.

**Plant Pathology (PLPA)
College of Food, Agricultural and Natural Resource Sciences**

**PLPA 5003. Diseases of Forest and Shade Trees.** (3.0 cr.; spring, every year) Diseases of trees in urban and forested areas. Biology, ecology, and control of tree diseases.

Identifying disease agents, integrated control procedures. Laboratory.

**PLPA 5090. Issues in Plant Pathology.** (1.0-4.0 cr.; fall, spring, summer, every year) See Class Schedule or department for current offerings.

**PLPA 5103. Plant-Microbial Interactions.** (3.0 cr.; prereq Intro course in plant pathology or molecular biology or equiv; fall, every year) Genetics, physiology, molecular biology of plant-microbe interactions. Communication between plant/microbes, signal transduction, control of gene expression, symbiosis/parasitism, plant host response mechanisms, plant disease physiology.

**PLPA 5202. Field Plant Pathology.** (2.0 cr.; summer, every year) 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.** (3.0 cr.; prereq BIOL 1009 or equiv; fall, every year) Fungi are a critical component of the diversity and function of terrestrial ecosystems, affecting decomposition, plant nutrient uptake, and agricultural practices. Key components of fungal biology, including ecology, genetics, life cycles and diversity. Labs provide hands on experience with a diverse range of organisms.

**PLPA 5300. Current Topics in Molecular Plant Pathology.** (1.0-2.0 cr.; S-N only; prereq #; fall, every year) Interactive class. Students read, discuss, and critique publications in molecular plant pathology. Focus on articles, examining from different dimensions (underlying principles, experimental strategies, data analysis, impact on the broader discipline).

**PLPA 5301. Plant Genomics.** (3.0 cr.; =[PBIO 5301]; prereq Intro course in genetics or #; fall, every year) Plants and model organisms. DNA sequencing, comparative genomics, genome structure and function, DNA chips/microarrays, RNA expression, gene-knockout systems, genome databases, sequence comparison/clustering algorithms, and visualization tools.

**PLPA 5444. Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions.** (3.0 cr.; A-F or Audit; prereq intro plant pathology or advanced biology coursework recommended; fall, every year) Concepts and recent research in the ecology, epidemiology, and evolutionary/coevolutionary biology of plant-microbe interactions spanning the range from parasitic to mutualistic in agricultural and natural habitats.

**PLPA 5480. Principles of Plant Pathology.** (3.0 cr.; prereq BIOL 1009 or equiv; fall, every year) Diseases that affect plants, microbiology and microbial and plant interactions. Mycology and select diseases caused by fungi within Ascomycota, Basidiomycota, and the fungal-like Oomycota. Diseases caused by bacteria, nematodes, viruses, parasitic plants and abiotic damage. Lecture and Lab.

**PLPA 5560. Plant Disease Resistance and Applications.** (3.0 cr.; A-F only; prereq 2001, BIOL 4003; spring, every year) Fundamentals of disease resistance in plants and the genetics of host-parasite interactions as they relate to the sustainable control of plant diseases. Examples explored at the Mendelian, populational, and molecular level of organization.

**PLPA 5999. Special Topics in Plant Pathology.** (1.0-8.0 cr.; fall, spring, summer, every year) Workshops on topics in plant pathology. See Class Schedule or department for current offerings.

**PLPA 8005. Supervised Classroom or Extension Teaching Experience.** (2.0 cr.; S-N or Audit; =[BBE 8005, SOIL 8005, AGRO 8005, LAAS 8005, HORT 8005]; prereq #; fall, every year) 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.** (1.0-8.0 cr.; fall, spring, summer, every year) Special assignment in lab and field problems in pathological research.

**PLPA 8103. Plant-Microbe Interactions.** (3.0 cr.; prereq Intro course in plant pathology or molecular biology or equiv; fall, every year) Genetics, physiology, and molecular biology of plant-microbe interactions. Communication between plants/microbes. Signal transduction, control of gene expression, symbiosis/parasitism, plant host response mechanisms, plant disease physiology.

**PLPA 8104. Plant Virology.** (2.0 cr.; A-F only; prereq 5480; spring, every year) Characteristics, biology, epidemiology, and control of plant diseases caused by viruses.

**PLPA 8105. Plant Bacteriology.** (2.0 cr.; prereq 5480; spring, every year) For graduate students interested in bacteria that cause plant diseases. Disease cycles, epidemiology, pathogenesis, and means of disease control. The lab section will focus on techniques used to identify bacteria, for inoculating plants, and isolating bacteria from plant material.

**PLPA 8123. Research Ethics in Plant and Environmental Sciences.** (0.5 cr.; S-N or Audit; =SOIL 8123, APSC 8123; prereq Enrolled in a plant/environmental grad research program; spring, every year) History/values relating to research/scholarship. Social responsibility, reporting misconduct, authorship, Plagiarism. Peer review. Copyright, intellectual property. Conflicts of interest. Research data management. Fiscal responsibility/management. Environmental

POLA 8280. Seminar. (1.0 cr.; A-F only; fall, spring, every year) Critical review and presentation of current problems and progress in plant pathology.

POLA 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

POLA 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

POLA 8500. Perspectives in Plant Pathology. (2.0 cr. [max 4.0 cr.]; S-N or Audit; fall, every year) Integrative overview of the field. For Ph.D. students nearing end of formal classroom experience.

POLA 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

POLA 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

POLA 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Polish (PLSH) College of Liberal Arts

PLSH 5900. Topics. (1.0-4.0 cr. [max 3.0 cr.]) Topics specified in Class Schedule.

PLSH 5993. Directed Studies. (1.0-3.0 cr.; fall, offered periodically) Guided individual reading or study in Polish language, literature, and culture.

Political Science (POL) College of Liberal Arts

POL 5210. Topics in Political Theory. (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically)

POL 5251. Greeks, Romans, and Christians: Ancient and Medieval Political Thought. (4.0 cr.; [=POL 3251W]; prereq grad student;)


POL 5252. Renaissance, Reformation, and Revolution: Early Modern Political Thought. (3.0 cr.; spring, every year) Thinkers, themes, and discourses from the Renaissance to the French Revolution. Renaissance Humanists; Machiavelli; More; Reformation; Luther; Calvin; Natural Law; Grotius; Divine Right; Common Law; Bacon; English Revolutionaries; Hobbes; Locke; Astell; Enlightenment; Rousseau; French Revolutionaries; Hume; Burke; Wollstonecraft.

POL 5253. Modernity and its Discontents: Late Modern Political Thought. (4.0 cr.; [=POL 4253]; prereq = 3253; spring, odd years) Theoretical responses to and rival interpretations of Western economy, society, politics, and democratic culture in the modern age; theories of history; class struggle; end of metaphysics and death of God; technology and bureaucracy; psychology of culture in Hegel, Marx, Tocqueville, Mill, Nietzsche, Weber, Freud.

POL 5275. Contemporary Political Thought. (3.0 cr.; prereq = 4275; grad student; 1201 recommended; fall, spring, every year) 20th-century crisis of Western humanism in major works of contemporary political thought from World War II to present. Force and freedom. Ideology and truth. Authority and resistance. Thinkers may include Arendt, Camus, Beauvoir, Fanon, Foucault, Habermas, Rawls, Sartre, Said. Ideas may include communitarianism, feminism, postcolonialism, postmodernism, socialism.

POL 5280. Topics in Political Theory. (3.0-4.0 cr. [max 3.0 cr.]; prereq = 4280; grad student; ) Topics in historical, analytical, or normative political theory. Topics vary, see Class Schedule.

POL 5306. Presidential Leadership and American Democracy. (3.0 cr.; [=POL 3306]; 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 5308. Congressional Politics and Institutions. (3.0-3.0 cr.; [=POL 4308, POL 3308]; prereq grad student or #; fall, spring, every year) Origin/development of U.S. congressional institutions, parties, committees, leaders, lobbying/elections, and relations between Congress/executive branch. Relationship of campaigning/governing, nature of representation, biases of institutional arrangements.

POL 5309. Justice in America. (3.0 cr.; 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. What influences judicial decisions. What impact decisions have. Why people comply with them.

POL 5310. Topics in American Politics. (3.0 cr.; prereq grad student or #; fall, spring, every year) See Class Schedule for description.

POL 5315. State Governments: Laboratories of Democracy. (4.0 cr.; [=POL 4315W]; prereq grad student or #;) Political behavior, governmental institutions, and public policies in American states. Comparison among states, between state and national government. Emphasizes Minnesota.

POL 5322. Rethinking the Welfare State. (3.0-4.0 cr. [max 3.0 cr.]; 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. (3.0-4.0 cr. [max 3.0 cr.]; prereq = 4331; grad student; ) Applications of rational-choice and game theories to important features of domestic politics in the United States and elsewhere.

POL 5403. Comparative Constitutionalism. (3.0 cr.; fall, spring, even years) Theory/practice of constitutionalism in different countries. Conceptual/normative inquiry between constitutionalism, rule of law, and democracy. Origins and role of constitutions. Relevance of courts with constitutional review powers: U.S., Germany, Japan, Hungary, Russia, South Africa, Nigeria.

POL 5410. Topics in Comparative Politics. (3.0 cr.; prereq grad student; fall, spring, every year) Topics of current analytical or policy importance. Topics vary, see Class Schedule.

POL 5461W. European Government and Politics. (4.0 cr.; [=POL 4461W]; prereq grad student or #; spring, every year) European political institutions in their social settings. Power and responsibility. Governmental stability. Political decision making. Government and economic order.

POL 5465. Southeast Asian Politics. (3.0 cr.; fall, spring, odd years) U.S. involvement in region. Progress toward and resistance to democratic political systems and economic development.

POL 5473. Chinese Politics. (3.0 cr.; prereq = 4473, EAS 4473; grad student; ) Fundamental conflicts in Chinese society. Democracy movement, human rights, class divisions, gender struggles, environmental
issues, capitalist vs socialist development strategies. Secondary topics include Chinese foreign relations and domestic/foreign political issues in Taiwan.

POL 5477. Strategies and Issues in the Middle East. (4.0 cr.; prereq =: 4477; 1054 or 3051 or non-pol sci grad student or #; ) Turkey, Iran, Israel, and selected Arab states. Domestic politics of religious/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. (4.0 cr.; = [AFRO 4478W, POL 4478W, AFRO 5478]; prereq grad student or #; fall, spring, offered periodically) 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. (3.0-4.0 cr.; = [POL 4481]; prereq 1054 or 3051 or non-pol sci grad student or #; fall, spring, offered periodically) Connection between democracy and markets. Focuses on countries in North America, Europe.


POL 5487. Struggle for Democratization and Citizenship. (4.0 cr.; = [POL 4501W]; prereq grad student; fall, spring, every year) History of democratic movement from its earliest moments in history to present. Attempts to draw balance sheet. Emphasizes how disenfranchised fought to become included.

POL 5501. Supreme Court and Constitutional Interpretation. (3.0 cr.; prereq grad student or #; fall, every year) 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. (3.0 cr.; prereq = 4502; 1001 or 1002 or equiv or non-pol sci grad student or #; spring, every year) Supreme Court's interpretation of Bill of Rights, 14th amendment. Freedom of speech, press, religion. Crime/punishment. Segregation/ desegregation, affirmative action. Abortion/privacy.

POL 5525. Federal Indian Policy. (3.0 cr.; A-F or Audit; prereq =: 4525, Amin 4525, grad student; ) Formulation, implementation, evolution, comparison of Indian policy from pre-colonial times to self-governance of new millennium. 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. (3.0 cr.; = = [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. (3.0-4.0 cr. [max 3.0 cr.; ] 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 5767. Public Opinion and Voting Behavior. (3.0 cr.; = [POL 3769]; prereq grad student or #; fall, spring, every year) Major factors influencing electoral decisions. Political attitude formation/change. Data analysis lab required.

POL 5810. Topics in International Politics and Foreign Policy. (3.0 cr. [max 6.0 cr.; ] prereq Grad student or advanced undergard; fall, spring, every year) Selected issues in contemporary international relations. Topics vary, see Class Schedule.

POL 5833. The United States in the Global EconomyUS For Econ Policy. (3.0-4.0 cr. [max 3.0 cr.; ] 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 5883. Global Governance. (3.0 cr.; prereq =: 4883; 3835 or non-pol sci grad student or #; fall, spring, summer, offered periodically) Rise/rule 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 8107. Quantitative Political Science II. (3.0 cr.; A-F only; prereq Political science grad major or #; spring, every year) Multiple linear regression model applied to political science data. How to use regression techniques to analyze data, interpret statistical results, and summarize/report the findings. Estimation of model. Underlying assumptions. Inference. Model diagnostics. Extensions of model.

POL 8120. Core Course in Political Methodology: Modeling Political Processes. (3.0 cr.; prereq Pol sci grad major or #; fall, spring, odd years) 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 committees/legislatures. Using statistics to measure political variables, design experiments with human subjects, and test micro/macro political theories.

POL 8122. Positive Theory. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) Survey of positive political theory and rational-choice models. Information and transaction costs; institutions; models of elections, voting, coalitions.

POL 8124. Game Theory. (3.0 cr.; prereq [8122, grad pol sci major] or #; spring, every year) Application of noncooperative game theory in political science. Equilibrium concepts, bargaining, repeated games, games of incomplete information, signaling games, reputation, learning in games.

POL 8125. Dynamic Analysis. (3.0 cr.; prereq Pol sci grad student or #; fall, spring, offered periodically) Time series method, its application in political science.

POL 8126. Qualitative Methods. (3.0 cr.; prereq Grad student; fall, spring, even years) Qualitative methods in social science. Hands-on training through fieldwork projects. Interviewing, participant observation, narrative interpretation, ethical problems. Issues of gender/race in fieldwork.

POL 8127. Survey Research Methods: Measuring Public Opinion. (3.0 cr.; prereq Pol sci grad major; fall, spring, even years) 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 to examine political phenomena.

POL 8131. Advanced Methods and Models. (3.0 cr.; prereq Grad pol sci major, 6 cr 81xx seminars or #; fall, every year) 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. (3.0 cr. [max 12.0 cr.]; prereq Grad pol sci major or #; fall, spring, every year) Seminars on selected topics, as specified in Class Schedule.

POL 8201. Understanding Political Theory. (1.5 cr.; prereq Grad student or #; fall, spring, every year) Key concepts/major approaches.

POL 8215. Philosophy of Political Inquiry. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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 8235. Democratic Theory. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) 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 8251. Ancient and Medieval Political Thought. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) Politics and ethics in Greece, Rome, Christendom: Thucydides, Socrates, Plato, Aristotle, Cicero, Augustine, Aquinas, Marsilius.

POL 8252. Early Modern Political Thought. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) Theorists and texts from Renaissance to French Revolution. Selectively includes Machiavelli, More, Calvin, Luther, Grotius, Bodin, Hobbes, Winstanley, Harrington, Locke, Montesquieu, Rousseau, Hume, Smith, Burke, and Wolfstonecraft; key debates over liberty, law, power, and knowledge.

POL 8253. Late Modern Political Thought. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, every year) 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, Tocqueville, Mill, Nietzsche, Weber, Freud.

POL 8260. Topics in Political Theory. (3.0 cr. [max 6.0 cr.]; prereq Grad pol sci major or #; fall, spring, every year) Readings and research in special topics or problems.

POL 8275. Contemporary Political Thought. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) 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 Behavior. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) Major theoretical perspectives/research on political participation, voting behavior, public opinion. Voter turnout, importance of party identification, effects of campaigns, long-term change in public opinion, designing/conducting research.

POL 8303. Political Parties. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) Party systems and subsystems; party organizational characteristics, goals, and incentives; distribution of power and authority within the party; chief party functions; party as an organizer of governmental power; determinants of party structure and role.

POL 8305. Interest Groups and Social Movements. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, every year) Theoretical/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/effectiveness groups/movements as agents of democratic representation, particularly for marginalized groups.

POL 8307. Proseminar in Political Psychology I. (2.0 cr.; S-N or Audit; [PSY 8211]; prereq Grad pol sci major or pol psych minor or #; fall, every year) Readings, discussion, and guest speakers. Topics vary by semester.

POL 8308. Proseminar in Political Psychology II. (2.0 cr.; S-N or Audit; [PSY 8212]; prereq Grad pol sci major or pol psych minor or #; spring, every year)
POL 8311. Political Psychology and Socialization. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or pol psych minor or #; fall, spring, every year) 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. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, every year) Introduction to study of legislative politics; theories of legislative institutions and individual behavior; congressional elections; congressional committees, parties, and leaders.

POL 8313. Executive Process. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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. (3.0 cr.; A-F or Audit; fall, every year) 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. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, every year) 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. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) Theoretical approaches to comparative study of state politics; study of political culture and behavior, governmental institutions, and public policy at state level; federalism.

POL 8331. Constitutional Law. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) Overview of substantive and theoretical debates in American constitutional law; role of law and constitutional interpretation in shaping American political institutions and American politics.

POL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

POL 8335. Public Policy. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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. (3.0 cr.; [max 9.0 cr.;] prereq Grad pol sci major or #; fall, spring, every year) Readings/research in special topics or problems.

POL 8401. International Relations. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, every year) Basic theories/approaches to study of international politics. Surveys representative work/central issues of scholarship.

POL 8402. International Security. (3.0 cr.; prereq Grad pol sci major or #; spring, even years) Introduction to contending theories of international conflict/security.

POL 8403. International Norms and Institutions. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) Origins, roles, and effectiveness of international norms and institutions; theoretical explanations and debates. Institution of sovereignty; rational choice versus constructivist perspectives; role of international law, international organizations, and non-governmental organizations; and international society and transnational cultural norms.

POL 8404. International Hierarchy. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) "[CSDS 8404];" 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. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, offered periodically) 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. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) Relationships between workings of the international political system and that of international markets for currency and capital.

POL 8407. Morality in World Politics. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) 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, moral implications of technology; case study on war (Gulf War).

POL 8408. International Relations of the Environment. (3.0 cr.; prereq Grad pol sci major or #) Theory and practice of international environmental politics. 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. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) 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. (3.0 cr.; prereq 8410 or #; fall, spring, offered periodically) U.S. policy toward foreign states and peoples: heritage, motivations, policy processes, what the public generally knows and wants, specific policies. Rise of imperialistic issues and decline of enemy-focused internationalism; implications for process and content of U.S. foreign policy.

POL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

POL 8460. Topics in International Relations. (3.0 cr.; [max 6.0 cr.;] prereq Grad pol sci major or #; fall, spring, every year) 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 8601. Introduction to Comparative Politics. (3.0 cr.; prereq Grad pol sci major; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, offered periodically) 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, cleavages 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. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, offered periodically) 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 peasantry and working class, political development and decay, social movements, and prospects for democracy.

POL 8608. Government and Politics of Russia and the Commonwealth of Independent States. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, offered periodically) 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 is assumed.


POL 8615. The Political Economy of Contemporary Japan. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) Major political and economic issues confronting the Japanese system; situation of Japanese case within comparative politics literature concerning role of the state in formulating economic and social policy making. Review of literature. Deregulation in key industries, welfare reform, tax reforms.

POL 8619. Latin American Politics. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) Major bodies of theory on development, democracy and redemocratization, social movements, civil society, the state, and transnational linkages.

POL 8633. Comparative Sociopolitical Change. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) Critical evaluation of literature and theoretical perspectives; comparative examination of social and political change and interrelationship between both processes; structure/agency nexus.

POL 8637. Comparative Political Economy. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) Connections between democracy and markets, emphasizing experiences of countries in North America and Europe.

POL 8641. Comparative Mass Political Behavior. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, even years) 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. (3.0 cr.; A-F or Audit; prereq Pol sci grad student or #; fall, spring, offered periodically) 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. (3.0 cr.; max 9.0 cr.; prereq Grad pol sci major or #; fall, spring, every year) Readings in advanced topics or problems. Supervised research/training. Topics specified in Class Schedule.

POL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; max 12.0 cr.; No Grade Associated; prereq Doctoral student who has not passed prelim oral, up to 24 combined cr, permission number required for registration, doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr; fall, spring, summer, every year) TBD

POL 8777. Thesis Credits: Master's. (1.0-18.0 cr.; max 50.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only], fall, spring, every year) (No description)

POL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; max 100.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

POL 8990. Directed Readings and Research in Political Science. (1.0-7.0 cr.; prereq 16 Bxxx pol sci courses, #, %; fall, spring, summer, every year) TBD

PORT 5520. Portuguese Literary and Cultural Studies. (3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, offered periodically) Origins/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. (3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) 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. (3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) Origins/development of Lusophone Africa (Angola, Mozambique, Cape-Verde, Guinea-Bissau, Sao Toma, Principe). Literature, cultural/literary criticism, history, sociology, media (film, art, music).

PORT 5910. Topics in Lusophone Cultures and Literatures. (3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) 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 5930. Topics in Brazilian Literature. (3.0 cr. [max 9.0 cr.]; fall, every year) Major issues of Brazilian literature; focuses on important authors, movements, currents, genres. Problems, socioeconomic questions, literary techniques related to Brazilian themes. Topics specified in Class Schedule.

PORT 5970. Directed Readings. (3.0 cr. [max 9.0 cr.]; fall, spring, summer, every year) Lusophone studies (Portuguese-speaking Africa, Brazil, Portugal). Areas not covered in other courses. Students submit reading plans for particular topics, figures, periods, or issues. Prereq MA or PhD candidate, instr consent.

PORT 5990. Directed Research. (1.0-4.0 cr. [max 9.0 cr.]; fall, spring, summer, every year) Graduate-level research in literatures and cultures of the Portuguese-speaking world. Topics vary. Prereq Grad student or instr consent.

PORT 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

PORT 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year) (No description)
Postsecondary Teaching and Learning (PSTL)
College of Education and Human Development

PSTL 5001. Modeling Instruction: Introductory Science Courses. (3.0 cr.; prereq [Teaching or preparing to teach] intro science courses; fall, spring, summer, every year) Use of model-centered, guided inquiry method of teaching introductory science. Making better use of resources for science education. Strengthening local institutional support for participants as learning community of leaders in disseminating standards-based reform.

PSTL 5010. Diverse Learners in Postsecondary Education. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, every year) Theories of teaching, learning, student development to diverse student populations in post-secondary settings.

PSTL 5020. Directed Study: Postsecondary Teaching and Learning. (1.0-6.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Directed study in postsecondary teaching and learning.

PSTL 5050. Reflecting on Professional Development Through Facilitating Peer Learning Groups. (1.0 cr.; S-N or Audit; prereq 90 cr; fall, every year) Personal/professional development that occurs through collaborating peer learning groups. Power of peer learning environments on students and on those who serve as facilitators. Direct instruction, directed learning tasks, intense reflective activities.

PSTL 5105. Increasing Access and Success in Undergraduate Classrooms. (3.0 cr.; A-F or Audit; fall, spring, summer, every year) Fundamentals and best practices for promoting student access, persistence, and retention within classroom. Focuses on traditionally under-represented/served populations.

PSTL 5106. Multicultural Teaching and Learning in Diverse College Contexts. (3.0 cr.; A-F only; prereq Grad student; fall, every year) Theory/ pedagogy for culturally responsive teaching from perspectives of teachers/learners in postsecondary settings. Critical multicultural education, universal instructional design, integrated multicultural instructional design.

PSTL 5196. Supervised Practicum in Multicultural Postsecondary Teaching and Learning. (3.0 cr.; S-N only; prereq Grad student in PsTL certificate program or admitted to PsTL master's program; fall, spring, summer, every year) Postsecondary teaching experience in supervised settings. Weekly group supervision session. Classroom experiences, learning centers, and other postsecondary teaching venues.

PSTL 5206. Action Research Methods to Improve College Teaching and Learning. (3.0 cr.; A-F or Audit; prereq Grad student; spring, every year) Action research as method of improving teaching/learning at postsecondary level. Experience doing research in college classrooms. Relative strengths/challenges of different approaches to classroom research. Ethical issues.

PSTL 5212. Multicultural Theories of College Student Development Applied to Teaching and Learning. (3.0 cr.; A-F only; prereq Grad student; fall, spring, summer, every year) Multicultural student development theories/ theorists. Implications for teaching/learning. Students reflect on The Student Personnel Point of View and Learning Reconsidered: Campus-wide Focus on the Student Experience and other collaborative efforts.

PSTL 8010. Special Topics: Postsecondary Teaching and Learning. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, summer, every year) Special topics on current research/best practices in postsecondary education contexts.

PSTL 8296. Supervised Internship in Postsecondary Teaching and Learning. (3.0-6.0 cr. ; S-N only; prereq 5196, grad student admitted to master's program in multicultural college teaching/learning; fall, spring, summer, every year) Classroom-based or online group supervision. Weekly supervised experiences. Internship settings based on students' interests/goals.

PSTL 8315. Plan B Capstone Seminar. (3.0 cr.; S-N only; prereq 5206, grad student admitted to master's program in multicultural college teaching/learning; if Plan B project includes research with human subjects, application to Institutional Review Board is required; fall, spring, summer, every year) Determining topic, creating timeline, and initiating project in conjunction with year 2 internship.

PSTL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser consent, DGS consent; fall, spring, summer, every year) FTE: master's.

PSTL 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; fall, spring, summer, every year) Thesis credits: master's.

Preventive Science Minor (PREV)
College of Education and Human Development

PREV 8001. Prevention Science Core. (3.0 cr.; Student Option No Audit; prereq Grad student; spring, every year) Theoretical, empirical, and practical foundations for strategic interventions to prevent behavioral problems and promote healthy development. Multidisciplinary roots of prevention science. Trends/directions. best practices.

PREV 8005. Prevention Science Capstone Course. (1.0 cr.; Student Option No Audit; prereq 8001; fall, every year) Topics for preservation research project. Students discuss possible projects with faculty/peers. Students present final proposal for research project.

Product Design (PDES)
College of Design

PDES 5170. Topics in Product Design. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Jr or Sr grad student; fall, spring, summer, every year) In-depth investigation of specific topic, announced in advance.

PDES 5193. Directed Study in Product Design. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Grad, #: fall, spring, summer, every year) Independent study in product design under tutorial guidance.

PDES 5701. Innovation. (3.0 cr.; A-F only; fall, every year) Half semester course. Introduction to a variety of creativity and idea generation tools with an emphasis on innovative product concept development. Students apply different tools to an ongoing project. Starting with a general theme, students explore problems and concepts, practice using a variety of idea generation tools, and learn methods of evaluating/selecting concepts. Customer needs, benchmarking, and intellectual property.

PDES 5702. Concept Sketching and Rendering. (3.0 cr.; A-F only; fall, every year) Sketching and marker rendering for communication of conceptual product design. Free-hand 2-point perspective. Weekly drawing assignments/presentations. Students keep a sketchbook to develop ideas/drawings.


PDES 5704. Innovative Computer Modeling and Rendering for Design. (3.0 cr.; A-F only; =PDES 3704; prereq Senior or grad student; spring, every year) Overview of how to make well-modeled, properly illuminated, and carefully composed digital models of existing/conceptual objects.

PDES 5711. Toy Product Design. (4.0 cr.; A-F only; spring, every year) Product design process with a focus on creativity and designing for play. Project-centric. Students work in small teams of 5-6 members to design and prototype new toys with the help of local industry and children.

PDES 8192. Readings in Product Design. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Grad, #: fall, spring, every year) Independent study; review of books and periodicals under tutorial guidance.

PDES 8193. Directed Study in Product Design. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Grad, #: fall, spring, summer, every year)
Psychology (PSY) College of Liberal Arts

PSY 5012. Learning and Cognition in Animals. (4.0 cr.; prereq 3011 or 4011 or honors or grad student or #; fall, every year) 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. (3.0 cr.; prereq 3011 or 3051 or honors or grad student; spring, even years) Human memory encoding/retrieval. How we adaptively use memory. Brain systems that support memory. Episodic/sememantic memory. Working/short-term memory. Procedural memory. Repetition priming. Prospective remembering. Autobiographical memory.

PSY 5015. Cognition, Computation, and Brain. (3.0 cr.; prereq [Honors or grad] or [jr or sr], [3011 or 3031 or 3051 or 3061]) or #; spring, odd years) Human cognitive abilities (perception, memory, attention) from different perspectives (e.g., cognitive psychological approach, cognitive neuroscience approach).

PSY 5018H. Mathematical Models of Human Behavior. (3.0 cr.; A-F only; prereq Math 1271 or #; fall, offered periodically) 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. (3.0 cr.; prereq 3031 or 3051 or #; fall, odd years) Cognitive, computational, and neuroscience 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. (3.0 cr.; prereq [3031 or 3051], [Math 1272 or equiv]) or #; fall, even years) 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. (3.0 cr.; prereq [MATH 1271, 3031 or 3051 or 3061]) or grad student; fall, offered periodically) Biological and physical aspects of hearing, auditory psychophysics, theories and models of hearing, perception of complex sounds including music and speech. Clinical/other applications.

PSY 5038W. Introduction to Neural Networks. (3.0 cr.; prereq [[3061 or NSC 3102], [MATH 1282 or 2243]] or #; fall, odd years) Parallel distributed processing models in neural/cognitive science. Linear models, Hebbian rules, self-organization, non-linear networks, optimization, representation of information. Applications to sensory processing, perception, learning, memory.

PSY 5054. Psychology of Language. (3.0 cr.; prereq Grad or [jr or sr], [3011 or 3031 or 3051 or 3061]) or #; fall, every year) Theories/experimental evidence in past/present conceptions of psychology of language.

PSY 5062. Cognitive Neuropsychology. (3.0 cr.; prereq Grad or [jr or sr], [3011 or 3031 or 3051 or 3061]) or #; fall, every year) Consequences of different types of brain damage on human perception/cognition. Neural mechanisms of normal perceptual/cognitive functions. Vision/attention disorders, split brain, language deficits, memory disorders, central planning deficits. Emphasizes function/phenomenology. Minimal amount of brain anatomy.

PSY 5063. Introduction to Functional MRI. (3.0 cr.; A-F only; prereq Jr or sr or grad or #; fall, every year) How to understand and perform a brain imaging experiment. Theory and practice of functional MRI experimental design, execution, and data analysis. Students develop experimental materials/acquire and analyze their own functional MRI data. Lectures/lab exercises.

PSY 5064. Brain and Emotion. (3.0 cr.; A-F or Audit; prereq 3061 or 5061 or #; spring, even years) 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.

PSY 5065. Functional Imaging: Hands-on Training. (3.0 cr.; prereq [3801 or equiv], [3061 or NSC 3101], #; spring, every year) Basic neuroimaging techniques/functional magnetic resonance imaging (fMRI). First half of semester covers basic physical principles. Second half students design/execute fMRI experiment on Siemens 3 Tesla scanner.

PSY 5011. Personality Psychology. (3.0 cr.; [PSY 3101]; prereq [3001W or equiv]; [honors undergrad or grad student]; spring, even years) Current theory and research on personality functioning and personality structure. Descriptive, biological, evolutionary, cognitive, developmental, cultural, and narrative perspectives on personality.

PSY 5135. Psychology of Individual Differences. (3.0 cr.; [PSY 3135]; prereq [3001W or equiv] or [5862 or equiv] or #; spring, offered periodically) 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 5136. Human Abilities. (3.0 cr.; prereq [3001W or 3011], [3135 or 5135], [5862 or equiv] or #; spring, every year) Theory, methods, and applications of research in human abilities. Intelligence, aptitude, achievement, specific abilities, information processing/learning and intelligence, aptitude/treatment interactions, and quantitative measurement issues.

PSY 5137. Introduction to Behavioral Genetics. (3.0 cr.; prereq 3001W or equiv or #; fall, every year) Genetic methods for studying human/animal behavior. Emphasizes nature/origin of individual differences in behavior. Twin and adoption methods. Cytogenetics, molecular genetics, linkage/association studies.

PSY 5202. Attitudes and Social Behavior. (3.0 cr.; prereq 3201 or #; spring, offered periodically) Theory/research on social psychology of beliefs/attitudes. Persuasion principles.

PSY 5204. Psychology of Interpersonal Relationships. (3.0 cr.; A-F only; prereq Honors or grad student or #; fall, offered periodically) Introduction to interpersonal relationship theory/research findings.

PSY 5205. Applied Social Psychology. (3.0 cr.; prereq 3201 or grad student or #; spring, even years) 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. (3.0 cr.; A-F only; prereq 3201 or grad student or #; spring, offered periodically) Survey of social psychological theory/research pertaining to processes by which people develop beliefs about health/illness. Relationship between these beliefs, adoption of health-relevant behavior. Effect of psychological factors on physical health.

PSY 5207. Personality and Social Behavior. (3.0 cr.; A-F or Audit; prereq 3101 or 3201 or honors or grad student or #; fall, every year) Conceptual/methodological strategies for scientific study of individuals and their social worlds. Applications of theory/research to issues of self, identity, and social interaction.

PSY 5501. Vocational and Occupational Health Psychology. (3.0 cr.; prereq 3001W or equiv or #; spring, every year) 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 5707. Personnel Psychology. (4.0 cr.; =PSY 5701; prereq [3001W or equiv], 3711 or #; fall, every year) Application of psychological research/theory regarding individual differences, psychological measurement, decision making, and learning to personnel selection, performance assessment, and occupational training. Job analysis, recruitment, selection decisions, performance appraisals, and training design, evaluation, and practice.

PSY 5708. Organizational Psychology. (3.0 cr.; =PSY 5702, PSY 5705; prereq [3001W, 3711] or psy grad or #; spring, every year) 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 5862. Psychological Measurement: Theory and Methods. (3.0 cr.; prereq 3801H or MATH 1271 or grad student; fall, every year) Types of measurements (tests, scales, inventories) and their construction. Theory/measurement of reliability/validity.


PSY 5960. Topics in Psychology. (1.0-4.0 cr. [max 8.0 cr.]; prereq PSY 1001, Jr or Sr or grad student; fall, spring, summer, offered periodically) Special course or seminar. Topics listed in Class Schedule.

PSY 5993. Research Laboratory in Psychology. (3.0 cr. [max 15.0 cr.]; prereq #, %; fall, spring, every year) Laboratory instruction and seminars in faculty research areas.

PSY 8004. Philosophical Psychology. (3.0 cr.; S-N or Audit; prereq Grad student or #; spring, offered periodically) Selected philosophical/methodological problems.

PSY 8010. Advanced Topics in Learning. (3.0 cr. [max 12.0 cr.]; S-N or Audit; prereq 5012 or #; spring, offered periodically) Contemporary topics in learning and behavior theory.

PSY 8026. Neuro-Immune Interactions. (3.0 cr.; =NSC 8026; prereq MIBC 4131 or equiv, NSC 5111 or equiv; ) Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation.

PSY 8031. Seminar: Visual Perception. (2.0 cr. [max 3.0 cr.]; prereq 5031 or #; fall, spring, every year) Cognitive, psychological, neurophysiological determinants of visual perception. Current research.

PSY 8036. Topics in Computational Vision. (3.0 cr. [max 12.0 cr.]; prereq 5031 or 5036 or equiv or #; spring, every year) Recent research in visual psychophysics, visual neuroscience, and computer vision.


PSY 8041. Proseminar in Perception. (3.0 cr.; A-F or Audit; prereq Psy grad student or #; fall, odd years) Seminar. Advanced topics in auditory and visual perception. Lecture, discussion, and student-led presentations of research papers on core topics of the peripheral visual and auditory systems, cortical representations, behavioral and brain-imaging methods, and computational approaches to understanding/simulating perception.

PSY 8042. Proseminar in Cognition, Brain, and Behavior. (3.0 cr.; A-F or Audit; prereq Psy grad student or #; fall, even years) Advanced topics in cognition, brain, and behavior. Lecture, discussion, and student-led presentations of research papers on core topics of attention, memory, emotion, categorization, thinking, and language, and intersections between these areas.

PSY 8055. Seminar: Cognitive Neuroscience. (3.0 cr.; prereq 5015 or #; spring, even years) Recent advances in analysis of neural bases of cognitive functions.

PSY 8056. Seminar: Psychology of Language. (3.0 cr.; A-F or Audit; prereq Grad psych major or #; fall, spring, offered periodically) Selected topics in psycholinguistics.

PSY 8061. Neuropsychopharmacology. (3.0 cr.; A-F or Audit; =CMB 8208; prereq 5xxx coursework in biological psych or neuroscience or pharmacology or #; fall, even years) Relationships between biochemical, neurophysiological, psychological, and behavioral effects of drugs. Research in neuropsychopharmacology, behavioral pharmacology, and pharmacology of addiction.

PSY 8070. Seminar: Psychopharmacology. (1.0-3.0 cr. [max 12.0 cr.]; =NSC 8207, PHCL 8207); #; fall, spring, every year) Basic issues, contemporary research. Lectures, student presentations.

PSY 8111. Biological, Cognitive, Affective, Social, Developmental and Historical Aspects of Psychopathology. (4.0 cr.; A-F or Audit; #; fall, every year) Descriptive psychopathology. Theory/research. Evaluation of current experimentation in various behavior disorders.

PSY 8201. Social Cognition. (3.0 cr.; A-F or Audit; prereq Psych PhD candidate; fall, offered periodically) Social psychological theory/research on social inference and reasoning processes. Psychology of prejudice/stereotyping.

PSY 8202. Close Relationships. (3.0 cr.; prereq 5204 or #; spring, offered periodically) Classic/contemporary theory/research on close relationships. Emphasizes romantic relationships.

PSY 8203. Impression Management. (3.0 cr.; prereq Grad psych major; 8208 recommended; #; fall, offered periodically) Classic 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. (3.0 cr.; A-F or Audit; fall, offered periodically) 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. Principles of Social Psychology. (3.0 cr. [max 15.0 cr.]; prereq Psych PhD student; fall, every year) Contemporary theoretical positions and related research.

PSY 8206. Proseminar in Social Psychology. (1.0 cr. [max 5.0 cr.]; S-N only; prereq [PSY 8205, Social Psych PhD student] or #; spring, every year) Current research topics in social psychology.

PSY 8208. Social Psychology: The Self. (3.0 cr.; A-F or Audit; prereq Psych background especially in personality and soc psych; spring, every year) Social psychological theory and research concerning the self and social behavior.


PSY 8210. Law, Race, and Social Psychology. (3.0 cr.; A-F only; prereq 2nd or 3rd yr law student or PhD student in social science doctoral program; fall, offered periodically) 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. (1.0 cr.; S-N or Audit; =POL 8307); prereq Political Psychology grad minor; fall, spring, offered periodically) Readings, discussion, and guest speakers. Topics vary each semester.

PSY 8212. Proseminar in Political Psychology II. (1.0 cr.; S-N or Audit; =POL 8308); prereq Political Psychology grad minor; fall, spring, offered periodically)
University Counseling and Consulting Services

Integrates science with supervised practice in psychology settings.

Beginning applied experiences in counseling psychology settings.

PSY 8510. Counseling Psychology Beginning Practicum: General. (1.0-6.0 cr.; S-N only; prereq Counseling Psy grad student; fall, every year)

Beginning applied experiences in counseling psychology settings.

PSY 8511. Counseling Psychology Beginning Practicum: General. (1.0-6.0 cr.; max 18.0 cr.; S-N only; prereq Counseling Psy grad student; spring, every year)

Beginning applied experiences in counseling psychology settings.

PSY 8512. Counseling Psychology Beginning Practicum: General. (1.0-6.0 cr.; max 18.0 cr.; S-N only; prereq Counseling Psy grad student; summer, every year)

Beginning applied experiences in counseling psychology settings.

PSY 8514. University Counseling Practicum I. (4.0-6.0 cr.; S-N only; prereq Counseling Psy grad student, instr consent; fall, every year)

Integrates science with supervised practice in University Counseling and Consulting Services (UCCS) involving career, academic, and personal counseling clientele.

PSY 8515. University Counseling Practicum II. (4.0-6.0 cr.; S-N only; prereq Counseling Psy grad student; spring, every year)

Integrates science with supervised practice in University Counseling and Consulting Services (UCCS) involving career, academic, and personal counseling clientele.

PSY 8541. Multicultural Psychology. (3.0 cr.; prereq #; spring, even years)

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. Professional Standards and Ethics in Clinical Psychology. (3.0 cr.; S-N or Audit; prereq Counseling or clinical psych grad student or #; fall, every year)

Ethical principles/codes of conduct for psychologists. Ethical dilemmas faced by researchers, practitioners, teachers.

PSY 8544. Vocational and Occupational Health Psychology Research. (3.0 cr.; prereq [[8501, 8502, 8503] or equiv], counseling psy grad student, #; spring, even years)

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. (3.0 cr.; prereq [8501, 8502, 8503] or equiv), counseling psy grad student, #; fall, every year)

Research methods, empirically-supported interventions, assessing treatment outcomes in practice, research on the counseling process, applying counseling research in counseling practice and in non-counseling contexts in the "real world." Ethics and standards of research, history of counseling process and outcome research.

PSY 8560. Counseling Psychology Advanced Practicum I: General. (1.0-3.0 cr.; S-N only; prereq Counseling psy grad student, #; fall, every year)

Applied practice experience in counseling psychology settings and seminars. May include guest speakers, readings, and student presentations.

PSY 8561. Counseling Psychology Advanced Practicum II: General. (1.0-3.0 cr.; S-N only; prereq Counseling psy grad student, #; spring, even years)

Applied practice experience in counseling psychology settings and seminars that 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. (1.0-3.0 cr.; S-N only; prereq Counseling psy grad student, #; fall, every year)

Applied practice experience in counseling psychology settings and seminars that may include guest speakers, readings, and students presentations on topics relevant to clients and settings of practice experiences.

PSY 8565. Counseling Psychology Advanced Practicum I: Career Counseling and Assessment Clinic. (1.0-6.0 cr.; S-N only; prereq Counseling psy grad student, #; fall, every year)

Applied practice experience in vocational assessment clinic of Department of Psychology. Career/vocational testing, assessment, decision making.

PSY 8566. Counseling Psychology Advanced Practicum II: Career Counseling and Assessment Clinic. (1.0-6.0 cr.; S-N only; prereq Counseling psy grad student, #; spring, every year)

Applied practice experience in Vocational Assessment Clinic of Department of Psychology. Career/vocational testing, assessment, decision making.

PSY 8567. Counseling Psychology Advanced Practicum III: Career Counseling and Assessment Clinic. (1.0-6.0 cr.; S-N only; prereq Counseling psy grad student, #; summer, every year)

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. (1.0-12.0 cr. [max 36.0 cr.]; S-N only; prereq Counseling psy PhD candidate, #; fall, every year)

First part of counseling psychology internship.

PSY 8571. Counseling Psychology Internship II. (1.0-12.0 cr. [max 36.0 cr.]; S-N only; prereq Counseling psy PhD candidate, #; spring, every year)

Second part of counseling psychology internship.

PSY 8572. Counseling Psychology Internship III. (1.0-12.0 cr. [max 36.0 cr.]; S-N only; prereq Counseling psy PhD candidate, #; summer, every year)

Third part of counseling psychology internship.

PSY 8561. Intellectual and Neuropsychological Assessment: Measurement, Methodology, and Development. (5.0 cr.; A-F or Audit; prereq Clinical psych grad student; fall, every year)

Theory/practice in clinical application of assessment techniques/interviewing. Lab observations, administration, scoring, interpretation.

PSY 8562. Clinical Praccticum: Consultation, Supervision, Professional Standards, and Lifelong Learning. (1.0-6.0 cr. [max 36.0 cr.]; S-N or Audit; prereq #; fall, spring, summer, every year)

Field experience in professional work in clinical settings.

PSY 8561. Crisis Intervention, Professional Consultation, and Community Psychology. (3.0 cr.; S-N only; prereq Counseling psy grad student, #; fall, every year)

Applied practice experience in vocational assessment clinic of Department of Psychology. Career/vocational testing, assessment, decision making.
PSY 8622. Theories and Methods of Effective Intervention. (3.0 cr.; A-F or Audit; prereq 8111, CSSP grad student; spring, odd years) Methodological issues in treatment research, theories of change/motivation. Empirically supported therapies for anxiety, mood, personality disorders, psychosis, addiction. Simulating therapeutic interactions to prepare students to provide therapy.

PSY 8664. Personality Assessment. (3.0 cr.; prereq Psy grad student or #; spring, odd years) Concepts/Issues concerning individual differences in personality and their assessment; content, reality, and significance of personality traits; classification of personality traits; major approaches to measurement of personality.

PSY 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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.; fall, spring, summer, every year) TBD

PSY 8701. Seminar in Industrial and Organizational Psychology I. (3.0 cr.; A-F or Audit; prereq #; fall, offered periodically) Application of research and theory in psychological measurement and individual differences to problems in job analysis, personnel selection and classification, performance assessment, and individual training.

PSY 8702. Seminar in Industrial and Organizational Psychology II. (3.0 cr.; A-F or Audit; prereq #; fall, offered periodically) Determinants of behavior, performance, job satisfaction that can be influenced after an individual enters an organization. Application of research/theory in attitudes, motivation, leadership, group/team dynamics, and job design to enhancement of job performance/satisfaction.

PSY 8703. Seminar in Industrial and Organizational Psychology III. (3.0 cr.; A-F or Audit; prereq #; fall, offered periodically) Developing issues/trends in current research, research methodological advances, and implementation practices. Recent important/controversial developments.

PSY 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)


PSY 8881. Seminar: Quantitative and Psychometric Methods. (3.0 cr. [max 15.0 cr.]; fall, every year) Reviews individual research on current topics in psychological measurement.

PSY 8882. Seminar: Quantitative and Psychometric Methods. (3.0 cr. [max 15.0 cr.]; spring, every year) Reviews, individual research on current topics in psychological measurement.

PSY 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

PSY 8935. Readings in Behavioral Genetics and Individual Differences Psychology. (1.0 cr. [max 10.0 cr.]; S-N or Audit; prereq 5135, 5137 or #; fall, spring, every year) Each week participants read and discuss one or two primary research articles.

PSY 8937. Seminar in Human Behavioral Genetics. (3.0 cr.; [max 9.0 cr.]; prereq 5137 or #; spring, every year) Advanced topics vary with each offering. Sample topics: gene identification in complex human traits, behavioral genetics of alcoholism, twin-family methodology.

PSY 8960. Graduate Seminar in Psychology. (1.0-4.0 cr.; prereq Psychology grad student or #; fall, spring, every year) Graduate seminar in subject of current interest in psychology.

PSY 8993. Directed Studies: Special Areas of Psychology and Related Sciences. (1.0-6.0 cr. [max 36.0 cr.]; prereq #; fall, spring, every year) Special area of psychology or a related science.

Public Affairs (PA) Hubert H. Humphrey School of Public Affairs


PA 5002. Introduction to Policy Analysis. (1.5 cr.; A-F or Audit; prereq Major or minor in public policy or science/technology/environmental policy or #; fall, spring, every year) Process of public policy analysis from problem structuring to communication of findings. Commonly used analytical methods. Alternative models of analytical problem resolution.

PA 5003. Introduction to Financial Analysis and Management. (1.5 cr.; A-F or Audit; prereq Public policy major/minor or major in development practice, public affairs or liberal studies or grad nonprofit mgmt cert or #; fall, spring, summer, every year) Finance/accounting concepts/tools in public/nonprofit organizations. Fund accounting. Balance sheet/income statement analysis. Cash flow analysis. Public/nonprofit sector budgeting processes. Lectures, discussions, cases.

PA 5004. Introduction to Planning. (3.0 cr.; A-F or Audit; prereq Major/minor in urban/regional planning or #; fall, every year) History/institutional development of urban planning as profession. Intellectual foundations, planning theory, Roles of urban planners in U.S./international settings. Scope, legitimacy, limitations of planning/planning process. Issues in planning ethics/settings of diverse populations/stakeholders.

PA 5011. Management of Organizations. (3.0 cr.; A-F or Audit; prereq Major/minor in public policy or sci, tech, and environ policy) or public affairs PhD or #; spring, every year) Challenges facing higher-level managers in public/nonprofit organizations in mixed economy/democratic republic. Distinctive features of public/nonprofit management, skills necessary for effective management, manager's role as creator of public value. Lectures, case discussions.

PA 5012. The Politics of Public Affairs. (3.0 cr.; A-F or Audit; prereq Major or minor in public policy or [sci, tech, and environ policy] or public affairs PhD or #; spring, every year) Stages of policy making from agenda setting to implementation. Role/behavior of political institutions, citizens, social movements, interest groups. Concepts of political philosophy. Theories of state. State taught, interdisciplinary course. Small discussion sections.

PA 5013. Law and Urban Land Use. (1.5 cr.; A-F or Audit; prereq Major or minor in urban/regional planning or #; fall, every year) Role of law in regulating/shaping urban development, land use, environmental quality, local/regional governmental services. Interface between public/private sector.
PA 5021. Economics For Policy Analysis and Planning I. (3.0 cr.; A-F or Audit; prereq [Econ 1101 or equiv], major or minor in public policy or science/technology/environmental policy or #; fall, every year) Introduction to tools useful for public policy. Intermediate microeconomics, macroeconomics, concepts of international trade.

PA 5022. Economics For Policy Analysis and Planning II. (1.5-3.0 cr.; max 4.5 cr.; A-F or Audit; prereq [[5021 or equiv], public policy major or #; spring, every year) Application of economic reasoning to various public policy issues. Cost-benefit analysis, nonmarket valuation, and tax analysis.

PA 5031. Empirical Analysis I. (4.0 cr.; A-F or Audit; prereq Major in dev practice or major/minor in pub policy or sci/tech, or environ policy or urban/regional planning or #; fall, every year) Basic statistical tools for empirical analysis of public policy alternatives. Frequency distributions, descriptive statistics, elementary probability/probability distributions, statistical inference. Estimation/hypothesis testing. Cross-tabulation/chi-square distribution. Analysis of variance, correlation. Simple/multiple regression analysis.

PA 5032. Regression Analysis. (2.0 cr.; A-F or Audit; prereq [5031 or equiv], major or minor in public policy or science/technology/environmental policy or #; spring, every year) Bivariate/multivariate models of regression analysis, assumptions behind them. Problems using these models when such assumptions are not met.

PA 5033. Multivariate Techniques. (2.0 cr.; A-F or Audit; prereq [5032 or equiv], major or minor in public policy or science/technology/environmental policy or #; spring, every year) May fulfill stats requirements in other programs.; spring, every year) Public affairs topics using maximum-likelihood estimation approaches.

PA 5035. Survey Research and Data Collection. (1.5 cr.; A-F only; prereq [5031 or equiv], major in publ policy or sci, tech, environ policy or urban/ regional planning or #; spring, every year) Introduction to survey research methods. Emphasizes applications to policy/applied research. Research design choices (e.g., descriptive, experimental, case studies), sampling, variable specification, measurement. Conducting interviews, self-administered questionnaires. Qualitative techniques.

PA 5038. Analytics for Leaders I. (3.0 cr.; A-F only; prereq Major in public affairs or public affairs leadership certificate or #; fall, spring, every year) Skills to do basic quantitative analyses, evaluate research, develop evidence-based policy, and lead data-driven organizations. Descriptive statistics, research design. Ethical issues in interpretation, analysis, and use.

PA 5039. Analytics for Leaders II. (3.0 cr.; A-F only; prereq 5038; fall, spring, every year) Builds on 5038. Skills to do basic quantitative analyses, evaluate research, develop evidence-based policy, and lead data-driven organizations. Descriptive statistics, research design. Ethical issues in interpretation, analysis, and use.

PA 5041. Qualitative Methods for Policy Analysts. (4.0 cr.; A-F only; prereq Major or minor in public policy or science/technology/environmental policy or #; fall, every year) Qualitative analysis techniques, examples of application. Meet with researcher. Hands-on experience in designing, gathering, analyzing data.

PA 5042. Urban and Regional Economics. (2.0 cr.; A-F only; prereq [Major or minor in urban and regional planning, microeconomics course] or #; spring, every year) Evaluation of city existence/growth using economics. Economic forces in development of cities. Economic analysis of urban areas/land market. Economic analysis of planning issues in land use, transportation, housing, environment.

PA 5043. Economic and Demographic Data Analysis. (2.0 cr.; A-F only; prereq Major or minor in urban/regional planning or #; spring, every year) Bivariate/multivariate models used in regression analysis, including assumptions behind them/problems that arise when assumptions are not met. Problems using these models when such assumptions are not met.

PA 5044. Regression Analysis, Accelerated. (2.0 cr.; A-F only; prereq Major or minor in public policy or sci, tech, and environ policy, [5031 or equiv or #]; spring, every year) Bivariate/multivariate models used in regression analysis, including assumptions behind them/problems that arise when assumptions are not met. Course covers similar topics as PA5032 but uses more mathematical notation/delves deeper into theory/application of methods.

PA 5051. Cohort Leadership I. (2.0 cr.; A-F only; prereq Major in public affairs (cohort) or public affairs certificate (cohort); 5051-5052 must be taken in same academic yr; fall, every year) Leadership theories, tools, and strategies in global context for the mid-career student.

PA 5052. Cohort Leadership II. (2.0 cr.; A-F only; prereq Major in public affairs (cohort) or public affairs certificate (cohort); 5051-5052 must be taken in same academic yr; fall, every year) Leadership theories, tools, and strategies in global context for the mid-career student.

PA 5053. Cohort Policy Analysis I. (2.0 cr.; A-F only; prereq Major in public affairs (cohort) or public affairs certificate (cohort); 5053-5054 must be taken in same academic yr; spring, every year) Process of public policy analysis, including problem formulation, problem-solving, and communication of findings. Commonly used analytical methods. Use of multimedia mini-cases, including readings, cases, and simulation exercises.

PA 5054. Cohort Policy Analysis II. (2.0 cr.; A-F only; prereq Major in public affairs (cohort) or public affairs certificate (cohort); 5053-5054 must be taken in same academic yr; fall, every year) Continues 5053. Process of public policy analysis, including problem formulation, problem-solving, and communication of findings. Commonly used analytical methods. Use of multimedia mini-cases, including readings, cases, and simulation exercises.


PA 5056. Cohort Analytics for Leaders II. (2.0 cr.; A-F only; prereq Major in public affairs or public affairs certificate, [5055-5056 must be taken in same academic yr]; spring, every year) Problem-based learning approach to quantitative analysis. Frequency distributions, descriptive statistics, elementary probability, statistical inference. Hypothesis testing. Cross-tabulation, analysis of variance, correlation. Simple/multiple regression analysis. Data set development.

PA 5057. Executive Leadership I. (6.0 cr.; A-F only; prereq Executive Leadership postbaccalaureate certificate student; spring, every year) Institutional leadership, management, interdisciplinary studies. Emerging issues/public policy to develop executive leaders. Opportunities for practicing/reassessing leadership inside/inside the workplace. Field-based management issues.

PA 5058. Executive Leadership II. (6.0 cr.; A-F only; prereq Executive leadership postbaccalaureate certificate; summer, every year) Institutional leadership, management, interdisciplinary studies. Emerging issues/public policy to develop executive leaders. Opportunities for practicing/reassessing leadership inside/inside the workplace. Field-based management issues.

PA 5080. Capstone Preparation Workshop. (1.0 cr.; S-N only; prereq &8081; fall, spring, summer, every year) Project management, qualitative research, and critical framework to complete Capstone course. Students write draft of client project group norms and client contract.

PA 5081. Working in Teams: Crossing Disciplines and Learning from Difference. (0.5 cr.; S-N only; prereq Major in development practice, public affairs, public policy, urban and regional planning, or sci, tech, and environ policy; fall, every year) Principles/skills necessary to create high-performing multi-disciplinary/multi-cultural teams.
PA 5101. Management and Governance of Nonprofit Organizations. (3.0 cr.; prereq Grad student or #; fall, every year) 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. (3.0 cr.; prereq Grad student or #; spring, odd years) Models of change/leadership. How leaders can promote personal, organizational, and societal change. Case studies, action research. Framework for leadership/change in an innovation society.

PA 5104. Strategic Human Resource Management. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year) Theory/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 5105. Integrative Leadership Seminar. (3.0 cr.; Student Option No Audit; =[MGMT 6402, PA 5130, OLDP 6402]; prereq Grad student or #; fall, every year) Basic concepts, practices, people, and organizations associated with integrative leadership. Case materials, related readings, presentations, and interactive discussion.

PA 5106. Government, Ethics and the Public Will. (1.0-3.0 cr.; Student Option No Audit; prereq Grad student or #; spring, every year) Links between core ethical values/formation documents that have shaped democracy in United States or student's homeland. Ethics/agency. Ethics in context of leadership development. Compose narrative of ethical practice.

PA 5107. Leadership, Reflective Practice, and Critical Theory: A Practicum. (2.0 cr.; prereq Grad student or #; fall, every year) For students immersed in a cultural shift, organization, or leadership form who wish to learn how to negotiate international, cross-cultural/political contradictions. Critical approach to understanding adult learning. How to perceive and challenge dominant ideology, unmask power, contest hegemony, overcome alienation, and practice democracy.

PA 5108. Board leadership development. (1.5 cr.; S-N only; prereq Grad student or #; fall, every year) Nonprofit board governance. Governance models, roles/responsibilities, ethics/dynamics.

Current research/concepts along with students' current board experiences to illuminate challenges/explore solutions that build board leadership competencies.


PA 5113. State and Local Public Finance. (3.0 cr.; prereq Grad or #; spring, every year) Theory/practice of financing. Providing public services at state/local level of government. Emphasizes integrating theory/practice, applying materials to specific policy areas, and documenting wide range of institutional arrangements across/within the 50 states.

PA 5122. Law and Public Affairs. (3.0 cr.; prereq Grad or #; spring, every year) 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. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically) Creating an arena for mediation. Skills/expectations needed to mediate disputes between individuals, among groups: balanced (peer or colleague), imbalanced (power differentials). Role playing, group debriefing, critique. Cases.

PA 5144. Social Entrepreneurship. (3.0 cr.; A-F only; prereq Grad student or #; fall, spring, offered periodically) Introduction to field of social entrepreneurship. Prepares current/future managers/leaders to create, develop, lead socially entrepreneurial organizations/initiatives.

PA 5145. Civic Participation in Public Affairs. (3.0 cr.; A-F only; prereq Grad student or #; spring, every year) Critique/learn various approaches to civic participation in defining/addressing public issues. Readings, cases, classroom discussion, facilitating/experiencing engagement techniques. Examine work of practitioner, design engagement process.

PA 5180. Topics in Executive Leadership. (0.5-3.0 cr. [max 6.0 cr.]; A-F only; prereq #; fall, spring, every year) Selected topics in executive leadership.

PA 5190. Topics in Public and Nonprofit Leadership and Management. (1.0-3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) Selected topics.

PA 5203W. Geographical Perspectives on Planning. (4.0 cr.; = [GEOG 3605W, GEOG 5605W, GEOG 3605V, GEOG 5605V]; prereq Grad student or #; fall, every year) Includes additional weekly seminar-style meeting and bibliography project on topic selected in consultation with instructor.

PA 5204. Urban Spatial and Social Dynamics. (3.0 cr.; prereq urban/regional planning Major/minor in or public affairs PhD or #; spring, every year) Behavioral theories of internal spatial arrangement, functioning, characteristics of cities at macro level/how they produce system of cities. Factors influencing urban spatial structure over time. Urban form, land use/rent. Spatial expression of economic, social, political forces.

PA 5211. Land Use Planning. (3.0 cr.; A-F only; prereq Major or minor in urban/regional planning or #; fall, every year) 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 5212. Managing Urban Growth and Change. (3.0 cr.; prereq Grad student or #; fall, even years) Theory/practice of planning, promoting, and controlling economic growth/change in urban areas. Economic development tools available to state/local policymakers, historic context of their use in the United States. Legal, social, and economic implementation constraints. Interactions among economic, social, and demographic trends.

PA 5213. Introduction to Site Planning. (3.0 cr.; prereq Grad student or #; fall, odd years) Analyzing/preparing graphic plans for development or redevelopment of property. Site planning issues, process, opportunities, details, and techniques. Hands-on preparation of a site plan. Site visits, lectures, research, presentations, exam, in-class exercises.

PA 5215. Computer Applications in Land Use Planning. (3.0 cr.; prereq Grad student or #; spring, every year) Geographical information system software, simulation modeling of land use/development, 3D software, the Internet. Project applications in citizen participation/decision-making. Meets weekly in mostly lab setting.

PA 5221. Private Sector Development. (3.0 cr.; prereq [Grad or #], college algebra required; spring, every year) Roles of various participants in land development. Investment objectives, effects of
regulation. Overview of development process from private/public perspective.

PA 5231. Transit Planning and Management. (3.0 cr.; prereq Grad student or #; fall, every year)

PA 5232. Transportation Policy, Planning, and Deployment. (4.0 cr.; =CE 5212; prereq Sr or grad student or #; fall, odd years)
Development of transportation policy, making of transportation plans, deployment of transportation technologies. Lectures, interactive case studies, role playing.

PA 5233. Sustainable Transportation. (2.0 cr.; A-F or Audit; prereq Grad or #; spring, even years)

PA 5242. Environmental Planning, Policy, and Decision Making. (3.0 cr.; A-F only; prereq Grad or #; spring, offered periodically)
Theory and practice. Ethical, legal, and institutional frameworks relative to a range of environmental issues. Innovative environmental decision making informed by collaboration, conflict resolution, adaptive management, and resilience thinking.

PA 5251. Strategic Planning and Management. (3.0 cr.; A-F or Audit; prereq Grad student or #; spring, offered periodically)
Theory/practice of strategic planning/management for public/nonprofit organizations/networks. Strategic planning process, management systems; stakeholder analyses. Tools/techniques such as purpose expansions, SWOT analyses, oval mapping, portfolio analyses, and logic models.

PA 5253. Designing Planning and Participation Processes. (3.0 cr.; A-F only; prereq Major or minor in urban/regional planning or #; fall, every year)
Theory/practice of design, implementation, evaluation of planning/participation processes.


PA 5261. Housing Policy. (3.0 cr.; A-F or Audit; =HSG 5463; prereq Grad or #; spring, every year)

PA 5271. Geographic Information Systems: Applications in Planning and Policy Analysis. (3.0 cr.; prereq Major in urban/regional planning or #; fall, every year)

PA 5281. Immigrants, Urban Planning and Policymaking in the U.S.. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year)

PA 5290. Topics in Planning. (1.0-4.0 cr.; [max 12.0 cr.]; prereq Grad student or #; fall, spring, offered periodically)
Selected topics.

PA 5301. Population Methods & Issues for the United States & Global South. (3.0 cr.; =SOC 5511; prereq Grad student or #; spring, offered periodically)

PA 5311. Program Evaluation. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Principal methods, primary applications of evaluation research as applied to policies/programs in health/human services, education, or the environment. Conducting evaluations. Becoming a critical consumer of studies.

PA 5350. Topics in Advanced Policy Analysis Methods. (1.0-4.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically)
Topics in advanced policy analysis methods.

PA 5401. Poverty, Inequality, and Public Policy. (3.0 cr.; prereq Grad or #; fall, every year)
Nature/extent of poverty/inequality in the United States, causes/consequences, impact of government programs/policies. Extent/causes of poverty/inequality in other developed/developing countries.

PA 5405. Public Policy Implementation. (3.0 cr.; A-F or Audit; spring, every year)
Theory, tools, and practice of the implementation of public policy, particularly in areas involving public, private, and nonprofit organizations. Analytical approach focuses on multiple levels in policy fields to pinpoint and assess implementation challenges and levers for improvement.

PA 5412. Aging and Disability Policy. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically)
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 5413. Early Childhood and Public Policy. (3.0 cr.; prereq Grad or #; fall, every year)

PA 5414. Child Human Rights: Work and Education. (3.0 cr.; prereq Grad student or #; spring, offered periodically)
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. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically)
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 5422. Diversity and Public Policy. (3.0 cr.; A-F only; prereq Grad student or #; fall, offered periodically)

PA 5431. Public Policies on Work and Pay. (3.0 cr.; =HRIR 5655; prereq [PA 5031 or equiv, grad student] or #; spring, every year)
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. (3.0 cr.; =HRIR 5655; prereq [PA 5031 or equiv, grad student] or #; spring, every year)

PA 5442. Policy Design for Education and Human Development. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically)
Designing effective educational policies. Using interdisciplinary approaches to identify/understand core variables (economic, psychological, etc). Work on policy design.

PA 5451. Immigrant Health Issues. (3.04-0.0 cr.; A-F only; =PUBH 6281; prereq Grad student or #; fall, every year)
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
PA 5452. Immigration and Public Policy. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) 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. (1.0-3.0 cr. [max 9.0 cr.]; prereq Jr or sr or grad student or #; fall, spring, offered periodically) 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. (1.0-4.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) Selected topics.

PA 5501. Theories and Policies of Development. (3.0 cr.; prereq Grad student or #; fall, every year) What makes some countries wealthier than others, one group of people healthier and more educated than another? How does the behavior of rich nations affect poor nations? Origins of development thought, contemporary frameworks and policy debates. Economic, human, and sustainable development.

PA 5503. Economics of Development. (3.0 cr.; A-F or Audit; prereq PA 5501 or &PA 5501; fall, every year) Economic growth, inequality, poverty, rural/urban labor markets, risk/insurance. Investments in human capital, credit markets, gender/household economics, governance/institutional issues. Microfinance, conditional cash transfers, labor/education policies.

PA 5511. Community Economic Development. (3.0 cr.; prereq Grad or #; fall, every year) 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. (4.0 cr.; prereq 5031 or equiv recommended or #; spring, every year) Techniques of development planning/policy analysis at national, regional, and project levels. Effects of external shocks and government interventions on national/regional economies. Macroeconomic modeling, input-output analysis, social accounting matrices/multipliers, project evaluation.


PA 5561. Gender and International Development. (3.0 cr.; prereq Grad or #; spring, offered periodically) Women and men are affected differently by development and participate differently in policy formulation and implementation. Gender-sensitive perspective. Historical, political context. Global South, Policy, practice, and experience (theory and measurement; international, national, local stakeholders; effects of policy and practice on development).

PA 5590. Topics in Economic and Community Development. (1.0-3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) Selected topics.

PA 5601. Global Survey of Gender and Public Policy. (3.0 cr.; prereq Grad or #; fall, offered periodically) Examine gender equality/public policy from local, national, global perspectives. Policy areas include women's human rights, girls' education, gender/military service, electoral systems.

PA 5621. Board Service in Women and Public Policy. (1.0 cr.; S-N only; prereq #; fall, spring, offered periodically) Students serve as full members of a board of directors for a women's movement organization. Organizational leadership. How to be an effective board member. Twin Cities feminist nonprofit organizations.

PA 5690. Topics in Economic and Community Development. (3.0 cr.; =[WRS 9.0 cr.]; prereq [Intermediate microeconomics, intermediate policy analysis, grad student] or #; fall, every year) Impact of energy production/consumption choices on environmental quality, sustainable development, and other economic/social goals. Emphasizes public policy choices for energy/environment, linkages between them.


PA 5723. Water Policy. (3.0 cr.; = [WRS 5101]; prereq Grad student or #; spring, every year) Sociocultural, legal, economic, and environmental forces affecting supply/use of water by individuals, sectors, and governance institutions. Historical trends; water laws in United States and internationally. Institutional structures for managing water at federal, state, and local levels. Current water-related issues/policies.

PA 5731. Emerging Technologies and Society. (3.0 cr.; A-F only; prereq Grad student or #; fall, spring, offered periodically) Legal, public policy, social, economic, and ethical implications of emerging technologies (such as nanotechnology). Perspective of stakeholders (federal agencies, public, industry, environment, international organizations) and public policies. Statutory objectives/regulatory. Diversity of policy problems. Research methodologies.

PA 5741. Risk Analysis and Policy. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Interplay between risk analysis, decision making, and risk policy. Role of S&T. Assessment methods; risk management processes, issues and methods; role/treatment of uncertainty; factors in decision making; risk-based rule making; public values; risk communication and perception. Scientific, technical, social, political, and ethical issues.

PA 5751. Urban Infrastructure Systems for Sustainable and Healthy Cities. (3.0 cr.; A-F or Audit; prereq Grad student or #; summer, every year) Study social actors, engineered infrastructures/natural systems as they, together, shape health/sustainability outcomes for cities. Understand role of infrastructure design, planning, policy in sustainable cities. Learn sustainability systems concepts, local-to-global linkages, inter-disciplinary, inter-cultural skills.

PA 5790. Topics in Science, Technology, and Environmental Policy. (1.0-3.0 cr. [max 9.0 cr.]; prereq Grad or #; fall, spring, offered periodically) Selected topics.

PA 5801. Global Public Policy. (3.0 cr.; prereq Grad or #; spring, every year)
PA 5802. Global Economic Policy. (3.0 cr.; prereq Major in [public affairs or public policy] or #; fall, every year) Economic logic of globalization, national policy objectives, international finance/financial institutions, international trade and agreements including regional pacts and the WTO, global environmental and resource governance, immigration and emigration, and development challenges.

PA 5821. Humanitarianism. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Foundations, logic, dynamics, dilemmas, and consequences of humanitarianism, a form of governance that operates in the name of--and for--the international community.


PA 5841. Women, Violence, and Armed Conflict. (3.0 cr.; A-F only; prereq Grad student or #; fall, spring, offered periodically) Role of women in recent armed conflicts/how women are affected by wartime as combatants, civilians, victims, and perpetrators of war violence. Conflicts in Sierra Leone, Liberia and El Salvador, where women participated in fighting forces in large numbers, as well as women's roles in the Abu Ghraib scandal, female suicide bombers, wartime sexual violence. Policy solutions offered by policymakers and NGOs to deal with problems of gender-based violence.

PA 5880. Exploring Global Cities. (1.0-3.0 cr. [max 6.0 cr.]; Student Option No Audit; prereq Grad student or #; spring, every year) Study abroad offered in cities across globe. Opportunities to study policy/planning issues in varied contexts from comparative/inter-cultural perspective. Study/work with practitioners/peers in field. Tanzania odd years/Austria even years. Additional countries may be added in future.

PA 5890. Topics in Foreign Policy and International Affairs. (1.0-5.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) Selected topics.

PA 5910. Developing Your Public Service Career. (1.0 cr.; S-N or Audit; prereq [Major in [public affairs or public policy or urban/ regional planning] or [science, technology/ environmental policy] or development practice]] or #; fall, every year) Students investigate/analyze interests, skills, and abilities and combine them in a career plan. Develop tools to demonstrate abilities, document experiences/knowledge, and explore public service career options.

PA 5912. Politics of Public Affairs and Civic Engagement. (3.0 cr.; A-F only; prereq Grad student or #; spring, every year) Potential for public affairs professionals to be agents/architects of democracy in a radically changing, diverse, global landscape of governance.

PA 5920. Skills Workshop. (0.5-4.0 cr. [max 12.0 cr.]; prereq Grad student or #; fall, spring, every year) Topics on public policy or planning skills. Topics specified in Class Schedule.

PA 5924. Intercultural Competence. (3.0 cr.; A-F only; prereq Grad student or #; spring, every year) Interacting with/working effectively with diverse populations. Researching ancestry. Analyzing cross-cultural communication issues in organizations. Prejudice, discrimination, group belonging. Analyze intercultural competence of global leader.

PA 5925. Creating a Professional Online Portfolio. (1.0 cr.; S-N only; prereq [MDP, MPA, MS-STEP, MURP] or #; spring, every year) Build electronic portfolio reflecting knowledge/skills learned in coursework, internships, volunteer efforts, leadership roles, research activities. Promote professional selves using social networking platform.

PA 5941. Leadership for the Common Good. (3.0 cr.; A-F only; prereq Major in development practice or public affairs or public affairs leadership certificate or minor in integrative leadership or #; fall, spring, every year) Personal, team, organizational, visionary, political, ethical aspects of leadership. Building/experiencing learning community.

PA 5947. Pedagogy in Public Affairs. (2.0 cr.; A-F only; prereq HHH International fellow; spring, every year) 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 5952. Global Commons Seminar II. (2.0 cr.; A-F only; prereq HHH International fellow; spring, every year) Students apply interdisciplinary methods, approaches, and perspectives from core courses. Written report with analysis and policy recommendations. Oral presentation. Topics vary by term.

PA 5990. Topics: Public Affairs--General Topics. (0.0-3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) General topics in public policy.

PA 8001. Transforming Public Policy. (3.0 cr.; A-F only; prereq 5941 or #; fall, spring, every year) 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 8003. Integrative Doctoral Seminar in Public Affairs I. (3.0 cr. [max 6.0 cr.]; A-F only; prereq Public Affairs doctoral student; fall, every year) Lay foundation for doctoral-level study of public affairs through introduction of key concepts, literature, research questions of public affairs. Critically examines paradigms/methodologies through readings, discussions, writing assignments, research presentations. Facilitates development of dissertation research ideas.

PA 8004. Integrative Doctoral Seminar in Public Affairs II. (3.0 cr.; A-F only; prereq Public Affairs doctoral student; spring, every year) Continues PA 8003. Lays foundation for doctoral-level study of public affairs through introduction of key concepts, literature, research questions of public affairs. Critically examines paradigms/methodologies through readings, discussions, writing assignments, research presentations. Facilitates development of dissertation research ideas.

PA 8081. Capstone Workshop. (3.0 cr. [max 6.0 cr.]; A-F only; prereq Grad major in public affairs or public policy or [urban and regional planning] or [science, technology, and environment policy] or development practice, completion of core courses or #; fall, spring, summer, every year) Project for external client on issue agreed upon by student, client, and instructor. Students apply interdisciplinary methods, approaches, and perspectives from core courses. Written report with analysis and policy recommendations. Oral presentation. Topics vary by term.

PA 8082. Working Group. (3.0 cr.; A-F or Audit; prereq [Grad major in [public policy or [urban and regional planning] or [science, technology, and environment policy]] completion of core courses] or #; fall, spring, every year) Facilitates completion of research paper on current issue in public policy and management. Students apply interdisciplinary methods, approaches, and perspectives studied in core courses. 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. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Selected topics.

PA 8201. Environment and Infrastructure Planning. (4.0 cr.; A-F or Audit; prereq [Urban and regional planning] grad student or #; fall, every year)
Relationship between infrastructure, human settlement design. Natural resource systems as foundation of infrastructure provision. Environmental basis of, and political/legal/institutional frameworks for, land-use planning. Parallel computer lab, practicum assignment.

PA 8202. Networks and Places: Transportation, Land Use, and Design. (4.0 cr.; A-F or Audit; prereq [urban and regional planning] grad student or #; spring, every year)
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 practicum assignment.

PA 8203. Neighborhood Revitalization Strategies and Theories. (4.0 cr.; A-F or Audit; prereq [Urban and regional planning] grad student or #; fall, every year)
Policy making/politics of planning in housing, community development, social policy. Connecting policy to local/regional politics. Role of institutional decision-making structures on policy outcomes. Importance of citizens, social movements, interest groups in policymaking process.

PA 8204. Creating Good Work: Economic and Workforce Development. (4.0 cr.; A-F or Audit; spring, every year)
Job-oriented 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. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Selected topics.

PA 8302. Applied Policy Analysis. (4.0 cr.; A-F only; prereq Intermediate microeconomics, introduction to econometrics; fall, spring, offered periodically)

PA 8312. Analysis of Discrimination. (4.0 cr.; fall, spring, offered periodically)
Policy analysis/other applied social sciences as tools for measuring/detecting discrimination in market/nonmarket contexts. Application of modern tools of labor econometrics/race relations research to specific problems of market/nonmarket discrimination.

PA 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

PA 8390. Advanced Topics in Advanced Policy Analysis Methods. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Selected topics.

PA 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
FTE: Doctoral

PA 8490. Advanced Topics in Social Policy. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Selected topics.

PA 8590. Advanced Topics in Economic and Community Development. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Selected topics.

PA 8686. Feminist Organizations. (3.0 cr.; A-F or Audit; spring, offered periodically)
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 8687. Women and Electoral Politics. (3.0 cr.; A-F or Audit; )
Political science and women's studies literature on American women and electoral politics.

PA 8690. Advanced Topics in Women and Public Policy. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Selected topics.

PA 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

PA 8790. Advanced Topics in Science, Technology, and Environmental Policy. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Selected topics.

PA 8811. Strategic Issues in International Economic Policy. (3.0 cr.; fall, spring, offered periodically)
Compares/contrasts experiences of industrial/developing countries in trade, investment, exchange rates, and immigration.

PA 8821. National Security Policy. (3.0 cr.; fall, every year)
Politics 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 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq [Max 18 cr per semester or summer], 24 cr required; fall, spring, summer, every year)
Doctoral thesis credit.

PA 8890. Advanced Topics in Foreign Policy and International Affairs. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Selected topics.

PA 8921. Master's: Professional Paper (Individual Option). (1.0-3.0 cr.; prereq #; fall, spring, summer, every year)
Masters of science in science, technology, and environmental policy majors work under guidance of paper adviser to complete their Professional Paper (individual option).

PA 8922. Master's Paper: Plan B. (1.0-3.0 cr.; prereq #; fall, spring, summer, every year)
Masters of science in science, technology, and environmental policy majors work under guidance of paper adviser to complete their Plan B.

PA 8991. Independent Study. (0.5-3.0 cr.; Max 6.0 cr.; prereq Limit of 3 credits applied toward a Humphrey School of Public Affairs degree or certificate program; #; fall, spring, summer, every year)
Independent study.

Public Health (PUBH)
School of Public Health

PUBH 5230. Topics: Public Health Practice. (2.0 cr.; max 4.0 cr.; Student Option No Audit; fall, spring, summer, every year)
Topics.

PUBH 5231. Emergency Preparedness: A Public Health Perspective. (2.0 cr.; A-F only; prereq Upper-level undergraduate students and grad/professional students in academic health sciences and fields related to public health emergency preparedness, response, and recovery. Credit will be not granted if student has completed the PUBH 5230 topic course with same title.; spring, every year)
Public health emergency preparedness, response, recovery. Introduction to field's core competencies. Various components of course, including online modules, intended to stimulate interactions among learners. Purpose, history, organization, functions, tools, activities used in field.

PUBH 8100. Topics: Applied Analyses of Occupational Health Data. (1.0-4.0 cr. [max 80.0 cr.]; prereq Doctoral student in occupational health studies. Prior coursework in epidemiology, statistics; fall, spring, summer, every year)
New course offerings or topics of interest in environmental health.

PUBH 8120. Occupational Health and Safety Research Seminar. (1.0 cr. [max 12.0 cr.]; S-N or Audit; prereq [8120, 6330 or 6341], 6450, environmental health major, [OIPRT specialty or equiv] or #; fall, spring, summer, every year)
Facilitates student research training in occupational injury prevention. Roundtable discussions, interdisciplinary involvement.

PUBH 8140. Validity Concepts in Epidemiologic Research. (2.0 cr.; S-N only; fall, every year)
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 8141. Doctoral Seminar in Observational Inference.** (2.0 cr. [max 20.0 cr.]; S-N or Audit; fall, spring, every year) Fundamentals of epidemiologic inference. Methods for designing, analyzing, and interpreting epidemiologic studies.

**PUBH 8142. Epidemiologic Uncertainty Analysis.** (2.0 cr.; S-N only; prereq 8140; spring, every year)

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.** (2.0 cr.; A-F only; prereq 6160, one course in biochem, one course in molecular biol, #; fall, every year)

Cellular/molecular mechanisms by which xenobiotics cause toxicity. Investigative approaches to current research problems in toxicology/carcinogenesis. Apoptosis, cell cycle regulation, genetic toxicity, molecular mechanisms of chemical carcinogenesis, genetic basis for susceptibility to environmental toxicants.

**PUBH 8161. Current Literature in Toxicology.** (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq 6160; fall, spring, every year)

Modern methods in toxicology, critical thinking skills. Topics vary each semester. Students read/discuss toxicological literature.

**PUBH 8162. Chemical Carcinogenesis and Chemoprevention.** (3.0 cr.; A-F or Audit; =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 8163. Toxicology.** (5.0 cr.; A-F only; prereq Enrolled in toxicology concentration of environmental health PhD program; fall, every year)

Biological/physiological principles that govern toxicological methods.

**PUBH 8165. Current Topics in Toxicology.** (1.0 cr. [max 2.0 cr.]; S-N only; prereq [Environmental health PhD, toxicology concentration] student or #; fall, spring, every year)

Seminars presented by students/faculty in toxicology grad program.

**PUBH 8166. Experiences in Toxicology Research.** (3.0 cr.; A-F only; prereq Environmental health PhD student in toxicology concentration; spring, every year)

Students complete research projects in labs of toxicology program graduate faculty members.

**PUBH 8170. Advanced Industrial Hygiene Applications.** (2.0 cr.; A-F or Audit; prereq 5170, eh grad major;)

Recognition, evaluation, and control of occupational health/safety hazards. Application of concepts to specific industrial hygiene problems related to gases/vapors, aerosols, and physical agents.

**PUBH 8194. Directed Research: Environmental Health.** (1.0-6.0 cr.; prereq #; fall, spring, summer, every year)

Research, with direction from faculty member, in environmental/occupational stresses on human health.

**PUBH 8300. Topics: Epidemiology.** (1.0-4.0 cr. [max 20.0 cr.]; fall, spring, summer, offered periodically)

New course offerings or topics of interest in epidemiology.

**PUBH 8333. Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

**PUBH 8341. Advanced Epidemiologic Methods: Concepts.** (3.0 cr.; fall, every year)

Conceptual foundations of fundamental issues in epidemiologic methodology. How/why a given method, design, or approach might help explain population health. Strengths, limits, and potential alternatives for a given approach.

**PUBH 8342. Advanced Epidemiologic Methods: Applications.** (3.0 cr.; prereq 8341 or equiv or #; spring, every year)

Applied methodology course designed for students in the Epi PhD program. Examples/ readings are aimed at clinical/biological and social/behavioral track students.

**PUBH 8392. Readings in Clinical Research.** (1.0-4.0 cr.; prereq Clinical research major, #; fall, spring, summer, every year)

Current readings in clinical research.

**PUBH 8393. Directed Study: Clinical Research.** (1.0-4.0 cr. [max 20.0 cr.]; prereq Clinical research major, #; fall, spring, summer, every year)

Directed research or field practice in clinical research.

**PUBH 8394. Culminating Experience: Clinical Research.** (1.0-10.0 cr.; S-N only; prereq Clinical Research master's student; fall, spring, summer, every year)

Directed research toward completion of culminating experience project in clinical research.

**PUBH 8400. Topics: Biostatistics.** (0.5-4.0 cr. [max 20.0 cr.]; fall, spring, summer, offered periodically)

Topics of interest.

**PUBH 8401. Linear Models.** (4.0 cr.; prereq [7405, &STAT 8101] or #, calculus, familiar with matrix/linear algebra; fall, every year)


**PUBH 8403. Research Skills in Biostatistics.** (1.0 cr.; S-N only; prereq Stat 8101-02 and admission to PhD program in Biostatistics)

The course is meant to be taken the fall before PhD written exam is attempted, so Schedule 2 students typically wait to enroll until second year in program; fall, every year

Introduces research skills necessary for writing/defending dissertation, career in research.

**PUBH 8412. Advanced Statistical Inference.** (3.0 cr.; prereq Stat 8101-8102 or equivalent, students should be comfortable with multivariate normal distribution/have some introduction to convergence concepts; spring, every year)


**PUBH 8422. Modern Nonparametrics.** (3.0 cr.; prereq [7406, STAT 5102. [public health or grad student]] or #; fall, every year)


**PUBH 8432. Probability Models for Biostatistics.** (3.0 cr.; prereq [7450, 7407, Stat 5102, [advanced biostatistics or statistics] major] or #; fall, every year)

Three basic models used for stochastic processes in the biomedical sciences: point processes (emphasizes Poisson processes), Markov processes (emphasizes Markov chains), and Brownian motion. Probability structure and statistical inference studied for each process.

**PUBH 8435. Latent Variable Measurement Models and Path Analysis.** (3.0 cr.; =[PUBH 7435]; prereq Biostatistics PhD student or #; fall, every year)

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 8442. Bayesian Decision Theory and Data Analysis.** (3.0 cr.; prereq [7460 or experience with FORTRAN or with [C, S+]]), Stat 5101, Stat 5102, Stat 8311, grad student in [biostatistics or statistics]] or #; spring, every year)

Theory/application of Bayesian methods. Bayesian methods compared with traditional, frequentist methods.

**PUBH 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

**PUBH 8445. Statistics for Human Genetics and Molecular Biology.** (3.0 cr.; prereq [(Stat 8101, Stat 8102) or equiv]. PhD student) or #; some background with molecular biology desirable; spring, every year)

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 8446. Advanced Statistical Genetics and Genomics.** (3.0 cr.; prereq [7445, statistical theory at level of STAT 5101-2; college-level molecular genetics course is recommended] or #; spring, every year) Genetic mapping of complex traits in humans, modern population genetics with an emphasis on inference based observed molecular genetics data, association studies; statistical methods for low/high level analysis of genomic/ proteomic data. Multiple comparison and gene network modeling.

**PUBH 8452. Advanced Longitudinal Data Analysis.** (3.0 cr.; prereq [Stat 5102, Stat 8311, experience with [SAS or St+], advanced [biostats or stat] student] or #; spring, every year) Methods of inference for outcome variables measured repeatedly in time or space. Linear/ nonlinear models with either normal or non-normal error structures. Random effects. Transitional/ marginal models with biomedical applications.


**PUBH 8472. Spatial Biostatistics.** (3.0 cr.; prereq [STAT 5101, STAT 8102] or [STAT 8101, STAT 8102] recommended experience with S-plus; STAT 8311 recommended; fall, spring, offered periodically) Spatial data, spatial statistical models, and spatial inference on unknown parameters or unobserved spatial data. Nature of spatial data. Special analysis tools that help to analyze such data. Theory/applications.

**PUBH 8475. Statistical Learning and Data Mining.** (3.0 cr.; prereq [[6450, 6451, 6452] or STAT 5503 or equiv], [biostatistics or statistics PhD student] or #; spring, offered periodically) Statistical techniques for extracting useful information from data. Linear discriminant analysis, tree-structured classifiers, feed-forward neural networks, support vector machines, other nonparametric methods, classifier ensembles (such as bagging/boosting), unsupervised learning.

**PUBH 8482. Sequential and Adaptive Methods for Clinical Trials.** (3.0 cr.; prereq Stat 8101-8102 or equivalent, [students should be comfortable with the multivariate normal distribution or #; spring, every year]) Statistical methods for design/analysis of sequential experiments. Wald theorems, stopping times, martingales, Brownian motion, dynamic programming. Compares

Bayesian/frequentist approaches. Applications to interim monitoring of clinical trials, medical surveillance.

**PUBH 8492. Theories of Hierarchical and Other Richly Parametrized Linear Models.** (3.0 cr.; A-F only; prereq [8401 or STAT 8311], [STAT 8101, STAT 8102] or equiv], [biostatistics or statistics] PhD student] or #; spring, every year) Linear richly-parameterized models. Hierarchical/dynamic/linear/linear mixed models. Random regressions. Smoothers, longitudinal models. Schemes for specifying/fitting models. Theory/computing for mixed-linear models. Richly parameterized models and the odd/surprising/undesirable results in applying them to data sets. Lectures, class project.

**PUBH 8494. Directed Research: Biostatistics.** (1.0-4.0 cr.; S-N only; prereq #; fall, spring, summer, every year) Research, with direction from a faculty member, in biostatistics.

**PUBH 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed preim 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; fall, spring, summer, every year) Add.

**PUBH 8777. Thesis Credits: Master’s.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

**PUBH 8800. Topics in Health Services Research and Policy.** (1.0-4.0 cr. [max 20.0 cr.]; fall, spring, summer, offered periodically) Topics and credit vary by instructor.

**PUBH 8801. Health Services Policy Analysis: Theory.** (3.0 cr.; prereq [Grad or professional school] student or #; fall, every year) Integrated overview of U.S. health services policy. Related theoretical/empirical literature. Analysis of alternative policy-making models, political/philosophical underpinnings of those models.

**PUBH 8802. Health Services Policy Analysis: Applications.** (2.0 cr.; A-F or Audit; prereq [6835, 8801] or #; spring, every year) Emphasizes relationships between health services research/policy. Uses case studies to examine how research influences policy/vice versa.

**PUBH 8803. Long-Term Care: Principles, Programs, and Policies.** (2.0 cr.; prereq Grad-level health-care policy course or #; spring, offered periodically) Long-term care for functionally impaired persons, particularly the elderly. Team taught from healthcare and social services perspective; grounded in research literature on evidence of program effects. Innovative programs addressing current fragmentation of services.

**PUBH 8804. Advanced Quantitative Methods Seminar.** (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq This is an advanced, doctoral-level course. Students are expected to have completed a full year of doctoral-level introductory statistical and/or econometric classes in their respective field prior to enrolling in this course (e.g., PubH 7401-2, ApEc8211-2, SOC 8801-8811). Exceptions may be granted with #; spring, every year) Understand/competently use advanced quantitative methods in applied social science, policy, demographic research. Methods considered largely within or related to framework of regression analysis. Effort will be made to reflect interests of class.

**PUBH 8805. Sociological Theory in Health Services Research.** (3.0 cr.; fall, every year) Overview of sociological theories in medical sociology, occupations/professions. Emphasizes teaching students how to apply theories to health/social phenomena of their own interest/choice.

**PUBH 8806. Sociology of Health Occupations and Organizations.** (3.0 cr.; prereq HsRp& grad major or #; fall, spring, every year) Sociological theories of occupations/organizations as applied to health care. Functional, conflict, evolutionary theories applied to health care reorganization such as managed care, technology on organization of work/occupations. Emphasizes application of theories to develop hypotheses.

**PUBH 8810. Research Studies in Health Care.** (3.0 cr. [max 6.0 cr.]; prereq [Grad or professional school] student or #; fall, every year) Introduction to philosophy of science, conceptual modeling, experimental design, survey/sample design, issues relevant to health services research.

**PUBH 8811. Research Methods in Health Care.** (3.0 cr.; prereq [8810, [grad or professional school] student] or #; fall, spring, every year) Research methods commonly used in analysis of health services research and health policy problems.

**PUBH 8813. Measurement of Health-Related Social Factors.** (3.0 cr.; A-F or Audit; prereq Intro stat course, understanding of simple correlations or #; fall, spring, every year) How social factors such as innovativeness, compliance, religiosity, and stress are measured and tested for reliability and validity. Relationships between theory, concepts, variables, data.

**PUBH 8820. Health Economics I.** (3.0 cr.; A-F or Audit; prereq One course each in intermediate microeconomics, calculus, intro to linear algebra; spring, every year) Application of microeconomic theory to healthcare decisions of consumers and producers under different assumptions about market structure and behavior.
PUBH 8821. Health Economics II. (3.0 cr.; A-F or Audit; prereq 8820 or #; fall, spring, every year)
Examines application of microeconomic theory to health services research through selected reading from published and unpublished health economics literature.

PUBH 8830. Writing for Research. (2.0 cr.; Student Option No Audit; prereq HSRPA PhD student or #; fall, every year)
Two-course sequence. Writing research grants/papers. Writing skills appropriate to research proposals and scholarly papers. How to review, synthesize, and critique research proposals and published articles.

PUBH 8831. Writing for Research. (2.0 cr.; Student Option No Audit; prereq 8830; spring, every year)
Second of two course sequence. Writing research proposals and scholarly papers. How to review, synthesize, and critique papers and research proposals.

PUBH 8836. Integration of Public Health Research Methods in Health Services Research and Policy. (2.0 cr.; prereq Professional school or grad student or #)
Integration of concepts/designs of public health research methods, how they can be integrated into health services research and policy analysis. Experiential learning opportunities in clinical settings that illustrate need for integration.

PUBH 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; For Environmental Health Students ONLY: Contact Director of Graduate Studies and the Graduate Student Coordinator.; fall, spring, summer, every year)
(No description)

PUBH 8893. Directed Study: Health Services Research, Policy, and Administration. (1.0-3.0 cr.; prereq HSRPA grad student; #; fall, spring, every year)
No description.

PUBH 8894. Directed Research: Health Services Research, Policy, and Administration. (1.0-8.0 cr.; prereq HSRPA grad student; #; fall, spring, every year)
No description.

tbd

Recreation, Park, and Leisure Studies (REC)
College of Education and Human Development

REC 5111. Sports Facilities. (3.0 cr.; A-F or Audit; prereq Kin or Rec major or #; fall, spring, summer, offered periodically)
Steps in planning and building facilities for athletics, physical education, and sport for college, professional, and public use.

REC 5115. Event Management in Sport. (3.0 cr.; A-F or Audit; prereq Kin 5115; Grad student; #; spring, summer, every year)
Techniques/principles of planning, funding, and managing sport events. Collegiate championships, non-profit events/benefits, professional events.

REC 5371. Sport and Society. (3.0 cr.; A-F or Audit; prereq [3126W, grad student] or #; fall, offered periodically)
Sport, sporting processes, social influences, systems, and structures that have effected and exist within/among societies, nations, and cultures. Issues concerning social differentiation. Social concerns such as violence and honesty.

REC 5421. Sport Finance. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year)
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. (3.0 cr.; A-F or Audit; prereq Kin or rec or postbac or grad student or #; fall, spring, summer, every year)
Theories/techniques in administering/managing sport enterprises. Organizational theory/policy. Practical examples of sport management skills/strategies.

REC 5511. Sport and Gender. (3.0 cr.; A-F only; prereq Kin or Rec major or #; fall, spring, summer, every year)
Critical examination of women's involvement in/ contributions to sport, physical activity, and leisure.

REC 5601. Sport Management Ethics and Policy. (3.0 cr.; A-F or Audit; 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 5631. Programming and Promotion in Sport. (3.0 cr.; A-F or Audit; prereq Kin or Rec grad student or #; fall, spring, every year)
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. (3.0 cr.; A-F only; prereq Upper div undergrad or grad student or #; spring, every year)

REC 5801. Legal Aspects of Sport and Recreation. (4.0 cr.; A-F or Audit; prereq 3551 or 5461 or #; fall, spring, summer, every year)
Legal issues related to recreation, park, and sport programs/facilities with public/private sectors.

REC 5981. Research Methodology in Kinesiology, Recreation, and Sport. (3.0 cr.; A-F or Audit; prereq HSRPA grad student or #; fall, spring, summer, every year)
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. (1.0-9.0 cr.; A-F only; prereq REC major; #; fall, spring, summer, every year)
Independent study under tutorial guidance by faculty member on topic(s) not covered in regular coursework.

REC 5995. Problems in Recreation, Park, and Leisure Studies. (1.0-9.0 cr.; A-F only; prereq [REC Med or grad student]; #; fall, spring, summer, every year)
Independent study of leisure service programs, systems, facilities, or policies. Focuses on conduct of recreation programs. Scholarly projects (e.g., library or field research) or demonstration projects.

Rehabilitation Science (RSC)
Medical School

RSC 5058. Anatomy for Rehabilitation Science. (6.0 cr.; A-F or Audit; prereq Student enrolled in Rehabilitation Science Program, #; summer, every year)
Study of gross human anatomy through lecture/labatory experiences that include cadaver dissection of extremities, head, neck, back, abdomen, thoracic, pelvic regions with correlation to clinical conditions.

RSC 5100. Hot Topics in the Biology of Aging. (1.0 cr.; prereq %; spring, odd years)
Biological research in aging. Student-faculty-led discussions on select research topics that are highly relevant to the field of biogerontology research, along with seminars on scientific integrity. Students lead discussions focused on their area of research expertise, using review/research articles and case studies of scientific misconduct. Tour of laboratory/discussion of literature published by lab dealing with aging and/or proteomics.
RSC 5101. Mathematical Tools for Research Applications in Health, Rehab, and Human Movement Sciences. (1.0 cr.; A-F or Audit; prereq Basic algebra or program permission; spring, fall, even years) Quantitative research approaches in health, rehabilitation, human movement sciences. Application examples/practice problems focus of the course. Basic algebra/geometry, solving equations for unknowns, logarithmic transforms, derivatives/integrals, matrix methods, use of macros in research applications.

RSC 5135. Advanced Biomechanics I: Kinematics. (3.0 cr.; A-F or Audit; prereq #; fall, odd years) How to describe/measure movement. Basic applied biomechanics, pathokinesiology, and rehabilitation literature. Lecture, lab, seminar discussions. Meets with RSC 8135.

RSC 5200. Introduction to Transcranial Magnetic Stimulation. (3.0 cr.; A-F or Audit; fall, even years) Theory/application of transcranial magnetic stimulation (TMS) to measure corticospinal excitability. Must sign consent form. Resting active motor thresholds, single hemisphere paired-pulse testing, bilateral interhemispheric inhibition paired-pulse testing, input-output recruitment curves, cortical silent periods, H-reflex testing.

RSC 5206. Academic Ethics. (1.0 cr.; A-F or Audit; fall, #) Explicit/implicit culture unique to academia. Early understanding within/beyond rehabilitation science. Role of higher education in society, academic freedom, tenure, corporatization of education, accreditation, globalization of education, regulatory monitoring of research, faculty scholarship/governance.

RSC 5231. Clinical Biomechanics. (2.0-5.0 cr.; A-F or Audit; #) Biomechanics of the musculoskeletal system. Focuses on knowledge necessary to prepare the student in PT or rehabilitation science for post-doctoral fellows for next step in academic career. Combination of student/adjunct faculty led discussions.

RSC 5235. Advanced Biomechanics II: Kinetics. (3.0 cr.; A-F or Audit; prereq 5135 or equiv or #; spring, every year) Forces that create human motion and are produced within body as a result of motion. Measuring human motion. Clinical movement assessment. Exercise, sport, and activities of daily living. Two-dimensional rigid body dynamics models, forward/inverse dynamics solutions, hypotheses to describe whole body/joint mechanics. Lectures, lab, discussion.

RSC 5281. Scientific Foundations: Exercise Theory. (3.0 cr.; A-F only; =RTT 5281, PT 6281) Suggested prerequisites: Basic algebra, trigonometry, and geometry. Pre-calculus or calculus is helpful but not required; fall, spring, summer, every year)

RSC 5294. Independent Study in Rehabilitation. (1.0 cr.; A-F or Audit; fall, spring, summer, every year) Independent exploration into topics related to rehabilitation science.

RSC 5814. Age, Exercise, and Rehabilitation. (2.0 cr.; prereq Rehabilitation science student or program permission; fall, every year) 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. (4.0 cr.; A-F or Audit; prereq [Phys 1031, Phys 1032], [Rehabilitation science student or program permission]; spring, every year) Theory/application of kinesiological EMG and other common instruments used to measure human motion.

RSC 5901. Scholarly Inquiry in Health Sciences. (4.0 cr.; A-F or Audit; prereq Three credits of undergraduate statistics, #; spring, every year) How research evidence is developed, disseminated, utilized in health sciences. Qualitative/quantitative scholarly project proposal. Critique studies/peer proposals. Explore conduct of research.

RSC 8022. Fostering a Career in Aging Research. (1.0 cr.; S-N only; =GERO 8022) Platform for preparing pre-doctoral students/post-doctoral fellows for next step in academic career. Combination of student/faculty led discussions.

RSC 8103. Current Literature Seminar. (1.0-3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq Grad student in PT or rehabilitation science major or #; spring, every year) Critical review of literature to evaluate efficacy of selected physical therapy interventions.

RSC 8135. Advanced Kinesiology. (3.0 cr.; A-F or Audit; prereq [Rehabilitation science student or program permission]; #; fall, odd years) How to describe/messure movement. Basic applied biomechanics, pathokinesiology, and rehabilitation literature. Lecture, lab, seminar discussion.

RSC 8170. Special Topics in Rehabilitation Science. (1.0-3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq [Rehabilitation science student or program permission]; #; fall, spring, summer, every year) Topics vary by semester. Papers required.

RSC 8185. Problems in Rehabilitation Science. (1.0-0.5 cr.; [max 9.0 cr.]; prereq [Rehabilitation science student or program permission]; #; fall, spring, summer, every year) 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. (1.0-0.5 cr.; A-F or Audit; prereq [Rehabilitation science student or program permission]; #; fall, spring, every year) 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. (4.0 cr.; A-F or Audit; prereq #; fall, every year) Critical appraisal of current medical literature. Fundamentals of research design, data analysis, and medical writing.

RSC 8206. Grant Writing. (2.0 cr.; A-F or Audit; prereq # or student in University of Minnesota Rehabilitation Science Program; fall, offered periodically) Process of applying for individual National Institutes of Health (NIH) pre-doctoral research training fellowship. Overview of NIH Program Announcement PA-11-111/NF424 individual fellowship application guide required for application will be included. Substantive writing of components of NIH fellowship.

RSC 8235. Human Kinetics. (3.0 cr.; A-F or Audit; prereq [5135 or equiv] or #; spring, every year) Forces that create human motion or are produced within body as a result of motion. Measuring kinetics of motion. Clinical movement assessment. Measuring/analyzing exercise, sport, and activities for transfer of forces within body. Two-dimensional rigid body dynamics. Forward/inverse dynamics. Hypotheses for whole body/joint kinetics. Lectures, lab experiments, discussion.

RSC 8282. Problems in Human Movement. (4.0 cr.; A-F or Audit; prereq [Rehabilitation science student or program permission]; #; spring, every year) Fundamental principles of neurophysiology, neurology, motor control, and motor learning as a basis for therapeutic intervention in motor dysfunction.

RSC 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

RSC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser
and DGS consent; fall, spring, summer, every year)  
(No description)

RSC 8666. Doctoral Pre-Thesis Credits.  
(1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)  
TBD

RSC 8777. Thesis Credits: Master’s.  
(1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)  
(No description)

RSC 8888. Thesis Credit: Doctoral.  
(1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; RSC doctoral student who has successfully passed the prelim written exam, %; fall, spring, summer, every year)  
Thesis credit: doctoral.

Religious Studies (RELS)  
College of Liberal Arts

(3.0 cr.; = [RELS 3001W]; prereq Sr or grad student or #; spring, every year)  
Theoretical/methodological issues in academic study of religion. Theories of origin, character, and function of religion as a human phenomenon. Psychological, sociological, anthropological, and phenomenological perspectives.

RELS 5070. Topics in Religious Studies.  
(3.0 cr. [max 18.0 cr.]; fall, spring, summer, offered periodically)  
Topics specified in Class Schedule and Course Guide.

RELS 5071. Greek and Hellenistic Religions.  
(3.0 cr.; = [CNES 5071, RELS 3071, CNES 3071]; spring, offered periodically)  

(3.0 cr.; fall, spring, offered periodically)  

RELS 5073. Roman Religion and Early Christianity.  
(3.0 cr.; spring, offered periodically)  

(3.0 cr.; fall, spring, odd years)  
How/what can we know about Paul. What his message was. What he was fighting. How he was later understood by friends/foes.

(3.0 cr.; = [CNES 3077, CNES 5077, RELS 3077, RELS 3077]; spring, even years)  
Methodological strategies for understanding discourses of violence. Ways religious traditions shaped ethnic identity/practices and views of sacrifice, martyrdom, spectacles of violence, apocalyptic ideologies of violence, state persecution, textual/terror, and holy war.

(3.0 cr. [max 18.0 cr.]; prereq 1082 or RELA 1082 or 3072 or equiv; fall, spring, offered periodically)  

RELS 5111. Problems in Historiography and Representation of the Holocaust.  
(3.0 cr.; prereq 3521 or 3541 or JWST 3521 or #; spring, every year)  

RELS 5115. Midrash: Jewish Biblical Interpretation.  
(3.0 cr.; = [RELS 3115, JWST 3115, CNES 5115, CNES 3115, JWST 3115]; fall, spring, offered periodically)  
Jewish law studies as mirror of society and as way to actualize its value. Original socio-religious contexts, current applications. Selections include biblical interpretations addressing moral, theological, legal, and literary problems.

RELS 5204. Dead Sea Scrolls.  
(3.0 cr.; = [JWST 5204, JWST 3204, RELS 3204, CNES 5204, CNES 3204]; spring, even years)  
Introduction to Dead Sea Scrolls and Qumran. Contents of Dead Sea Scrolls, significance for development of Bible. Background of Judaism and Christianity. Archaeological site of Qumran.

RELS 5252. Art and Archaeology of Early Christianity and the Late Roman Empire.  
(3.0 cr.; = [ARTH 5188]; fall, spring, offered periodically)  

RELS 5255. Archaeology of Religion.  
(3.0 cr.; fall, odd years)  
Evidence for origins of religion, its diverse roles in human societies over millennia. What constitutes religion, why it is constantly present in human history. How archaeologists reconstruct beliefs/practices of past peoples.

RELS 5325. The Art of the Aztec Empire.  
(3.0 cr.; = [ARTH 5325, ANTH 5325]; spring, every year)  
Art/architecture of Nahua-speaking Aztecs of Central Mexico, from first appearance in archaeological record until Spanish invasion in 1521. Major scholarly problems, theoretical/methodological approaches. Analysis of scholarly writing.

RELS 5326. Art of the Inka and their Ancestors.  
(3.0 cr.; = [ARTH 5802, AMIN 5802, ANTH 5802]; prereq Jr. or Sr. or grad student; spring, every year)  

RELS 5503. History and Development of Israelite Religion I.  
(3.0 cr.; fall, every year)  
Survey of the evolution of Israelite religion. Cultic practices, law and religion, prophecy, religion and historiography. Relationship to surrounding religious systems.

RELS 5504. Development of Israelite Religion II.  
(3.0 cr.; fall, offered periodically)  
Ancient Judaism from the Persian restoration (520 B.C.E.) to Roman times (2nd century C.E.). Religious, cultural, and historical developments are examined to understand Jewish life, work, and worship under a succession of foreign empires: Persian, Greek, Roman.

RELS 5513W. Scripture and Interpretation in Israelite Religion and Judaism.  
(3.0 cr.; A-F or Audit; = [JWST 5513W, CNES 8513, CNES 5513W]; prereq At least one upper level course (3xxx or higher) in academic biblical or religious studies; spring, even years)  

RELS 5535. Death and the Afterlife in the Ancient World.  
(3.0 cr.; A-F only; fall, even years)  
Beliefs, attitudes, and behaviors related to death and afterlife found in cultures of ancient Mediterranean and Near East. Literature, funerary art/epitaphs. Archaeological evidence for burial practices and care of dead.

(3.0 cr.; = [ARTH 5355, HIST 3706, ARTH 3335, RELS 3612]; fall, even years)
Rome as city of spectacle/pageantry. Urban development. Major works in painting, sculpture, and architecture. Ecclesiastical/private patrons who transformed Rome into one of world’s great capitals.

RELS 5614. Medieval Church. (3.0 cr.; fall, spring, offered periodically) 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.

RELS 5621. The Christian Right and Left in America: Protestant Liberals, Evangelicals, and Fundamentalists. (3.0 cr.; = [RELS 3621]; spring, odd years) Religious, historical, social, and scientific thought/practice across three main U.S. Protestant groups since 1820. Historical processes that brought about diverse understandings of Christianity, theologies, and worship. Theological left/right views of views of society, history, and science that influence public debates.


RELS 5993. Directed Studies. (1.0-4.0 cr. [max 24.0 cr.]; prereq #: fall, spring, every year) TBD

RELS 8190. Comparative Seminar in Religions in Antiquity. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Grad student in relevant field; spring, even years) Topics vary, see Class Schedule. Major cultural movement as it developed over several centuries. Draws on evidence in literature, archival records, inscriptions, documentary papyri, and archaeological remains. Artistic media such as wall painting, architectural ornament, funerary sculpture, or manuscript illumination.

Scandinavian (SCAN) College of Liberal Arts

SCAN 5501. Scandinavian Mythology. (3.0 cr.; ) 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. (3.0 cr.; ) 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 5505. The Scandinavian Short Story. (3.0 cr.; = [SCAN 3605]; fall, spring, even years) Short stories by 19th-20th century authors from all five Scandinavian countries. Genre theory/practical criticism. Readings in English for non-majors.

SCAN 5613. Contemporary Scandinavian Literature. (3.0 cr.; ) 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 5614. Blood on Snow: Scandinavian Thrillers in Fiction and Film. (3.0 cr.; = [SCAN 3614]; fall, spring, offered periodically) Scandinavian crime novels/films against background of peaceful welfare states. Readings in translation for non-majors. Scandinavian majors/minors read excerpts in specific languages.

SCAN 5615. Ibsen and the Beginnings of Modern Drama. (3.0 cr.; fall, offered periodically) 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 5634. Scandinavian Women Writers. (3.0 cr.; = [SCAN 3634]; fall, spring, even years) Issues important to women as articulated by Scandinavian women writers. Historical overview of women’s writing in Scandinavia. In-depth investigation of texts by contemporary women writers. All readings in translation.

SCAN 5670. Topics in Scandinavian Studies. (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically) 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. (3.0 cr.; fall, every year) 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. (3.0 cr. [max 9.0 cr.]; prereq 5701 or equiv; spring, every year) 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. (1.0-4.0 cr. [max 16.0 cr.]; fall, spring, every year) Guided individual study. Prereq instr consent, dept consent, college consent.

SCAN 8500. Seminar in Medieval Scandinavian Languages and Literature. (3.0 cr. [max 9.0 cr.]; spring, offered periodically) Sample topics: [Volsunga Saga], studies in Snorri Sturluson’s Edda, dialogue analysis in the Icelandic saga.

SCAN 8994. Directed Research. (1.0-3.0 cr. [max 12.0 cr.]; prereq #: may be taken as tutorial with #: %; fall, spring, every year) TBD

Scientific Computation (SCIC)

Institute of Technology

SCIC 8001. Parallel High-Performance Computing. (3.0 cr.; prereq Undergrad degree in field using sci comp or #: fall, every year) 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. (3.0 cr.; prereq Undergrad degree in field using sci comp or #: spring, every year)
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 8041. Computational Aspects of Finite Element Methods. (3.0 cr.; prereq Undergraduate 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 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. (1.0-3.0 cr. [max 9.0 cr.]; prereq Undergraduate degree in field using sci comp or #; ) Selected topics in interdisciplinary aspects of scientific computing.

SCIC 8190. Supercomputer Research Seminar. (1.0 cr. [max 3.0 cr.]; prereq Undergraduate degree in field using sci comp or #; fall, spring, offered periodically) Series of seminars by distinguished lecturers.

SCIC 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SCIC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SCIC 8594. Scientific Computation Directed Research. (1.0-4.0 cr. [max 9.0 cr.]; prereq Undergraduate degree in field using sci comp or #; fall, spring, summer, every year) tbd

SCIC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) tbd

SCIC 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

SCIC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Security Technologies (ST)

College of Science and Engineering

ST 8109. Cybersecurity Foundations - Technology, Risk & Communication. (2.0 cr.; A-F only; fall, every year) Explore cyber security risks through evaluation of consumer driven technology concepts/their applicability to enterprise. Core technology concepts that face both consumers/businesses. How technology works, how to understand/communicate risks to business management, deliver actionable risk mitigation approaches. Security standards/benchmarks that guide industry.

ST 8110. Security Science and Technology Foundations. (3.0 cr.; A-F only; prereq Admitted student in security technologies program; summer, every year) Essential areas of emerging science and pivotal technology disciplines for homeland security. Nanotechnology, sensor networks (biosensing, critical infrastructure protection), food and biosafety, cyber and control systems security, and secure energy technologies. Current state-of-the-art status for each technology, together with barriers and opportunities for commercialization.

ST 8111. Methods, Theory, and Applications. (2.5 cr.; A-F only; fall, every year) Methods, theory, techniques and models for understanding risk and implementing security strategies. Processes, methods, and application of risk assessment and management. Approaches for building scenarios, assessing the effectiveness of alternative management strategies, and designing risk management and mitigation plans. Case studies/simulations. How to use emergency management tools, techniques, and resources.

ST 8112. Technology for Homeland Security. (2.0 cr.; A-F only; fall, every year) Technologies involved in homeland security issues from several perspectives, including science, engineering, business, policy, and society. Advanced tools for the analysis and forecasting of technology and developing strategies aligned with overall stakeholder and organizational goals. Micro- and nanotechnologies and biochemical/chemical, radiological agents. Readings/ discussion. Select a technology topic and analyze its current status and possible future trajectories for application or relevance to key issues of importance to security, both threats and opportunities. Present this in the last class session.

ST 8113. Information and Cyber Security. (2.0 cr.; A-F only; prereq MSST grad program student; spring, every year) Existing and emerging IT, cyber, communication networks, and coordination activities during emergencies. Technological and policy issues for the need to share information through the use of interoperable technologies and to rapidly collect and synthesize data in real time in order to achieve critical national security.

ST 8200. Special Topics in Security Technologies. (0.5 cr.; A-F only; fall, spring, every year) Leaders in the field related to security technologies. Special speakers.


ST 8221. Communications of Risk and Security. (1.0 cr.; A-F only; prereq MSST grad student; fall, every year) Analyze public speaking. How to be an effective listener, how to prepare for effective public speaking, how to be an effective writer, communicate by email, write for emphasis, tone, and business writing.

ST 8330. Critical Infrastructure Protections. (3.0 cr.; A-F only; prereq MSST grad student; summer, every year) Systems risk analysis, engineering, economics, and public policy. Investigate infrastructure security/support design and management of complex civil infrastructure systems. Systems' vulnerability assessment, asset and risk management, investigation of infrastructure interdependencies and couplings, along with judicial analyses of policies. Contribution of science and technology to strategically enhance security/quality of life.

ST 8331. Dynamic Systems Modeling and Simulation Tools. (2.0 cr.; A-F only; fall, every year) Techniques for modeling complex systems and predicting and evaluating consequences, risks and the potential utility of interventions and countermeasures in the context of intentional disruptions or use of the system as an attack vehicle. Importance of interoperability system modeling. Variety of modeling approaches. How systems can be characterized focusing on the parameters that are important for
consequence assessment, risk assessment, capability benchmarking, and decision support. Develop a systems and simulation-based approach to risk assessment, preparedness, intervention assessment, and problem solving.

ST 8440. Security Practicum. (0.5-2.0 cr.; A-F only; prereq Admitted to MSST grad program; summer, every year)
Seminars and focused workshops on selected areas of security science and technology.

ST 8441. Internship (optional). (0.5 cr. [max 1.0 cr.]; A-F only; fall, spring, every year)
Summer internship opportunities at the university centers, companies, state, and federal agencies.

ST 8510. Psychology/Behavior Intelligence for Homeland Security. (2.0 cr.; A-F only; summer, every year)
Political, psychological, sociological, and economic foundations and dynamics of both terrorism and homeland security. Contemporary debates over terrorism, counterterrorism, and homeland security. Students develop their own (informed) perspectives.

ST 8511. Public Policy. (1.0 cr.; A-F only; fall, every year)
Key policies in the U.S. addressing safety and security of citizens, institutions, and systems. Complex network of actors/organizations involved in S&T and security-related areas and their multiple objectives and values. Legislative, policy, and organizational issues facing U.S. intelligence, business, academic, and S&T communities. Students reflect on how these issues relate to their own professional roles/experiences, as well as stakeholder communities with which they work. Consider a specific piece of security-related legislation/analyze associated policy problems and how they relate to security risks. Historical and contemporary examples used to illustrate related public policy questions.

ST 8512. Partnership in Conflict Management: Security/Privacy Law, Social Responsibility and Ethics. (2.0 cr.; A-F only; prereq MSST grad student; spring, every year)
An exploration of challenges to American civil liberties and national security in times of terrorism.

ST 8620. Capstone. (0.5-2.0 cr.; A-F only; prereq MSST grad program student; spring, summer, every year)
The Capstone project is an independent, original, and applied investigation on a relevant subject, problem, or issue in the area of security technologies and homeland security.

ST 8660. Independent Study. (1.0-4.0 cr.; A-F only; fall, spring, summer, every year)
Focused study in security science, technology, business, policy or law, with a deliverable project report/presentation.

Social Work (SW)
College of Education and Human Development

SW 5051. Human Behavior and the Social Environment. (2.0-3.0 cr.; A-F or Audit; prereq Grad student or 8 cr social sciences or #; fall, spring, every year)
Social, psychological, biological, and cultural factors of individual and group development as applied to social work practice. Behavior and life-cycle development focusing on diversity and each stage of life. Discuss development in terms of the individual, and in terms of overlapping social systems such as the multigenerational family, culture, community, and society.

SW 5101. Historical Origins and Contemporary Policies and Programs in Social Welfare. (3.0-4.0 cr.; A-F or Audit; prereq Grad or 8 sem cr of social sciences; fall, spring, every year)
Contemporary policies and programs in social welfare are examined in light of their historical origins and evolution. A framework is then developed for analysis of concepts and principles in contemporary social policy for social welfare programs and services. The emergence of the profession of social work also examined.

SW 5105. Women and Public Policy. (3.0 cr.; )
Study of feminist organizations; issues and conflicts within organizations and movements; methods and sources for studying feminism.

SW 5309. Case Management with Special Populations. (3.0 cr.; prereq Grad or non-degree seeking student or #; fall, spring, offered periodically)
Examine concepts and principles of case management practice with special populations such as older adults, persons with developmental disabilities, and persons with serious and persistent mental illness. The core functions of case management practice in a range of settings are addressed in relationship to issues of diversity, vulnerability, and empowerment.

SW 5312. Children With Sexual Behavior Issues. (1.0 cr.; summer, every year)

SW 5313. Social Work with Older Adults. (2.0 cr.; prereq Grad or non-degree seeking student or #; fall, spring, offered periodically)
The practice components of social work with older adults including assessment, intervention, and case management. Taught from the perspective of bio-psycho-social strengths and challenges and within the context of current social policy and delivery systems.

SW 5316. Brief Treatment and the Task-Centered Approach. (2.0 cr.; prereq Grad student or non-degree seeking student or #; spring, offered periodically)
Advent/prominence of brief-treatment models in work with individuals, families, and groups. Theoretical/empirical bases. Practice with diverse populations in managed care. Skill training, supervised practice.

SW 5318. Family Centered Home Based Services. (2.0 cr.; prereq = 8314; grad or non-degree seeking student or #)
Ecological, multisystems approach focusing on the family system. Triadic theory, meta-neutrality, strengths-focus, case management and team treatment. Family-based services evaluated for high-risk, multi-problem families and as an alternative to foster placement.

SW 5319. Adolescents: Norms, Culture, and Health. (2.0 cr.; )
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 adolescents.

SW 5482. Child Abuse Prevention II: Program Development, Evaluation, and Advocacy. (3.0 cr.; prereq 5481; )
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. (3.0 cr.; prereq Bachelor's degree or #; fall, offered periodically)
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. (3.0 cr.; prereq Bachelor's degree or #; fall, spring, offered periodically)

SW 5512. Developing and Managing an Agency Budget. (1.0 cr.; prereq MSW student or #; spring, summer, every year)
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. (1.0 cr.; prereq MSW student or #; fall, summer, every year)
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. (1.0 cr.; prereq MSW student or #; spring, summer, every year)
Strategies to minimize risk to agency, its assets, and its resources. Relationship between mission, risk management, and board role. Agency internal systems, controls, and
SW 5562. Global Social Work and Social Development. (3.0 cr.; fall, every year) Theories/strategies of social work and social development in industrial/developing countries. Applying international perspective and comparative framework to analyze basic human needs, social problems, and social work and social development strategies in different countries.

SW 5801. Policies and Programs in American Social Welfare. (2.0 cr.; A-F or Audit; fall, every year) Major policies and programs of social welfare, distinguishing between programs of social insurance and public assistance. Develops skills for analyzing social problems/policies that respond to those problems. Concepts for defining and measuring poverty and social disparity.

SW 5802. Social Welfare History. (1.0 cr.; A-F or Audit; spring, every year) Policies/programs in social welfare. Historical evolution, along with themes that have shaped development over time. Contributions of population subgroups to the development of the welfare state, and the impact of policies and programs on such groups. History of social work profession.

SW 5810. Seminar: Special Topics. (1.0-4.0 cr. [max 10.0 cr.]; fall, spring, summer, every year) Topics specified in Class Schedule.

SW 5813. Child Welfare and the Law. (2.0 cr.; prereq 2nd yr MSW or advanced standing or #; fall, spring, offered periodically) Social work practice in juvenile court. Child abuse/neglect reporting laws, risk assessment, reasonable efforts, case plan, custody proceedings, permanency planning, termination of parental rights, child testimony, social worker testimony, adoption laws.

SW 5903. Substance Abuse and Social Work. (2.0 cr.; prereq Grad student or %; spring, every year) Students gain skills in eliminating the detrimental impact of substance use disorders at multiple levels (families, groups, organizations, and communities) through an ability to identify, assess, intervene, and evaluate those struggling with substance abuse and dependency throughout the life span.

SW 5904. Facilitation & Conflict Mgmt: Humanistic Approach. (2.0 cr.; fall, spring, summer, every year) Humanistic approach to facilitating meetings in small human service organizations and units within large bureaucratic structures. Managing conflict among individuals, groups, and communities in multiple settings.

SW 5905. Permanency in Child Welfare. (2.0 cr.; prereq Grad student or %; spring, every year) Depth/breadth in knowledge/skill acquisition in achieving permanency for children receiving services within public, tribal, and private child welfare systems. Out-of-home/permanency placements, specific permanency interventions, and child/family responses to different permanency options.

SW 5906. Advanced Ethical Decision Making. (1.0 cr.; prereq Grad student or %; spring, every year) Identify ethical issues, resolve ethical dilemmas, make ethical decisions when confronted with conflicting duties/choices that occur within the context of professional social work at all levels of practice.

SW 5907. School Social Work. (1.0 cr.; prereq Grad student or %; fall, spring, summer, every year) Apply social work knowledge/skills in school settings through prevention, assessment, intervention, and evaluation from an ecological multilevel approach focused on students, families, and the school community.

SW 5908. Technology and Communication in Social Work. (1.0 cr.; prereq Grad student or %; spring, every year) Online course explores the influence of technology in social work practice/society. Appropriate community or direct interventions using new technologies. Introduction to effective communication and public relations.

SW 5909. Social Work With Involuntary Clients. (2.0 cr.; prereq Grad or non-degree seeking student or #; fall, spring, summer, every year) Includes theory, ethics, effectiveness, and intervention methods for work with client systems that experience involuntary contact with a social worker. Interventions at micro, mezzo, and macro levels are included. Practice in varied settings such as child welfare, mental health, corrections, and public schools as well as practice related to organizational responses to change.


SW 5914. Independent Study in Social Work. (1.0-4.0 cr.; fall, spring, summer, every year) Independent study in areas of special interest to students and faculty.

SW 8010. Seminar: Field Practicum I. (1.0-8.0 cr.; S-N or Audit; prereq 8201; fall, spring, summer, every year) 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 sharing, and implications of students' privilege/power in relation to client systems.

SW 8051. Psychopathology and Social Work Practice. (3.0 cr.; A-F only; prereq All foundation courses for full program or advanced standing or #; fall, spring, every year) Psychopathology from 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 8052. Resilience and Risk. (3.0 cr.; A-F only; prereq [Foundation coursework, adv standing] or #; fall, every year) Applying theories of human development to issues confronting children, families, and social workers. Identifying strengths-based resources within ecologies of families. Mobilizing resources to empower clients to cope with, adapt to, and overcome adversities.

SW 8105. Economic Security of Disadvantaged Populations. (3.0 cr.; A-F only; prereq [8211, advanced standing] or #; spring, every year) Impact of social policy and macro economic trends on economic security of disadvantaged populations. Focuses on antipoverty/welfare programs in the United States, although international perspective is used as well.

SW 8150. Social Work Methods: Practice With Individuals and Systems. (2.0 cr.; A-F only; #; fall, spring, summer, every year) 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 8200. Field Practicum II. (1.0-6.0 cr.; S-N or Audit; prereq 8010; fall, spring, summer, every year) Integrates classroom learning within a concentration with the direct experience of an internship. Students expand competency in cross-cultural practice.
or Audit; prereq MSW student or #; fall, every year)
Develops foundational knowledge and skills for social workers to work with individuals and systems.

**SW 8152. Social Work Practice Methods: Families and Groups.** (2.0 cr.; A-F or Audit; prereq MSW student or #; fall, every year)
Develops foundational knowledge and skills in relationship building, engagement, interviewing, and assessment with families and groups using the ecological-systems theoretical framework and resiliency-based approach.

**SW 8153. Models of Community Intervention.** (1.0 cr.; A-F or Audit; prereq MSW student or #; spring, every year)
Models of community intervention as integral to social work profession's role in community/policy practice. Multi-modes of community intervention. How they are practiced at neighborhood, community, and legislative levels.

**SW 8154. Organizations and Policy Advocacy.** (1.0 cr.; A-F or Audit; prereq MSW student or #; spring, every year)
Community practice as it relates to human service agencies and organizations. Builds upon theoretical approaches to human service organizations/agencies and their distinct attributes. Key practice knowledge, skills, and values that promote, develop, and maintain human service organizations that effectively meet community/client needs.

**SW 8211. Macro Social Work Practice and Policy Advocacy.** (3.0 cr.; A-F or Audit; prereq 5101 or #; spring, every year)
Policy analysis, development, implementation, community development, social action, social planning. Ecological, problem-solving, empowerment perspectives, policy/methods. Theories of organizational/community development/change.

**SW 8251. Social Work Practice in Health, Disabilities, and Aging.** (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8154] or MSW Adv Standing or #; fall, every year)
Social work practice in health/disabilities/aging. History in social work, practice contexts/settings, service delivery systems. Practice/population overlaps, distinctions, co-operations.

**SW 8252. Advanced Interventions and Issues in Health, Disabilities, and Aging (HDA).** (3.0 cr.; A-F or Audit; prereq [8251 or &8251]; [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, every year)

**SW 8261. Advanced Social Work Practice in Health Care.** (3.0 cr.; A-F only; prereq [5051, 5101, 8151, 8152, 8841] or MSW Adv Standing or #; fall, spring, summer, every year)

**SW 8262. Empowerment Practice With Persons With Disabilities.** (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, every year)
Models of disability, types of disability, common social work practices. Knowledge/skills for use across lifespan/cultures/various settings.

**SW 8263. Advanced Direct Practice and Community-Based Interventions in Gerontology.** (3.0 cr.; A-F or Audit; prereq [8251 or &8251]; [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; spring, every year)

**SW 8312. Advanced Social Work Practice With Groups.** (3.0 cr.; 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.** (3.0 cr.; prereq [Foundation curriculum, advanced standing or grad student in health and human service or in educational professional program] or #; fall, spring, every year)
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 8315. Mood Disorders: New Directions in Clinical Care.** (2.0 cr.; prereq [Foundation coursework, advanced standing] or #; spring, offered periodically)

**SW 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
No description

**SW 8335. Advanced Practice I: Families and Children.** (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8154] or MSW Adv Standing or #; fall, spring, every year)

**SW 8352. Advanced Practice II: Families and Children.** (3.0 cr.; A-F or Audit; prereq [8351 or &8351]; [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, spring, every year)

**SW 8361. Identification and Assessment of Family Violence.** (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, offered periodically)
Identification/assessment of family violence. Contextual knowledge of behaviors of perpetrators, victims, survivors. Gender, race, culture, age, ability, SES, sexual orientation.

**SW 8362. Social Work Interventions With Families.** (2.0 cr.; A-F or Audit; prereq [8451 or &8451], [8351 or &8351]; [5051, 5081, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, every year)
Theory/models of social work intervention with families. Theoretical constructs of traditional/emerging models of social work practice with families. Develop assessment/intervention skills.

**SW 8363. Social Work in Child Welfare.** (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; spring, every year)
Public, private, tribal child welfare related to assessment of strengths/risks. Develop appropriate plans that secure child safety/well-being.

**SW 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
No description

**SW 8451. Assessment and Engagement in Clinical Social Work Practice.** (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8154] or MSW Adv Standing or #; fall, summer, every year)

**SW 8452. Core Concepts in Clinical Social Work Practice.** (3.0 cr.; A-F or Audit; prereq [8451 or &8451]; [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, spring, every year)
Interpersonal process skills. Developing/maintaining effective therapeutic alliances/positive intervention outcomes with diverse populations.

**SW 8461. Advanced Clinical Social Work Practice with Adults.** (3.0 cr.; A-F or Audit; prereq [8451 or &8451]; [5051, 5081, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, every year)
Research-informed clinical interventions for adults with mental health distress. Application of cognitive behavioral/psychodynamic psychotherapies through brief/long-term models across diverse populations.

**SW 8462. Advanced Clinical Practice With Children and Adolescents.** (3.0 cr.; A-F
SW 8463. Social Work Practice With Severe and Persistent Mental Illness and Severe Emotional Disturbance. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; spring, every year) Integrated social work approach to assessing/working with individuals with SPMI, SED. Trends/modalities/evidence-supported approaches. Recovery/wellness approaches. Macro systems that impact lives of individuals/families.

SW 8501. Planning, Marketing, and Program Development. (3.0 cr.; A-F only; prereq [Foundation curriculum, advanced standing] or #; fall, every year) 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. (3.0 cr.; A-F only; prereq [Foundation curriculum, advanced standing] or #; fall, spring, every year) 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. (1.0 cr.; prereq [Foundation curriculum, advanced standing] or #; spring, every year) Links content from human services management and from community organization and advocacy. Integrating framework that draws upon knowledge/skills used in agency/organizational management and in community organization/change.

SW 8519. Mediation and Conflict Resolution for Social Workers. (3.0 cr.; prereq = 5519; MSW student or grad conflict mgmt minor or #; spring, offered periodically) 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. (3.0 cr.; A-F only; prereq [8211, advanced standing] or #; spring, offered periodically) 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 8551. Advanced Community Practice: Assessment, Organizing, and Advocacy. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, every year) Community practice, including community organizing, policy advocacy, social service/change leadership.

SW 8552. Advanced Community Practice: Leadership, Planning, and Program Development. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, every year) Advanced community practice knowledge/skills. Strategic planning, program design, organizational leadership/management, work groups.


SW 8562. Human Services Finances. (2.0 cr.; prereq [5051, 5801, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; spring, every year) Contexts, purposes, principles, strategies associated with human services financing. Acquiring, allocating, managing, reporting public/private funding. Financial policy, mission. Short/long term agency sustainability.

SW 8563. Advanced Policy Advocacy. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, every year) Students paired with social service, social policy, social justice agencies, coalitions. Agenda setting, legislative research, legislative advocacy in relation to specific legislation proposed in Minnesota state legislature. Tie policy theory to real-world practice.

SW 8602. Direct Practice Evaluation. (2.0 cr.; A-F only; prereq 8601 or equiv or #; fall, spring, every year) 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. (2.0 cr.; A-F only; prereq 8601 or equiv or #; fall, every year) 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. (1.0-6.0 cr. [max 12.0 cr.] No Grade Associated; 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; fall, spring, summer, every year) TBD

SW 8693. Directed Study. (1.0-6.0 cr.; prereq #; fall, spring, summer, every year) Independent study under tutorial guidance.

SW 8694. Directed Research. (1.0-6.0 cr.; prereq #; fall, spring, summer, every year) 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 8801. Social Work Ethics and Legal Issues. (3.0 cr.; prereq = 5811; foundation courses or adv standing or #; fall, spring, offered periodically) Develops knowledge base and skills required to identify and understand legal and 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 8804. Child Welfare Policy. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; spring, every year) Develops advanced policy knowledge/skills for social workers practicing in or collaborating with public or private child welfare services.

SW 8805. Aging and Disability Policy. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151,
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. (3.0 cr.; A-F only; prereq Soc wk PhD student or 2nd-yr MSW student or #; fall, offered periodically) 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. (3.0 cr.; A-F only; prereq Soc wk PhD student or #; fall, every year) 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. (3.0 cr.; A-F only; prereq 8871 or #; spring, every year) Methods/design of quasi-experiments, surveys, descriptive research. Grounded theory. Analysis of quantitative/qualitative data.

SW 8875. Research Practicum. (2.0 cr. [max 6.0 cr.]; S-N or Audit; prereq Soc wk PhD student or #; fall, spring, every year) Experience in conduct of research, following completion of 8871 and 8872. Students work under faculty direction.

SW 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

SW 8901. Assessment and Treatment of Trauma. (2.0 cr.; prereq Advanced Standing or students who have completed entire foundation curriculum including SW 8010 or #; spring, every year) Sociopolitical context of trauma. Impact on diverse populations of individuals, families, communities. Evidence-based approaches for addressing trauma on multiple system levels. Applications to case conceptualization, treatment planning.

SW 8902. Social Work Supervision, Consultation, and Leadership. (2.0 cr.; prereq Advanced Standing or students who have completed entire foundation curriculum including SW 8010 or #; fall, spring, offered periodically) Sociopolitical context of trauma/its impact on diverse populations of individuals, families, communities. Evidence-based approaches for addressing trauma on multiple system levels through applications to case conceptualization/ treatment planning.

Social and Administrative Pharmacy (SAPH)
College of Pharmacy

SAPh 5100. Pro-Seminar. (1.0 cr.; A-F or Audit; fall, every year) History, foundational frameworks, and key research domains for social and administrative pharmacy through examining landmark literature. Students think critically, reflect on important works, and create a cognitive map of the discipline and their own focus for study.

SAPh 5610. Pharmacoepidemiology. (2.0 cr. [max 3.0 cr.]; A-F only; fall, odd years) Application of epidemiologic principles to study/use. Beneficial/adverse outcomes of drugs in human populations.

SAPh 8054. Advanced Studies in Pharmaceutical Care Practice. (3.0 cr.; A-F or Audit; fall, spring, every year) Analyzing practice/implementation of pharmaceutical care. Students confront their assumptions about pharmacy profession, pharmacy practice, and pharmaceutical care. Discussions, guest speakers, intensive literature searches/evaluation.

SAPh 8100. Seminar. (1.0 cr. [max 8.0 cr.]; A-F only; prereq Grad SAPh major or #; fall, spring, every year) Contemporary issues and research problems in sociobehavioral pharmacy, pharmaco economics and policy, and clinical research.

SAPh 8173. Principles and Methods of Implementing Research. (3.0 cr.; [NURS 8173]; prereq Two grad stat courses; fall, every year) Integrates scientific, statistical, and practical aspects of research. Interrelationships among design, sample selections, subject access, human subjects requirements, instrument selection and evaluation, data management, analyses plans, grant writing, and research career issues. Field experiences.

SAPh 8200. Research Problems. (1.0-8.0 cr. [max 16.0 cr.]; prereq Grad SAPh major or #; fall, spring, summer, every year) Individually designed research experience directed at contemporary problems related to drug use process.

SAPh 8235. Pharmaceutical Economics and Policy. (3.0 cr.; A-F or Audit; prereq Grad SAPh major or #; fall, every year) Economic analysis of pharmaceutical sector of health care systems. Problems of pricing production and distribution of pharmaceuticals. Domestic or international policy issues relevant to price and access of pharmaceuticals.

SAPh 8255. Pharmaceutical Marketing. (3.0 cr.; A-F or Audit; prereq Grad SAPC major or #; fall, spring, offered periodically) Historical development of distributive systems, marketing channels, institutions, policies, and practices as they relate to pharmaceutical industry. Contemporary issues/theory related to pharmaceutical marketing. Pharmaceutical proportion, especially directed to consumer advertising.

SAPh 8270. Clinical Conferences. (2.0 cr.; prereq Grad SAPh major or #; fall, every year)

SAPh 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student,
adviser and DGS consent; fall, spring, summer, every year)
(No description)
SAPH 8420. Social and Behavioral Aspects of Pharmacy Practice. (3.0 cr.; A-F or Audit; prereq Grad SAPh major or #; spring, every year)
Historical development of the profession, its growth and development, emphasizing forces of education, professionalism, attitude modification, and changes occurring as a product of legal and organizational forces in society.
SAPH 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)
SAPH 8500. Pharmacy and Its Environment. (3.0 cr.; A-F or Audit; prereq Grad SAPh major or #; spring, every year)
Cultural foundations of pharmacy.
Development of present state of pharmacy practice. Role of pharmacist as health practitioner in relation to other health practitioners. Identification of factors (health policy, regulation, economics, research and development, promotion) that affect individual responses to drug therapy.
SAPH 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) Doctoral pre-thesis credits.
SAPH 8700. Hospital Pharmacy Administration. (3.0 cr.; A-F or Audit; prereq Grad SAPh major or #; )
History, classification, organization, and functions of hospital departments in relation to the pharmacy service.
SAPH 8702. Hospital Pharmacy Survey. (1.0 cr. [max 3.0 cr.]; prereq Grad SAPh major or #; )
Readings for self-directed students to explore contemporary issues in hospital pharmacy practices.
SAPH 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 or total required [Plan A only]; fall, spring, summer, every year)
(No description)
SAPH 8810. Social Psychology of Health Care. (3.0 cr.; prereq Grad SAPh major or #; spring, offered periodically)
Behavioral and social aspects of recovery responses to drugs and other therapies, patients’ compliance with prescribed therapies, relationships between healthcare professional and patient.
SAPH 8840. Social Measurement. (3.0 cr.; A-F or Audit; prereq Intro stat course, understanding of simple correlations or #; fall, spring, offered periodically)
How social factors such as innovativeness, compliance, religiosity, and stress are measured and tested for reliability and validity. Relationships between theory, concepts, variables, data.
SAPH 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)
Social, Administrative, and Clinical Pharmacy (SACP)
College of Pharmacy
SACP 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, [adviser, DGS] consent; fall, spring, summer, every year) tbd
SACP 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, [adviser, DGS] consent; fall, spring, summer, every year) tbd
SACP 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) Doctoral pre-thesis credits.
SAPC 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Plan A, fall, spring, summer, every year) tbd
SAPC 8888. Thesis Credits: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; fall, spring, summer, every year) tbd
Sociology (SOC)
College of Liberal Arts
SOC 5090. Topics in Sociology. (1.0-3.0 cr. [max 9.0 cr.]; prereq Undergrad soc majors/ minors must register A-F; spring, offered periodically)
Topics specified in Class Schedule.
SOC 5455. Sociology of Education. (3.0 cr.; [=OLPD 5041]; prereq 1001 or equiv or #; soc majors/minors must register A-F; spring, offered periodically)
Structures/processes within educational institutions. Links between educational organizations and their social contexts, particularly as these relate to educational change.
SOC 5511. World Population Problems. (3.0 cr.; [=PA 5301]; prereq Soc majors/minors must register A-F; credit will not be granted if credit has been received for PA 5301; fall, every year)
Population growth, natural resources, fertility/mortality in less developed nations, population dynamics/forecasts, policies to reduce fertility.
SOC 5811. Intermediate Social Statistics. (4.0 cr.; [=SOC 8311]; prereq Primarily for 1st-yr soc grad students, [undergraduates with strong math background who have completed 3801 are encouraged to register for 5811 in lieu of 3811 or #], soc majors/minors must register A-F; fall, every year)
Measurement, theory of probability, bivariate statistics. Multiple regression analyses of sociological data.
SOC 8001. Sociology as a Profession. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Grad soc major; fall, spring, every year)
Sample topics: role of sociology in society, professional organizations, employment opportunities, professional ethics, and writing for publication or grant proposals.
SOC 8011. Teaching Sociology: Theory & Practice. (3.0 cr.; prereq Soc grad student or #; spring, every year)
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 syllabus or teaching plan.
SOC 8090. Topics in Sociology. (1.5-3.0 cr. [max 12.0 cr.]; prereq #; fall, spring, summer, every year)
Topics specified in [Class Schedule].
SOC 8091. Independent Study. (1.0-5.0 cr. [max 20.0 cr.]; )
Independent study of an established 8xxx course.
SOC 8093. Directed Study. (1.0-4.0 cr. [max 20.0 cr.]; prereq Grad soc major or #; fall, spring, summer, every year)
Directed study in sociology.
SOC 8094. Directed Research. (1.0-4.0 cr. [max 20.0 cr.]; fall, spring, summer, every year)
May be used to fulfill sociology graduate requirement for advanced methodological training.
SOC 8101. Sociology of Law. (3.0 cr.; fall, spring, offered periodically)
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. (3.0 cr.; fall, spring, offered periodically)
Overview of theoretical developments and empirical research. Underlying assumptions, empirical generalizations, and current controversies in criminological research.
SOC 8148. Law, Society, and the Mental Health System. (3.0 cr.; A-F or Audit; prereq [Grad student, 4148] or #; fall, spring, offered periodically)
Intensive survey of psychopathology. Reference to criminal behavior, criminal justice system.

SOC 8190. Topics in Law, Crime, and Deviance. (3.0 cr. [max 9.0 cr.; prereq Grad student in sociology or #; fall, every year]) Advanced topics in law, crime, and deviance. Social underpinnings of legal/illegal behavior and of legal systems.

SOC 8201. Social Stratification and Mobility. (3.0 cr.; prereq 3811 or equiv or #; fall, spring, offered periodically) 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. (3.0 cr.; fall, spring, offered periodically) 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. (3.0 cr.; = [WOST 8202]; fall, offered periodically) 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. (3.0 cr. [max 12.0 cr.; fall, offered periodically]) 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. (3.0 cr.; fall, every year) 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. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SOC 8390. Topics in Political Sociology. (3.0 cr. [max 12.0 cr.; prereq Soc grad student or #; fall, spring, offered periodically) 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. (3.0 cr.; fall, every year) Sociological analysis of work, occupations, and labor markets, including contemporary theory and research. Course emphasis varies with instructor.

SOC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SOC 8490. Advanced Topics in Social Organization. (3.0 cr. [max 12.0 cr.; prereq #; fall, spring, every year) 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. (3.0 cr.; fall, every year) 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, childbearing, parenthood, and cultural variations in families.

SOC 8540. Topics in Family Sociology. (3.0 cr. [max 12.0 cr.; fall, every year) 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. (3.0 cr.; prereq Soc grad major or #; fall, every year) Central concepts/premises of life course analysis as applied to intersocietal (comparative); intrasocietal (socioeconomic status, race, gender); and historical variability. Institutional patterning of life course (family, education, work, polity), deviance and criminal careers, changes in the self, methodological strategies.

SOC 8559. Topics in Life Course Sociology. (3.0 cr. [max 12.0 cr.; fall, offered periodically) Sociology of aging, sociology of youth, and mental health and adjustment in early life course. Topics specified in [Class Schedule].

SOC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.; No Grade Associated; 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; fall, spring, summer, every year) TBD

SOC 8701. Sociological Theory. (4.0 cr.; A-F or Audit; prereq Grad soc major or #; fall, every year) Traditions of social theory basic to sociological knowledge, their reflection and expansion in contemporary theory, their applications in selected areas of empirical research. Sample topics: social inequality, social organization and politics, family organization and social reproduction, social order and change, sociology of knowledge and religion.

SOC 8721. Theories of Social Psychology. (3.0 cr.; fall, spring, offered periodically) Prominent contemporary theories of sociological social psychology, including structural (social structure and personality) perspectives, social relationships and small group processes (exchange, equity, expectation states theories), and symbolic interactionism. Classical writings, theoretical statements, and empirical studies.

SOC 8731. Sociology of Knowledge. (3.0 cr.; prereq Soc grad student or #; fall, offered periodically) Knowledge and related terms (ideology, stereotype, prejudice, belief, truth). Variation of knowledge across social groups/categories (e.g., gender, race, class, generation, nationality); institutions (e.g., politics, law, science); and societies across time and space. Power, rituals, institution, networks, and knowledge. Genealogy of theories.


SOC 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

SOC 8790. Advanced Topics in Sociological Theory. (3.0 cr. [max 12.0 cr.; spring, offered periodically) Sample topics: theories of conflict, theories of purposive action, Marxist theory, and structure-agency debate.

SOC 8801. Sociological Research Methods. (4.0 cr.; A-F or Audit; prereq Grad soc major or #; fall, spring, offered periodically) Multiple objectives of social research and how they inform research design. Conceptualization and measurement of complex concepts. Broad issues in research design and quantitative and qualitative approaches to data collection and management.

SENG 5551. Introduction to Intelligent Robotic Systems. (3.0 cr.; A-F or Audit; 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. (3.0 cr.; A-F or Audit; prereq Grad SEng major; fall, every year) Fundamental concepts; representing instances; prototypic model shapes; model evolution; interviewing user skills, reverse engineering; mapping to DBMS schema; database querying.

SENG 5708. Data Analytics. (2.0-3.0 cr.; A-F or Audit; prereq Grad SEng major; spring, every year) Applications/motivation. Extended relational, object-relational, and object-oriented data models. Object identifier, types/constructors. Versions, schema evolution. Query language (e.g., recursion, path expressions). Object indices, buffer management, and other implementation issues. Triggers, rules, complex objects, and case studies.

SENG 5801. Software Engineering I: Overview, Requirements, and Modeling. (3.0 cr.; A-F or Audit; prereq Grad SEng major; fall, every year) Software engineering as a discipline. Preview of topics to be covered in subsequent courses in master of science in software engineering program; in-depth study of requirements engineering; modeling techniques applicable to requirements and specification, including UML and formal modeling.

SENG 5802. Software Engineering II: Software Design. (3.0 cr.; A-F or Audit; prereq Grad SEng major; spring, every year) Software design quality, processes that produce quality design, graphical and textual representations, including UML, common problems and patterns that solve them, refactoring. Students develop fluency in object-oriented design, and ability to read, critique, and advocate design ideas. Students work in teams to complete a multiphase project.

SENG 5811. Software Testing and Verification. (2.0 cr.; A-F or Audit; prereq 5801, grad SEng major; spring, every year) Theoretical/practical aspects of testing software. Analyzing a requirements document for test conditions. Writing a test plan. Designing, creating, and executing test cases. Recording defects. Writing a test report.


SENG 5841. Model-based Development. (3.0 cr.; A-F or Audit; prereq Grad SEng major; spring, every year) Formal specification of software artifacts. Applicability of formal specifications. Methods such as Z, SCR, and Statecharts. Formal analysis. Theorem proving. Reacheability analysis. Model checking. Tools such as PVS, Statemate, SPIN, and SMV.

SENG 5851. Software Project Management. (3.0 cr.; A-F or Audit; prereq Grad SEng major; fall, spring, every year) Concepts used to manage software projects. Project management cycle: initiation, planning/ control, status reporting, review, post-project analysis. Leadership and motivation strategies. Lecture, discussion, individual/team presentations/projects.

SENG 5852. Quality Assurance and Process Improvement. (3.0 cr.; A-F or Audit; prereq Grad SEng major; fall, spring, every year) Theory and application of capability maturity model: process assessment, modeling, and improvement techniques. Life cycle issues related to development and maintenance; quality, safety, and security assurance; project management; and automated support environments. Group projects and case studies.

SENG 5861. Introduction to Software Architecture. (3.0 cr.; A-F or Audit; 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. (1.0 cr. [max 2.0 cr.]; prereq Grad SEng major, #: fall, every year) Software engineering trends. Talks by invited speakers, selected readings.

SENG 5900. Directed Study. (1.0-3.0 cr.; fall, spring, every year) Directed study/research in software engineering. Topics/scope decided in collaboration with instructor.

SENG 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SENG 8494. Capstone Project (Plan B Project). (3.0 cr.; S or A; prereq SEng major; spring, every year) 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. (2.0-6.0 cr. [max 12.0 cr.]; fall, spring, every year) Independent project arranged with faculty.
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.

(1.0-3.0 cr.; max 6.0 cr.; S-N or Audit; fall, spring, summer, every year)
Research or intellectual areas in soil science or climatology not covered in regular courses. Topics vary; contact department for current offerings.

SOIL 8123. Research Ethics in the Plant and Environmental Sciences. 
(0.5 cr.; S-N or Audit; =APSC 8123, PLPA 8123; prereq Enrolled in a plant/environmental sci grad research prog; spring, every year)

SOIL 8252. Advanced Soil Physics. 
(2.0 cr.; prereq [5232, differential equations] or #; spring, odd years)

(3.0 cr.; S-N or Audit; spring, odd years)
Integrative/quantitative treatment of dynamics of water, carbon, and nitrogen in soil-plant-air continuum.

SOIL 8510. Advanced Topics in Pedology. 
(2.0-4.0 cr.; max 12.0 cr.; A-F or Audit; prereq 5515; fall, odd years)
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. 
(3.0 cr.; A-F or Audit; prereq = CE 8541; 5311 or CE 4541; spring, odd years)
Physical chemical principles, geochemical processes controlling chemical composition of natural waters, soil-sediment-water interactions. Emphasizes behavior of inorganic contaminants in natural waters, engineered systems, dissolved natural organic matter.

SPAN 5100. Discursive Formations at the Threshold of 20th-Century Spain. 
(3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Theorized and representational examples of the realist/naturalist novel (Galdas, Pardo Bazan) in the context of its antecedents ("costumbrismo"), opposites (the idealist/sentimental novel), and turn-of-the-century innovations of modernism and the "generation of 1898.

SPAN 5150. Contemporary Spanish Literature. 
(3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)

SPAN 5160. Medieval Iberian Literatures and Cultures. 
(3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Analysis of Cervantes' [Don Quixote] in its sociohistorical context; focus on the novel's reception from the romantic period to postmodern times.

(3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Major literary works/intellectual movements/conflicts represented in written culture, of 18th/early 19th centuries (1680-1845), examined as expressions of long crisis of Spain's Old Regime and rise of bourgeois liberalism.

SPAN 5316. Spanish Picaresque Narratives. 
(3.0 cr.; prereq Grad student or #; fall, offered periodically)

SPAN 5531. Hispanic Literature of the United States. 
(3.0 cr.; prereq Grad student or #; fall, offered periodically)
Interdisciplinary approach providing a framework for deconstructing issues of national identity, marginalization, and gender. U.S. Hispanic theatre/literature and its ethnic diversity, regional variations, cultural links, and scope of its genres.

(3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Literature of Spanish-speaking Caribbean. Emphasizes historical legacy of slavery, African culture, independence struggles.
SPAN 5560. Global Colonial Studies in the Hispanic World. (3.0 cr.; prereq Grad student or #; fall, offered periodically)

SPAN 5570. Nineteenth Century Latin America: Enlightened Thought, Nation Building, Literacy, Cultural Discourse. (3.0 cr.; prereq Grad student or #; spring, offered periodically)

SPAN 5580. Latin American Cultural Integration in the Neocolonial Order. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Modernismo, historical vanguard, impact of populist politics in patterns of culture/literature. 1900-50.


SPAN 5701. History of Ibero-Romance. (3.0 cr.; prereq Grad student or #; spring, offered periodically)
Origins and developments of Ibero-Romance languages; evolution of Spanish, Portuguese, and Catalan.

SPAN 5711. The Structure of Modern Spanish: Phonology. (3.0 cr.; prereq Grad student or #; fall, offered periodically) Formulating and evaluating a phonological description of Spanish. Approaches to problems in Spanish phonology within metrical, autosegmental, and lexical phonological theories.

SPAN 5714. Theoretical Foundations of Spanish Syntax. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Linguistic types/processes that appear across languages. Grammatical relations, word order, transitivity, subordination, information structure, grammaticalization. How these are present in syntax of Spanish.

SPAN 5715. The Structure of Modern Spanish: Semantics. (3.0 cr.; prereq Grad student or #; fall, offered periodically) 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 5717. Spanish Sociolinguistics. (3.0 cr.; prereq Grad student or #; spring, offered periodically) 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. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Analysis of different types/results of Spanish language contact globally, taking into account varying social conditions under which contact occurs.

SPAN 5721. Spanish Laboratory Phonology. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically) Core literature on Spanish laboratory phonology. Phonology from a laboratory perspective. Students evaluate laboratory research methodologies, perform basic acoustic analyses, and design laboratory phonology studies.

SPAN 5790. Topics in Spanish Peninsular Studies. (3.0 cr.; max 9.0 cr.; prereq Grad student or #; fall, spring, summer, offered periodically) Crucial moment or characters, works, or events marking beginning of new phase in literary/cultural landscape.

SPAN 5910. Topics in Ibero-Romance Linguistics. (3.0 cr.; max 9.0 cr.; prereq Grad student or #; spring, summer, offered periodically) Spanish-American literature analyzed according to important groups, movements, trends, methods, and genres. Specific approaches depend on topic and instructor. Topics specified in Class Schedule.

SPAN 5930. Topics in Ibero-Romance Linguistics. (3.0 cr.; max 9.0 cr.; prereq Grad student or #; spring, summer, offered periodically) Problems in Hispanic linguistics; a variety of approaches and methods.

SPAN 5970. Directed Readings. (1.0-4.0 cr. [max 9.0 cr.]; fall, spring, summer, every year) Students must submit reading plans for particular topics, figures, periods, or issues. Readings in Spanish and/or Spanish-American subjects. Prereq Grad student or instr consent.

SPAN 5985. Sociolinguistic Perspectives on Spanish in the United States. (3.0 cr.; prereq Grad student or #; spring, offered periodically) 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. (1.0-4.0 cr. [max 9.0 cr.]; fall, spring, summer, every year) Directed research. Prereq Grad student or instr consent.

SPAN 5991. The Acquisition of Spanish as a First and Second Language. (3.0 cr.; prereq Grad student or #; spring, offered periodically) 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. (3.0 cr. [max 9.0 cr.]; prereq 5xxx courses in Spanish 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. (3.0 cr. [max 9.0 cr.]; prereq 5xxx courses in Spanish 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 8212. Spanish Theater of the 16th Century: Drama up to Lope. (3.0 cr.; prereq 5xxx courses in Spanish literature and culture; ) Medieval origins of drama to [La Celestina] (1499-1502), pastoral dialogues, crossover plays of Spanish and Portuguese dramatists, popular theater up to emerging public and private theaters under Italian influence. Rojas, Encina, Vicente, Naharro, Cervantes, and new tragedians.


SPAN 8300. The Construction of Spanish Literary History. (3.0 cr. [max 9.0 cr.]; prereq Two 5xxx courses in Spanish 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]. (3.0 cr.; 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. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SPAN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SPAN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

SPAN 8710. Seminar in Hispanic Linguistics. (3.0 cr. [max 9.0 cr.]; prereq 5711, [Ling 5302 or #]; fall, even years) Critical examination of readings/research on specific topic.

SPAN 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

SPAN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

SPAN 8900. Spanish Seminar. (3.0 cr. [max 9.0 cr.]; prereq Span 5xxx series required for MA or #; fall, spring, summer, every year) 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. (3.0 cr. [max 9.0 cr.]; ) 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. (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq Reading knowledge of Spanish and Portuguese; fall, spring, summer, every year) 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. (3.0 cr. [max 9.0 cr.;] 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) College of Liberal Arts

SPPT 5930. Selected Topics in Hispanic and Lusophone Cultural Discourse. (1.0-3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq Reading knowledge of Span and Port; fall, summer, every year) 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 5995. Directed Teaching. (1.0 cr.; S-N only; prereq Grad student with concurrent enrollment in 5999; fall, every year) Taken in conjunction with SPPT 5999. Language acquisition theory as applied to foreign language instruction at college level. How current theory translates into practice through hands-on practical application particular to communicative language instruction practiced in Department of Spanish/Portuguese Studies.

SPPT 5999. The Teaching of College-Level Spanish: Theory and Practice. (3.0 cr.; prereq Grad or #; fall, every year) 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. (3.0 cr. [max 9.0 cr.]; prereq Three 5xxx SPAN or PORT courses; fall, spring, offered periodically) 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. (3.0 cr. [max 9.0 cr.;] prereq Grad student; fall, spring, every year) 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 5401. Counseling and Professional Issues. (3.0 cr.; prereq [ & 8720 or & 8820], grad student) recommended; fall, every year) Basic counseling principles and current professional issues in communication disorders. Application of counseling theory to clinical practice. Analysis of regulation, practice, and future direction of communication disorders.


SLHS 5503. Fluency and Motor Speech Disorders. (3.0 cr.; prereq graduate SLHS student or department permission, [3305, 4301] or #; fall, every year) Nature/management of motor speech disorders in adults/children.

SLHS 5504. Dysphagia. (2.0 cr.; prereq current SLHS graduate major; fall, every year) Normal/disordered aspects of swallowing. Nature, etiologies, evaluation, management of swallowing disorders.

SLHS 5602. Phonological Disorders. (3.0 cr.; prereq [3303, 3304, 4601] or #; fall, every year) Theory/research related to nature, assessment, treatment of phonological disorders in children.

SLHS 5603. Language and Cognitive Disorders in Children. (3.0 cr.; prereq 3303 or CDis 3303 or equiv or grad student or #; fall, spring, offered periodically) Language assessment, teaching procedures used with children/adolescents. Procedures apply to children who face language disabilities such as developmental delays, autism, learning disabilities.

SLHS 5605. Language and Cognitive Disorders in Adults. (3.0 cr.; prereq [3302, 4301] or [CDis 3302, CDis 4301] or #; fall, spring, offered periodically) Neurogenic communicative and cognitive disorders in adults, including aphasia, right-hemisphere syndrome, traumatic brain injury, and dementia. Consideration of neurologic substrates, assessment and diagnosis, and clinical intervention.

SLHS 5606. Introduction to Augmentative and Alternative Communication. (3.0 cr.; prereq SLHS grad or #; fall, spring, every year) Description of the range of augmentative and alternative communication applications for persons with developmental and acquired disabilities.
SLHS 5608. Clinical Issues in Bilingualism and Cultural Diversity. (3.0 cr.; A-F only; prereq 3303 or equiv or #; spring, every year) 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. (3.0 cr.; prereq 4801 or CDIS 4801 or #; fall, every year) Basic audiometric battery, including pure tones, speech, masking, and immittance in adults. Industrial audiology, ototoxic emissions.

SLHS 5802. Hearing Aids I. (3.0 cr.; prereq [3305, 4801] or [CDIS 3305, CDIS 4801], SLHS grad or #; fall, every year) 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. (3.0 cr.; prereq [[4801 or CDIS 4801], SLHS grad] or #; fall, every year) Behavioral, physiological approaches to assessment and identification, development of the auditory mechanism, etiologies of hearing losses in infants, children, selection of sensory aids, principles of case management with children and families.


SLHS 5806. Auditory Processing Disorders. (3.0 cr.; A-F or Audit; prereq [4802 or CDIS 4802, SLHS grad] or #; spring, odd years) 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. (3.0 cr.; A-F or Audit; prereq [[8801, 8802] or [CDIS 8801, CDIS 8802], SLHS grad] or #; summer, every year) Disorders of auditory system, including anatomical, physiological, perceptual, and audiological manifestations of pathologies affecting hearing.

SLHS 5810. Laboratory Module in Audiology. (1.0-2.0 cr. [max 5.0 cr.]; prereq [4801 or CDIS 4801, SLHS grad] or #; fall, spring, every year) 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. (1.0-6.0 cr.; S-N or Audit; prereq [4801 or CDIS 4801 or equiv], SLHS grad) or #; fall, spring, every year) Group discussions of current professional issues in audiology. Case presentations, guest presentations on current technology, clinical/research ethics. Group meets for an hour weekly with faculty coordinator who leads discussion. Integrates academic/clinical education.

SLHS 5830. Clinical Foundations in Audiology. (1.0-8.0 cr. [max 24.0 cr.]; S-N or Audit; prereq Grad SLHS major; fall, spring, summer, every year) Clinical foundations in audiology for first year AuD graduate students.

SLHS 5900. Topic in Speech-Language-Hearing Sciences. (1.0-4.0 cr. [max 8.0 cr.]; prereq SLHS grad student or #; fall, spring, offered periodically) Topics listed in Speech-Language-Hearing Sciences office.

SLHS 5993. Directed Study. (1.0-12.0 cr. [max 18.0 cr.]; prereq SLHS grad or #; fall, spring, every year) Directed readings and preparation of reports on selected topics.

SLHS 8333. FTE: Masters. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SLHS 8410. Seminar: Research. (3.0 cr.; fall, spring, offered periodically) Advanced study exploring application of experimental and quasi-experimental research designs used in single-subject and group research.

SLHS 8420. Seminar: Teaching. (3.0 cr. [max 9.0 cr.]; prereq Grad com dis major; fall, spring, offered periodically) Advanced study to prepare doctoral students for careers in undergraduate and graduate teaching.

SLHS 8430. Proseminar in Speech-Language-Hearing Sciences. (1.0 cr. [max 10.0 cr.]; S-N only; prereq SLHS grad student; fall, spring, every year) Presentations/discussions led by faculty and PhD students in the department, based on research or issues in the discipline.

SLHS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SLHS 8501. Interdisciplinary Management in Cleft Palate and Craniofacial Disorders. (3.0 cr.; prereq 3305 or CDIS 3305 or #; fall, every year) 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. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Advanced study and analysis of research in speech science and speech pathology.


SLHS 8630. Seminar: Language. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Research in language acquisition, language science, and language disorders.

SLHS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) tbd

SLHS 8720. Clinical Education in Speech-Language Pathology. (1.0-8.0 cr. [max 24.0 cr.]; S-N or Audit; fall, spring, summer, every year) Clinical experience. Prereq Grad CDIs major, adviser, DGS consent.

SLHS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

SLHS 8801. Audiologic Assessment II. (3.0 cr.; prereq 5801 or CDIS 5801 or #; spring, every year) 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. (3.0 cr.; prereq 5802 or Cdis 5802 or #; spring, every year) 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. (3.0 cr.; prereq [3305, 3306, 4801] or [Cdis 3305, CDis 3306, 4801] or #; fall, every year) 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. (1.0-6.0 cr.; S-N or Audit; prereq 8802, 8807; fall, offered periodically) 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 8807. Audiologic Assessment III: Balance. (3.0 cr.; prereq 5801, 8801; spring, even years) Anatomy/physiology of vestibular mechanism, assessment techniques to evaluate balance function. Treatment options available for persons with balance disorders.

SLHS 8820. Clinical Education in Audiology. (1.0-8.0 cr. [max 24.0 cr.]; S-N or Audit; prereq Grad Cdis major; fall, spring, summer, every year) Clinical experience.

SLHS 8830. Seminar: Hearing. (3.0 cr. [max 12.0 cr.]; fall, spring, summer, offered periodically) Advanced study/analysis of research in hearing science and audiology.

SLHS 8840. Audiology Externship. (1.0-7.0 cr.; S-N or Audit; prereq [8802, 8807] or [CDis 8802, CDis 8807]; fall, spring, offered periodically) 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. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

SLHS 8994. Directed Research. (1.0-12.0 cr. [max 18.0 cr.]; prereq #; fall, spring, summer, every year) Directed research

Statistics (STAT)

College of Liberal Arts

STAT 5021. Statistical Analysis. (4.0 cr.; =STAT 3011, ANSC 3011, ESPM 3012; prereq = 3011; College algebra or #; Stat course recommended; fall, spring, every year) Intensive introduction to statistical methods for graduate students needing statistics as a research technique.

STAT 5031. Statistical Methods for Quality Improvement. (4.0 cr.; prereq [3021 or 3022 or 4102 or 5021 or 5102 or 8102], Math 1272; spring, offered periodically) Random variability/sampling. Controlling statistical process. Shewhart/accumulative charting. Analyzing plant data, trend surface, and variance/design of experiments.


STAT 5101. Theory of Statistics I. (4.0 cr.; =STAT 4101; prereq MATH 2263 or MATH 2374; fall, every year) 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 5102. Theory of Statistics II. (4.0 cr.; =STAT 4102; prereq 5101 or Math 5651; spring, every year) Sampling, sufficiency, estimation, test of hypotheses, size/power. Categorical data. Contingency tables. Linear models. Decision theory.

STAT 5201. Sampling Methodology in Finite Populations. (3.0 cr.; prereq 3022 or 4102 or 5021 or 5102 or #; spring, every year) Simple random, systematic, stratified, unequal probability sampling. Ratio, model based estimation. Single stage, multistage, adaptive cluster sampling. Spatial sampling.

STAT 5302. Applied Regression Analysis. (4.0 cr.; prereq 3022 or 4102 or 5021 or 5102 or #; fall, spring, summer, every year) Simple, multiple, and polynomial regression. Estimation, testing, prediction. Use of graphics in regression. Stepwise and other numerical methods. Weighted least squares, nonlinear models. Goodness of fit. Topics may include smoothing, bootstrap, and generalized linear models.

STAT 5301. Statistical Computing. (3.0 cr.; fall, spring, every year) Statistical programming, function writing, graphics using high-level statistical computing languages. Data management, parallel computing, version control, simulation studies, power calculations. Using optimization to fit statistical models. Monte Carlo methods, reproducible research.

STAT 5302. Topics in Statistics. (3.0 cr.; fall, offered periodically) Topics vary according to student needs and available staff.

STAT 5303. Designing Experiments. (4.0 cr.; prereq 3022 or 4102 or 5021 or 5102 or #; fall, spring, summer, every year) Analysis of variance. Multiple comparisons. Variance-stabilizing transformations. Contrasts.
Audit; prereq Statistics grad or #; fall, every year) Linear/generalized linear models, modern regression methods including nonparametric regression, generalized additive models, splines/basis function methods, regularization, bootstrap/other resampling-based inference.


STAT 8054. Statistical Methods 4: Advanced Statistical Computing. (3.0 cr.; A-F or Audit; prereq 8053 or #; spring, every year) Optimization, numerical integration, Markov chain Monte Carlo, related topics.

STAT 8055. Applied Project. (2.0 cr.; S-N only; prereq [8054, 8801] or #; fall, every year) Collaborative applied statistical practice with a member of University community, including consulting, problem solving, presentation/documentation of results.


STAT 8111. Mathematical Statistics I. (3.0 cr.; prereq [5102 or 8102 or #], [[Math 5615, Math 5616] or real analysis], matrix algebra; fall, every year) Probability theory, basic inequalities, characteristic functions, and exchangeability. Multivariate normal distribution. Exponential family. Decision theory, admissibility, and Bayes rules.


STAT 8141. Probability Assessment. (3.0 cr.; prereq 5102; spring, offered periodically) 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 8171. Sequential Analysis. (3.0 cr.; 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. (3.0 cr.; S-N or Audit; prereq 8102 or #; ) Sampling theory, stratified sampling, ratio estimators, cluster sampling, double sampling, superpopulation theory, Bayesian methods, multiple imputation, nonresponse.

STAT 8311. Linear Models. (4.0 cr.; prereq Linear algebra, 6102 or 8102 or #; fall, every year) General linear model theory from a coordinate-free geometric approach. Distribution theory, ANOVA tables, testing, confidence statements, mixed models, covariance structures, variance component estimation.

STAT 8312. Linear and Nonlinear Regression. (3.0 cr.; 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. (3.0 cr.; prereq 8311; ) Optimal, Bayes, and nonlinear designs; algorithms for computing designs; sample size; recent developments.


STAT 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)


STAT 8411. Multivariate Analysis. (3.0 cr.; prereq 8152; fall, spring, offered periodically) 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 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

STAT 8501. Introduction to Stochastic Processes with Applications. (3.0 cr.; prereq 5101 or 8101; ) Markov chains in discrete and continuous time, renewal processes, Poisson process, Brownian motion, and other stochastic models encountered in applications.


STAT 8666. Doc Pre-Thesis Cr. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

STAT 8701. Computational Statistical Methods. (3.0 cr.; prereq 8311, programming exper; spring, every year) Random variate generation, variance reduction techniques. Robust location estimation and regression, smoothing additive models, regression trees. Programming projects; basic programming ability and familiarity with standard high-level language (preferably FORTRAN or C) are essential.

STAT 8711. Statistical Computing. (3.0 cr.; prereq 8701 or #; )
Basic numerical analysis for statisticians. Numerical methods for linear algebra, eigen-
analysis, integration, and optimization and their statistical applications.

STAT 8721. Programming Paradigms and Dynamic Graphics in Statistics. (3.0 cr.;
prereq 8062, 8102.) 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. (1.0-18.0 cr. [max 50.0 cr.]; No Grade
Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall,
spring, every year) (No description)

STAT 8801. Statistical Consulting. (3.0 cr.; S-N or Audit; prereq Grad stat major or #;
spring, every year) Principles of effective consulting/problem-solving, meeting skills, reporting.
Aspects of professional practice/behavior, ethics, continuing education.

STAT 8811. Statistical Consulting Practicum. (3.0 cr. [max 12.0 cr.]; S-N or
Audit; prereq Statistics grad student or #; fall, spring, every year) Providing (under faculty supervision) statistical support to clients, primarily University researchers. Exercises in problem solving, ethics, listening/communication skills.

STAT 8821. Curricular Practical Training. (1.0 cr.; S-N only; prereq Statistics grad student, %; fall, spring, summer, every year) Industrial work assignment using advanced statistical techniques. Grade based on final report and presentation covering work assignment.

STAT 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade
Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year)
(No description)

STAT 8900. Student Seminar. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Statistics graduate student; fall, spring, every year) Preparation or presentation of seminar on statistical topics.

STAT 8911. Literature Seminar. (1.0 cr. [max 4.0 cr.]; S-N only; prereq Statistics grad major or #; fall, spring, every year) Students will read, present, discuss, and critique current literature/research.

STAT 8921. Advanced Topics in Statistics. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Topics vary according to student needs/ available staff.

STAT 8922. Advanced Topics in Statistics. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Topics vary according to student needs/ available staff.

STAT 8933. Advanced Topics in Statistics. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Topics vary according to student needs and available staff.

STAT 8932. Advanced Topics in Statistics. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Directed study in areas not covered by regular offerings.

Statistical Consulting Practicum. (3.0 cr. [max 12.0 cr.]; S-N or Audit; prereq Statistics grad student or #; fall, spring, every year)

STAT 8934. Advanced Topics in Statistics. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Topics vary according to student needs and available staff.

STAT 8935. Advanced Topics in Statistics. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Topics vary according to student needs and available staff.

STAT 8992. Directed Readings and Research. (1.0-6.0 cr.; [max 12.0 cr.]; prereq #;
fall, spring, summer, every year) Directed study in areas not covered by regular offerings.

Stem Cell Biology (SCB) Medical School

SCB 5051. Stem Cell Biology Practical Training Module. (1.0 cr.; A-F only; prereq
Acceptance into stem cell biology module's program; fall, every year) Intensive two-week course. Hands-on instruction in techniques of tissue culture. Conventional, fluorescence, and confocal microscopy. Flow cytometry for both analysis of cell populations and sorting of cells.

SCB 5054. Stem Cell Institute Research Seminar and Journal Club. (2.0 cr. [max 6.0 cr.;] A-F only; prereq Acceptance into stem cell biology module's [master's prog or PhD minor prog] or #; fall, spring, every year) Students attend weekly Stem Cell Institute research seminars and journal clubs, write brief summaries, participate in journal club, and present original research paper.

SCB 5090. Master's Plan B Research Paper and Presentation. (2.0 cr.; A-F only; prereq
Admission to stem cell biology module's plan B program; fall, spring, summer, every year) Students write research paper based on primary literature on stem cell biology topic of interest, mentored by faculty member.

SCB 8181. Stem Cell Biology. (3.0 cr.; [max 6.0 cr.;] A-F only; prereq Acceptance into stem cell biology module's plan B program; fall, spring, summer, every year) Students will attend weekly Stem Cell Institute seminars and journal clubs, write brief summaries, participate in journal club, and present original research paper.

SCB 8333. FTE: Master's. (1.0 cr.; No Grade
Associated; prereq Master's student, adviser consent, DGS consent; fall, spring, summer, every year) FTE: master's

SCB 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade
Associated; fall, spring, summer, every year) Thesis credits: master's

Studies in Cinema and Media Culture (SCMC)

College of Liberal Arts

SCMC 5001. Critical Debates in the Study of Cinema and Media Culture. (4.0 cr.; fall,
 spring, every year) Basic concepts in historical/international debates over production/reception of media culture. Emphasizes cinema. Advanced orientation toward intellectual traditions that inform contemporary scholarship.

SCMC 5002. Advanced Film Analysis. (4.0 cr.; A-F only; prereq [1201 or ARTH
1921W or SCSL 1201 or SCSL 1921 or equiv coursework]; SCMC major; fall, every year) Application of textual analysis to the reading of a film. Students work collaboratively to discern and interpret all component aural/visual elements of what the film says and how it says it.

SCMC 5993. Directed Study. (1.0-3.0 cr. [max 6.0 cr.;] fall, spring, every year) Guided individual reading or study.

Studies of Science and Technology (SST)

College of Science and Engineering

SST 8000. Colloquium. (1.5 cr. [max 3.0 cr.;] S-N or Audit; prereq Grad SST minor; fall,
spring, every year) Series of weekly lectures by nationally and internationally known scholars with diverse disciplinary and methodological backgrounds speaking on a variety of issues.

SST 8100. Seminar: Models, Theories, and Reality. (3.0 cr.; prereq HSci 8111 or
[Phil 8601 or Phi 8602 or Phi 8605] or #; fall, spring, every year) Students participate in ongoing research on the role of models and theories in science, and prepare and present research papers.

SST 8200. Seminar: Philosophy of the Physical Sciences. (3.0 cr. [max 6.0 cr.;]
prereq #; fall, offered periodically) Students participate in ongoing research in history, philosophy, and social study of physical sciences and prepare and present research papers.

SST 8300. Seminar: The Biological and Biomedical Sciences. (3.0 cr.; prereq HSci
8111 or [Phil 8601 or Phi 8602 or Phi 8605] or #; fall, spring, every year) Students participate in ongoing research in history, philosophy, and social study of biological and biomedical sciences, and prepare and present research papers.

SST 8400. Seminar: Science, Technology, and Society. (3.0 cr.; prereq HSci 8111 or
[Phil 8601 or Phi 8602 or Phi 8605] or #; fall, spring, offered periodically) Students participate in ongoing research on interactions involving science, technology, and society from perspectives of history, philosophy, and social study of science, and prepare and present research papers.

SST 8420. Seminar: Social and Cultural Studies of Science. (3.0 cr. [max 6.0 cr.;]
[Phil 8601 or Phi 8602 or Phi 8605]; fall, spring, offered periodically) Recent work; theoretical and methodological differences among practitioners; selected responses from historians and philosophers of science.

Supply Chain and Operations (SCO)

College of Science and Engineering

SCO 5993. Directed Study. (1.0-3.0 cr. [max 6.0 cr.;] fall, spring, every year) Guided individual reading or study.
SCO 8651. Experimental Design. (3.0 cr.; A-F or Audit; prereq MBA 6120 or equiv or business admin PhD student or #; offered alt yrs; spring, odd years) 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.

SCO 8652. Regression Analysis. (3.0 cr.; A-F or Audit; prereq MBA 6120 or equiv, business admin PhD student or #; offered alt yrs; spring, offered periodically) Regression and correlation models, inferences in simple and multiple regression, multicolinearity, indicator variables, variable selection techniques, treatment of assumption violations, applications to management problems, basic concepts of experimental design.

SCO 8711. Research in Operations Strategy. (3.0 cr.; A-F or Audit; prereq Business admin PhD student or #; offered alt yrs; fall, offered periodically) Operations performance; competitive advantage; focused factory, product, and process innovation; and operations strategy implementation. Research results and methods.

SCO 8721. Management of Technological Operations. (3.0 cr.; A-F or Audit; prereq Business admin PhD student or #; offered alt yrs; spring, offered periodically) 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.

SCO 8735. Supply Chain Management. (3.0 cr.; A-F or Audit; prereq Business admin PhD student or #; spring, offered periodically) 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.

SCO 8745. Research on Quality Management. (3.0 cr.; A-F or Audit; prereq Business admin PhD student or #; offered alt yrs; fall, spring, offered periodically) Research literature, methods, and results. Research on quality strategy, economics of quality, statistical process control, vendor management, off-line quality, and quality practice.

SCO 8755. Behavioral Operations. (3.0 cr.; A-F only; prereq Business admin Ph.D. student or #; fall, spring, offered periodically) Research/review classic behavioral literature in economics and other business disciplines; identify behavioral problems within operations contexts; test/analyze operations phenomenon through experimental study, empirical methods, and analytical modeling. Supply chain problems.

SCO 8800. Research Topics in Operations and Management Science. (2.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; prereq Business admin Ph.D. student or #; fall, offered periodically) Topics selected from new areas of research. Research methods, issues in operations/management science.

SCO 8892. Readings in Operations and Management Science. (1.0-8.0 cr. [max 16.0 cr.]; prereq Business admin PhD student or #; fall, spring, summer, every year) Readings useful to student’s individual program and objectives that are not available in regular courses.

SCO 8894. Graduate Research in Operations and Management Science. (1.0-8.0 cr. [max 16.0 cr.]; prereq Business admin PhD student or #; fall, spring, summer, every year) Individual research on an approved topic appropriate to student’s program and objectives.

Surgery (SURG) Medical School

SURG 8200. Clinical Surgical Problems in Management. (3.0 cr.; A-F or Audit; prereq Grad surg major; fall, spring, summer, every year) Diagnostic and management instruction in all phases of clinical surgery, inpatient and outpatient.

SURG 8201. Surgery Roentgenological Pathology Conference. (1.0 cr.; A-F or Audit; prereq Grad surg major; fall, spring, summer, every year) 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. (3.0 cr.; A-F or Audit; prereq Grad surg major; fall, spring, summer, every year) Graduate students undertake original investigation of problems in either experimental or clinical surgery.

SURG 8203. Surgery Complications and Research Conference. (1.0 cr.; A-F or Audit; prereq Grad surg major; fall, spring, summer, every year) Evaluation of surgical patients, including postoperative course. Discussion and critical evaluation of current research problems.

SURG 8207. Transplantation Conference. (1.0 cr.; A-F or Audit; prereq Grad surg major; fall, spring, summer, every year) Interdepartmental discussion and evaluation of current clinical and research problems.

SURG 8293. Applied Statistics. (1.0 cr.; S-N or Audit; prereq Grad student in [surgery or experimental surgery or health sciences] or; fall, spring, every year) 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. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SURG 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SURG 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) TBD

SURG 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 80.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year) (No description)

SURG 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year) (No description)

Sustainable Agricultural Systems (SAGR) College of Food, Agricultural and Natural Resource Sciences

SAGR 8010. Colloquium in Sustainable Agriculture. (2.0 cr.; A-F or Audit; prereq Coursework in biological or social sciences that provides intro to ag practices or issues; fall, every year) 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. (1.0-4.0 cr.; S-N or Audit; prereq Coursework in biological or social sciences that provides intro to ag practices or issues; fall, spring, summer, every year) 3- to 14-week internship with growers or organizations working with sustainable agriculture issues. Students analyze issues in final written project, oral seminar.

Swahili (SWAH) College of Liberal Arts
SWAH 5226. Advanced Swahili II. (3.0 cr.; prereq 5225 or equiv; spring, every year) Continuation of skill development from 5225.

TMD & Orofacial Pain (TMDP) School of Dentistry

TMDP 8440. Advanced Theory and Principles of TMD and Orofacial Pain. (0.0-3.0 cr.; A-F or Audit; fall, spring, every year) Nature and pathophysiology of disorders causing chronic pain in TMJ and craniofacial regions; advanced principles and theory on assessment, diagnosis, and interdisciplinary management.

TMDP 8441. Seminar in Temporomandibular Disorders & Orofacial Pain. (1.0 cr.; A-F or Audit; fall, spring, summer, every year) Advanced topics on theories and application of recently developed techniques of data collection, diagnostic strategies, and management.

TMDP 8442. Advanced Clinical Temporomandibular Disorders and Orofacial Pain. (1.0-4.0 cr.; A-F or Audit; prereq Participation in TMJ and orofacial pain advanced education program; fall, spring, summer, every year) Interdisciplinary study of patients with TMD and orofacial pain using techniques of assessment currently being researched; background and clinical knowledge of patient synthesized with respect to current literature on management; management program is developed, discussed with faculty, and implemented.

Theatre Arts (TH) College of Liberal Arts

TH 5100. Theatre Practicum. (1.0-4.0 cr. [max 20.0 cr.]; prereq #, %; 4 cr of 3100 for undergrads; fall, spring, every year) Individual creative projects in production of approved plays as an actor, director, dramaturg, or playwright. (See 5500 for design practicums.)

TH 5117. Performance and Social Change. (3.0 cr.; A-F or Audit; prereq Jr or sr or grad student; ) Reading, writing, research, presentations and workshops explore activist performance projects. Theories of social formation and identity, and theories of spatial representation in context to current literature on management; management program is developed, discussed with faculty, and implemented.

TH 5178. History and Theory of Performance Conventions. (3.0 cr.; A-F or Audit; prereq [1322, [3171 or 3172] 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 5179W. Text and Performance. (3.0 cr.; A-F or Audit; prereq [1322, [3171 or 3172] or grad student; fall, every year) How to read texts toward performance in various dramatic/non-dramatic material. Method of unlocking metaphorical energy of texts. Vocabulary/techniques of analysis that transform text from page to stage.

TH 5181W. Blacks in American Theatre. (3.0 cr.; = [AFRO 5181W]; spring, offered periodically) Historical survey of significant events in the development of American black theatre traditions. Essays, plays, playwrights, and theatres from early colonial references to the Black Arts Movement.

TH 5182. Contemporary Black Theatre: 1960-Present. (3.0 cr.; [max 6.0 cr.]; A-F only; prereq [3322, 3331, grad student] or #; fall, every year) Fundamentals of puppet and object theater/ performance are introduced through traditional/ contemporary puppetry forms. Focuses on methods of creating observational puppetry. (See 5500 for design practicums.)

TH 5330. Comedy; Advanced Physical Performance Studio. (3.0 cr.; A-F only; prereq 3331, #; spring, every year) 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. (3.0 cr. [max 6.0 cr.]; A-F only; prereq [3322, 3331, grad student] or #; fall, every year) 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 Theater. (3.0 cr.; prereq [[3513 or &3513], #] or grad student; fall, spring, every year) Fundamentals of puppet and object 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 5370. Hand, Mind, and Gesture: An Independent Study in the Creation of Image Driven Performance. (3.0 cr.; prereq 5355, #; spring, every year) Create single or collaborative performance/ event that lives in time/space. Work will draw from personal investigation, amplify personal signature, explore modalities of image driven forms. Propose, develop, construct, rehearse, present finished public performance.

TH 5500. Theatre Design Practicum. (1.0-3.0 cr. [max 20.0 cr.]; prereq 3515, #; fall, spring, summer, every year) Individual projects in production of approved plays as a designer of scenery/properties, costumes, lighting, or sound. (See 5510 for other creative practicums.)

TH 5510. Drawing, Rendering, and Painting for the Theatre Designer I. (3.0 cr.; prereq 3515 or grad or #; fall, spring, offered periodically) Development of skills necessary for presentation of theatre scene/costume designs. Materials, layout, and techniques in scene painting. Basic drawing/graphic skills.

TH 5520. Scene Design. (3.0 cr. [max 9.0 cr.]; prereq 3515 or grad or #; fall, every year) Theory and process of costume design for theatrical productions (e.g., dance, opera, film) through hypothetical productions.

TH 5540. Lighting Design for the Theatre. (3.0 cr. [max 9.0 cr.]; prereq 3515 or grad or #; spring, every year) 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. (3.0 cr.; prereq 3515 or grad or #; fall, offered periodically) The lighting technician's skills and crafts: equipment, techniques, control operation, wiring, and maintenance.

TH 5550. Video Project. (3.0 cr. [max 6.0 cr.]; prereq [4550 or 4600 [preferred]], #; fall, offered periodically) Students participate in a video-shoot project serving in various positions, including camera operator, gaffer, grip, audio engineer, cast, and possibly director and director of photography.

TH 5554. Multimedia Production for Live Performance. (3.0 cr.; 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. (3.0 cr.; prereq 4555, #; spring, offered periodically) Miking/recording techniques specific to music/dramatic dialogue. Recording 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 5559. Sound Design for Performance.**
(3.0 cr.; prereq 4555 or #; fall, spring, offered periodically)
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.**
(3.0 cr.; prereq 5510; spring, offered periodically)
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.**
(1.0-3.0 cr. [max 15.0 cr.]; prereq 3515 or grad or #; fall, spring, every year)
Management, structures, upholstery, mask-making, furniture construction, stage mechanics, soft properties, faux finishes. Topics specified in Class Schedule.

**TH 5580. Costume Technology.**
(3.0 cr. [max 15.0 cr.]; prereq 3515 or grad or #; fall, spring, every year)
Fabric enhancement techniques, masks, wig-making, millinery, makeup prosthetics, pattern drafting, and draping. Topics specified in Class Schedule.

**TH 5590. Theatre Technology Practicum.**
(1.0-3.0 cr. [max 15.0 cr.]; prereq 3515, #, %; 4 cr max for undergrads; fall, spring, summer, every year)
Individual creative project in technology/craft area of theatre. Practical work in costume, lighting, makeup, props, scenery, sound, or theatre management.

**TH 5711. Advanced Stage Direction.**
(3.0 cr.; prereq 4711, # or grad student; fall, spring, offered periodically)

**TH 5716. Stage Management for the Theatre.**
(4.0 cr.; prereq [1101, 1321, soph] or grad; fall, every year)
Theories, practicalities, and techniques for rehearsal/performance. Organizing/managing various types of performance venues.

**TH 5718. Principles of Arts Management.**
(3.0 cr.; prereq #, fall, offered periodically)
Nonprofit arts organization structure: concept, mission, organization. Financial, marketing, fund-raising, and grant-writing strategies. Discussion/guest professionals from Twin Cities arts/funding communities.

**TH 5760. Advanced Stage Management.**
(2.0-3.0 cr.; prereq 5716 or & 5716, #; [4 cr max for undergrads]; fall, spring, every year)
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.**
(2.0-4.0 cr. [max 8.0 cr.]; prereq 5718; fall, offered periodically)
Students apply non-profit arts management theories/techniques learned in 5718. Marketing/audience development, fundraising and grant writing strategies, and financial management of a nonprofit arts organization.

**TH 5950. Topics in Theatre.**
(1.0-4.0 cr. [max 20.0 cr.]; fall, spring, summer, every year)
Topics specified in Class Schedule.

**TH 5993. Directed Study.**
(1.0-5.0 cr. [max 20.0 cr.]; fall, spring, summer, every year)
Guided individual reading or study. Prereq 6 Th cr, instr consent, dept consent, college consent.

**TH 8100. Theatre Practicum.**
(1.0-4.0 cr. [max 20.0 cr.]; prereq #, %; fall, spring, summer, every year)
Individual creative projects in production of approved plays as an actor, director, dramaturg, or playwright (see 8500 for design practicums).

**TH 8102. Theatre Historiography.**
(3.0 cr.; fall, offered periodically)
Current trends in historiography; research strategies and methods.

**TH 8111. History and Theory of Western Theatre: Ancient World and Early Medieval.**
(3.0 cr.; fall, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8112. History and Theory of Western Theatre: Medieval Through Renaissance.**
(3.0 cr.; fall, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8113. History and Theory of Western Theatre: National Theatres to the French Revolution.**
(3.0 cr.; fall, spring, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8114. Theatre: Performance and Political Modernity.**
(3.0 cr.; fall, spring, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8115. History and Theory of Western Theatre: 20th Century Through World War II.**
(3.0 cr.; fall, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8116. History and Theory of Western Theatre: 20th Century From 1945 to the Present.**
(3.0 cr.; fall, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8120. Seminar.**
(3.0 cr. [max 12.0 cr.]; fall, spring, every year)
Selected research topics from 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.**
(1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**TH 8444. FTE: Doctoral.**
(1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**TH 8500. Theatre Design Practicum.**
(1.0-3.0 cr. [max 20.0 cr.]; prereq #, %; fall, spring, summer, every year)
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 8510. Professional Design Workshop.**
(2.0 cr. [max 4.0 cr.]; A-F only; prereq MFA candidate; fall, spring, every year)
Development of graduate student as individual artist working collaboratively in performing arts industry. Further mastery of designer collaboration, self-promotion, management, displaying of job materials. Attend both professional/university productions throughout semester.

**TH 8590. Theatre Technology Practicum.**
(1.0-3.0 cr. [max 20.0 cr.]; prereq #, %; fall, spring, every year)
Individual creative projects in the technology or craft of costume, lighting, makeup, props, scenery, sound, or theatre management.

**TH 8666. Doctoral Pre-Thesis Credits.**
(1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
(tbd)

**TH 8711. Theory and Practice of the Modern Stage Director.**
(3.0 cr.; fall, offered periodically)
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.**
(2.0-3.0 cr. [max 10.0 cr.]; A-F or Audit; prereq MFA directing specialization; fall, spring, every year)
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.**
(1.0-18.0 cr. [max 50.0 cr.] ; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year)
(No description)

**TH 8888. Thesis Credit: Doctoral.**
(1.0-24.0 cr. [max 100.0 cr.] ; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)
Toxicology.

TXCL 5000. Directed Research in Toxicology. (1.0-5.0 cr.; max 80.0 cr.; prereq A-F or Audit; fall, spring, every year) Special project that addresses specific issue in toxicology. Under guidance of faculty member.

TXCL 5011. Principles of Toxicology. (2.0 cr.; A-F or Audit; prereq Grad or upper class or #; Intro to fundamentals of poisoning in individuals and the environment, assessment of potential health hazards, and application of toxicology in various professional careers.

TXCL 5012. Principles of Toxicology. (3.0 cr.; A-F or Audit; prereq At least one semester [biochemistry, calculus, cell biology]; at least one semester of [human or animal] physiology recommended; spring, every year) Science of toxicology. Biomedical principles. Regulatory practices governing protection of human health and environmental quality.

TXCL 5013. Chemical Toxicology. (3.0 cr.; A-F or Audit; prereq 5012; #; fall, every year) Signs, symptoms, and mechanism of toxicity of different classes of chemicals spanning several organ systems, including chemical carcinogenesis.

TXCL 5101. Molecular and Cellular Basis of Nanoparticle Toxicology. (3.0 cr.; A-F or Audit; prereq Introductory toxicology course; fall, odd years) Introduction to science of nanotoxicology. Nanotechnology in scientific research. Assessment of impact on biological systems.

TXCL 5195. Veterinary Toxicology. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year) Toxicology of minerals, pesticides, venoms, and various toxins. Identification of poisonous plants. Recognition, diagnosis, and treatment of animal poisons.

TXCL 5545. Introduction to Regulatory Medicine. (2.0 cr.; A-F or Audit; prereq Grad student or #; spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq 5011 or BioC 4331, PubH 5104 or #; spring, every year) Absorption, distribution, metabolism, and excretion of xenobiotics; toxicokinetics; mechanisms of toxicity or specific classes of chemical agents.

TXCL 8013. Advanced Toxicology II. (3.0 cr.; A-F or Audit; prereq 8012, BioC 4332, Phsl 5062 or Phsl 6101 or #; fall, every year) 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. (1.0 cr. [max 2.0 cr.; A-F or Audit; prereq 8013 or #; fall, spring, every year) Evaluating toxicology research issues and literature.

TXCL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; spring, summer, every year) (No description)

TXCL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

TXCL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.; No Grade Associated; 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; fall, spring, summer, every year) tbd

TXCL 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; spring, summer, every year) (No description)

TXCL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year) (No description)
VMED 5080. Problems in Veterinary Epidemiology and Public Health. (1.0-3.0 cr.; A-F or Audit; fall, spring, every year) Individual study on problem of interest to epidemiology or public health student.

VMED 5082. Diagnostic Epidemiology of Infectious Diseases. (2.0 cr.; A-F only; prereq Statistics course or #; spring, every year) Theoretical principles, practical applications of diagnostic testing in populations. Examples related to infectious diseases in veterinary/human health. Basis of test performance, limitations, interpretations.

VMED 5090. Seminar: Veterinary Epidemiology. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq Veterinary Medicine grad student; fall, spring, every year) 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 5101. Molecular and Cellular Basis of Nanoparticle Toxicity. (3.0 cr. [max 6.0 cr.]; A-F or Audit; #[TXCL 5101]; fall, every year) Use of nanotechnology in scientific research. Impact of nanomaterials on biological systems.

VMED 5165. Surveillance of Foodborne Diseases and Food Safety Hazards. (2.0 cr.; #[PUBH 6181]; prereq #[PUBH 5330], [professional school or grad student] or #; spring, every year) Principles/methods for surveillance of foodborne diseases. Investigation of outbreaks. Assessment of food safety hazards. Focuses on integration of epidemiologic/lab methods.

VMED 5180. Ecology of Infectious Disease. (3.0 cr.; #[CMB 5180, PUBH 5380]; fall, every year) How host, agent, environmental interactions influence transmission of infectious agents. Environmental dissemination, eradication/control, evolution of virulence. Use of analytical/molecular tools.

VMED 5181. Spatial Analysis in Infectious Disease Epidemiology. (4.0 cr.; Student Option No Audit; #[CMB 5181]; prereq Intro to epidemiology, statistics, #; spring, every year) Spatial distribution of disease events. Exposures/outcomes. Factors that determine where diseases occur. Analyzing spatial disease data in public health, geography, epidemiology. Focuses on human/animal health related examples.

VMED 5190. Seminar and Presentation Development. (2.0 cr.; S-N only; prereq Grad student; fall, every year) 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 for Veterinarians. (3.0 cr.; A-F only; fall, every year) Concepts/tools of economic analysis needed to support decision making on dairy farms, particularly as those decisions relate to health, disease impact, nutrition, general farm management. Prereq Earned DVM, inst consent.

VMED 5196. Dairy Production Medicine. (4.0 cr.; A-F only; prereq DVM degree, #; fall, every year) Intense eight week course designed to develop advanced knowledge/skills in dairy production medicine. Mixture of lectures, wetlabs, farm investigations, presentations. Held at Dairy Education Center at New Sweden Dairy.

VMED 5210. Advanced Large Animal Physiology I. (1.0-3.0 cr. [max 6.0 cr.]; fall, every year) 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. (1.0-3.0 cr.; A-F or Audit; prereq #: 5210 recommended; spring, every year) 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 5232. Comparative Clinical Veterinary Dermatological Pathology. (1.0 cr. [max 2.0 cr.]; S-N only; prereq DVM degree or foreign equiv; fall, spring, every year) Microscopic pathology of basic dermatologic reactions and of variable disease states.

VMED 5240. Advanced Small Animal Pathobiology I. (1.0 cr.; A-F only; fall, every year) Biology, pathology, pathophysiology, and medicine of disciplines relevant to companion animals. Pathogenesis/treatment of diseases. Developing hypotheses that can be translated into clinical research. Prereq CVM grad student, [DVM degree or foreign equiv] degree.

VMED 5241. Advanced Small Animal Pathobiology II. (1.0 cr.; A-F only; spring, odd years) Overview of biology, physiology, pathophysiology, and medicine of disciplines. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5242. Advanced Small Animal Pathobiology III. (1.0 cr.; A-F only; fall, odd years) Overview of biology, physiology, pathophysiology, and medicine. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5243. Advanced Small Animal Pathobiology IV. (1.0 cr.; A-F only; spring, every years) Overview of biology, physiology, pathophysiology, and medicine. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5250. Problems in Large Animal Clinical Medicine/Surgery and Theriogenology. (1.0 cr. [max 3.0 cr.]; A-F or Audit; prereq VMed grad student, possess DVM; fall, spring, every year) Hospital cases using standardized format, audiovisual aids. Review literature pertaining to case. One or two cases presented by enrolled participants per month.

VMED 5310. Topics in Veterinary Clinical Pathology. (1.0 cr. [max 2.0 cr.]; S-N only; prereq Grad student in CVM; fall, spring, every year) 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. (1.0 cr. [max 3.0 cr.]; S-N only; fall, spring, every year) 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. Prereq Grad student in CMB or [VMED, [DVM degree or foreign equivalent], college consent]

VMED 5320. Advanced Veterinary Systemic Pathology I. (3.0 cr.; A-F only; prereq Grad student in VMED or [CMB, [DVM degree or foreign equiv]] or #; fall, even years) 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. (1.0 cr. [max 2.0 cr.]; prereq Grad student in VMED or [CMB, [DVM degree or foreign equiv]] or #; fall, spring, every year) 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 5420. Molecular Epidemiology of Infectious Disease. (3.0 cr.; A-F only; prereq Basic course in microbiology; spring, every year) 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/zoonotic significance. Population and evolutionary genetics of pathogenic microorganisms. Data analysis/interpretation. Design of descriptive/hypothesis-driven epidemiological studies involving molecular techniques.

VMED 5430. HIV/AIDS: Pathogenesis, Treatment, and Prevention. (1.0 cr.; prereq Grad student; fall, every year) Exposure to pathogenesis, treatment, and prevention of HIV/AIDS from clinical faculty who are dealing with AIDS patients. Developing new questions and design experiments that have greatest chance of translating to clinical setting.

VMED 5440. Microbial Risk Assessment of Foods. (3.0 cr.; Student Option No Audit; prereq Intro course in microbiology; [basics algebra, calculus, probability theory, probability distributions] or #; spring, every year) Risk analysis process as part of science-based decision-making. Conduct microbial risk assessment by different steps of hazard identification, hazard characterization, exposure assessment/risk characterization. Qualitative/quantitative tools.

VMED 5496. Training in Swine Production and Management. (4.0 cr.; S-N only; prereq VMED grad student or #; fall, spring, every year) Production module introduces techniques/protocols for swine production system operation. Research module covers applied research trials for viral/bacterial pathogens in pigs.

VMED 5594. Advanced Clinical Epidemiology. (1.0 cr.; A-F only; fall, every year) An in-depth focus on infectious disease epidemiology, with opportunities to apply epidemiologic principles to control infectious diseases in animal populations.

VMED 5995. Engaging Intergovernmental Organizations. (1.0 cr.; S-N only; fall, spring, every year) Relevant policy issue/roles of intergovernmental organizations. Discussions/debate about current issue, interact with key officials, perform group task assignments, develop/deliver presentation to relevant leaders.

VMED 5996. Professional Communications: Current Veterinary, Public Health and Food System Issues. (1.0 cr. [max 2.0 cr.]; S-N only; prereq Students must have a professional or graduate degree related to human, animal, or ecosystem health or be pursuing a graduate degree (MS/PhD) or professional masters (MPH/MPA) or #: spring, every year) Critical review of scientific/lay literature. Principles of risk communication. Presentation of scientific information. Prepare/critique executive summaries of current topics for CAHFS Daily News. Support media interactions of CAHFS faculty. Generate fact sheets for use on CAHFS website.

VMED 5997. Farm to Table Study Program. (1.0 cr.; prereq #: fall, every year) Explore food system within specific country while considering aspects of animal welfare/health, food safety, food protection, public health. Site visits along food supply chain. Discussions with government/private sector leaders. Interactive cross-cultural group activities.

VMED 5998. Leadership to Address Global Grand Challenges. (1.5 cr.; Student Option No Audit; prereq Grad or professional student; spring, every year) Leadership strategies useful in addressing global grand challenges. Practices that foster collective action across diverse groups of people. Mapping polarities/balancing paradox. Inclusive decision-making processes.

VMED 5999. Professional Communications: Agendas, Minutes, Briefing Memos, Decision Memos. (1.0 cr.; S-N only; prereq Professional or graduate degree related to human, animal, or ecosystem health or be pursuing a graduate degree (MS/PhD) or professional masters (MPH/MPA) or #: fall, every year) Improve professional communications to increase effectiveness of meetings, conference calls. Enhance influence of emails, minutes, issue briefs/decision memos. Compose/critique meeting agendas, minutes, notes, summaries, e-mails, trip reports. Produce issue briefs/decision memos.

VMED 8090. Epidemiology of Zoonoses and Diseases Common to Animals and Humans. (3.0 cr.; A-F or Audit; prereq Epidemiology and infectious disease course or #: fall, spring, every year)
Major human zoonotic diseases, methods of transmission, diagnosis, control, and prevention.

**VMED 8134. Ethical Conduct of Animal Research.** (3.0 cr.; A-F or Audit; [ANSC 8134, CMB 8134]; prereq [Grad or professional school] student or #; fall, every year)
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 proper conduct. Societal impact on scientific investigations utilizing animal subjects.

**VMED 8220. Advanced Nephrology/Urology Clinics.** (1.0-3.0 cr.; prereq #; fall, spring, every year)
Clinical investigation of naturally occurring urinary diseases in patients admitted to Veterinary Medical Center.

**VMED 8230. Medical Conference.** (1.0 cr. [max 2.0 cr.]; prereq #; fall, spring, every year)
Participation in weekly conference about internal medical disorders.

**VMED 8250. Problems in Acid-base, Electrolyte, and Fluid Metabolism.** (2.0-4.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
Clinical problems and physiology of acid-base, electrolyte, and fluid disorders of dogs and cats.

**VMED 8292. Journal Club: Large Animal Internal Medicine.** (1.0 cr. [max 3.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically)
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.** (1.0-3.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
Studies of urinary tract disease with goal of generating new knowledge.

**VMED 8333. FTE: Master’s.** (1.0 cr. [max 2.0 cr.]; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**VMED 8360. Evidence-based Medicine.** (2.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
Use of medicine literature in clinical problem solving.

**VMED 8394. Research in Veterinary Medicine.** (1.0-3.0 cr.; prereq #; fall, spring, every year)
Research problems relating to any aspect of internal medicine or to the various systems in animals.

**VMED 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**VMED 8492. Seminar: Infectious Diseases and Swine Medicine.** (1.0 cr. [max 2.0 cr.; fall, spring, every year)
Students, faculty, and guest speakers present seminars on current research in diagnosis, control, and treatment of infectious diseases.

**VMED 8520. Advanced Immunology.** (2.0 cr.; spring, every year)
Lectures and case presentations.

**VMED 8550. Veterinary Medicine Seminar.** (1.0 cr. [max 2.0 cr.]; S-N only; prereq Grad student; fall, spring, every year)
Seminar. Exposure to research activities of CMB and VMED students and faculty. Students prepare/present a 20 minute seminar on their original research.

**VMED 8592. Infectious Disease Journals: Critical Thinking.** (1.0 cr.; fall, spring, summer, every year)
Reading and critical discussion of journal articles.

**VMED 8593. Advanced Veterinary Virology and Serology.** (1.0-3.0 cr.; fall, spring, every year)
Discussion and laboratory practice.

**VMED 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
tbd

**VMED 8682. Advanced Large Animal Surgery.** (2.0 cr. [max 6.0 cr.]; A-F or Audit; prereq DVM or equiv degree; #; fall, spring, every year)
Surgery of various systems in large animals, with preoperative and postoperative evaluation and management.

**VMED 8854. Surgical Physiology.** (1.0-3.0 cr.; fall, spring, offered periodically)
Discussions on pathophysiology of surgical diseases in dogs and cats.

**VMED 8685. Neurosurgery.** (2.0-3.0 cr.; A-F or Audit; fall, spring, every year)
Advanced neurosurgical diseases of small animals amenable to surgical treatment.

**VMED 8686. Thoracic and Cardiovascular Surgery.** (2.0-4.0 cr.; A-F or Audit; fall, spring, every year)
Advanced thoracic and cardiovascular diseases of small animals amenable to surgical treatment.

**VMED 8693. Seminar: Large Animal Surgery.** (1.0 cr. [max 6.0 cr.]; A-F or Audit; prereq DVM or equiv degree; #; fall, spring, every year)
Discussion of current literature and surgery board preparation.

**VMED 8696. Research in Critical Care/Emergency Medicine.** (1.0-3.0 cr.; prereq DVM or equiv degree; fall, spring, every year)
Special problems course. Controlled study; prospective and retrospective models of evaluation are defined, critiqued, and used for experimental design and data collection to validate research methods.

**VMED 8777. Thesis Credits: Master’s.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

**VMED 8780. Advanced Avian Critical Care: Principles and Procedures.** (2.0 cr.; A-F or Audit; prereq Course each in vet pathology, physiology, pharmacology, anatomy, small animal anesthesiology and critical care; spring, every year)
Procedures and protocols for managing avian medical emergencies such as starvation, toxicities, respiratory failure, and massive trauma.

**VMED 8781. Seminar: Advanced Veterinary Anesthesiology.** (1.0-3.0 cr.; A-F or Audit; prereq [CVM 6321, CVM 6322] or equiv), grad student; fall, every year)
Active interaction around topics of advanced anesthesiology in veterinary species.

**VMED 8788. Seminar: Veterinary Critical Care/Emergency Medicine.** (1.0 cr.; A-F or Audit; prereq DVM or equiv degree; fall, spring, every year)
Current topics.

**VMED 8793. Seminar: Veterinary Anesthesiology.** (1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq [CVM 6321, CVM 6322] or equiv), DVM degree; fall, spring, every year)
Discussion and presentations; for veterinary anesthesiology and surgery residents and graduate students.

**VMED 8796. Avian Anesthesia and Orthopedic Surgery.** (1.0-3.0 cr.; A-F or Audit; prereq courses in vet anesthesia, vet small animal orthopedics; fall, spring, every year)
Current methods for anesthetizing raptors, psittacine birds, and waterfowl. Lecture and lab on current methods for avian fracture bone fixation.

**VMED 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

**Vienna Executive MBA (VMBA)**
Curtis L. Carlson School of Management

**VMBA 5700. Managerial Accounting.** (4.0 cr.; A-F or Audit; spring, every year)

**VMBA 5701. Data Analysis and Decision Making.** (4.0 cr.; A-F or Audit; spring, summer, every year)
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

WMBA 5702. Financial Management. (4.0 cr.; A-F or Audit; spring, summer, every year) Theory/practice of finance from an analytical approach. Students apply concepts of risk, return, valuation to decisions that a corporate financial officer or person engaged in small business must make about sources/uses of funds during changing financial markets.

WMBA 5703. Marketing Management. (4.0 cr.; A-F or Audit; spring, summer, every year) Developing/implementing most appropriate combination of variables to carry out a firm's strategy in its target markets. Analytic perspectives, concepts, decision tools of marketing for product offering decisions, distribution channel decisions, pricing decisions, communication program decisions.

WMBA 5704. Managing People and Organizations. (4.0 cr.; A-F or Audit; spring, every year) Theories/frameworks for analyzing behavior of individuals, groups, organization itself. Emphasizes making decisions, developing action plans. Concepts/principles associated with function of human resource management (e.g., personnel selection, reward/compensation, collective bargaining).

WMBA 5705. Operations Management. (4.0 cr.; A-F or Audit; fall, every year) Operations management function in different types of organizations. Emphasizes productive, innovative, competitive operations. Concepts/principles related to management of quality/innovation within service/manufacturing organizations.


WMBA 5707. Economics in Transition. (6.0 cr.; A-F or Audit; fall, every year) Technological, political, and ethical forces that are shaping the competitive environment. Theoretical considerations. Business responses to specific issues. Projects/cases for companies in East Central Europe.

WMBA 5709. Info Tech Mgmt. (6.0 cr. [max 24.0 cr.]; A-F or Audit; spring, every year) Various information technologies, their applications. Competitive advantages associated with information technology, organizational/managerial implications.


WMBA 5712. Strategies for a Global Company: an Integrative Perspective. (6.0 cr. [max 36.0 cr.]; A-F or Audit; spring, every year) Multi-disciplinary perspectives from strategic marketing, corporate strategy, operations management. Involvement of faculty/corporate executives. Site visits to global companies, student projects. Capstone course.

WMBA 5713. Negotiations and Conflict Management. (4.0 cr.; A-F only; spring, every year) Typical challenges faced when negotiating. Strategies for managing challenges and improving skills as a negotiator and conflict manager.


WMBA 5651. Human Resources Management. (3.0 cr.; A-F or Audit; ) Human resources issues from managerial perspective. External environment in which firm operates, characteristics of its workforce. The firm's developed culture. Strategy of the organization, technology of production, organization of work. Framework for managing human resources strategically.

WMBA 5653. Managerial Economics. (3.0 cr.; A-F or Audit; ) Tools, economics principles that provide overview of competition/cooperation in different environments. Emphasizes practical implications of principles.


WMBA 5656. Financial Accounting. (3.0 cr.; A-F or Audit; fall, spring, every year) Introduction to accounting system used by firms to measure/report their economic performance and financial position to external constituents, such as stockholders, creditors, and potential investors. Basic accounting model, its strengths/shortcomings.


WMBA 5659. Strategic Marketing Management. (4.5 cr. [max 435.0 cr.]; A-F or Audit; ) Marketing concepts/analysis, strategy/planning in different market conditions. Lectures, readings, case discussions, computer simulation.

WMBA 5660. Operations and Logistics Management. (4.5 cr.; A-F or Audit; ) Operations/business logistics as field of managerial responsibility. Linkages between logistics, operations, and other managerial disciplines, such as marketing and finance.

WMBA 5661. Managing in an International Environment. (4.5 cr.; A-F or Audit; fall, offered periodically) Policies to balance constraints produced by globalization and regional economic integration, in order to reduce transaction costs for business/public.

WMBA 5662. Macroeconomic Business Environment. (3.0 cr.; A-F or Audit; spring, every year) Students apply methods of decision-making, and of business/public policy analysis, in various real situations drawn from experience of developed market economies.

WMBA 5663. Business Ethics. (1.5 cr.; A-F or Audit; ) Ethical dimension of business decision-making in a market economy. Does behaving ethically mean more than behaving legally? Do managers have responsibilities to parties other than stockholders? How can managers balance potentially conflicting obligations? Is there a
logical relationship between ethical behavior and profitability? Ethical dilemmas in various business settings.

WMB 5664. Strategic Management. (4.5 cr.; A-F or Audit; fall, spring, every year)
Integrated top-executive point of view on successful managing of diverse businesses in a challenging game with competitors. Analytical skills, creative synthesis of diverse factors, individual/team work, information search, problems formulation. Decision making under conditions of time pressure, uncertainty, ambiguity, and risk.

WMB 5665. Management Information Systems. (3.0 cr.; A-F or Audit; fall, spring, every year)
Information technology/systems. Data flow diagrams, data modeling, electronic commerce, HTML, Web design, ERP systems, database management systems, business process reengineering.

WMB 5666. Effective Decisions. (1.5 cr.; A-F or Audit; fall, spring, every year)
Identifying barriers to effective decision making in business. Different forms of decision making. Methods of overcoming barriers and managing practical difficulties.

WMB 5670. Field Project. (12.0 cr.; A-F or Audit;)
Students define problem; gather, analyze, and evaluate data; develop managerial recommendations; and prepare/present a report.

WMB 5673. Strategic Brand Management. (1.5 cr.; A-F only; spring, every year)
Warshaw Executive MBA: Strategic Brand Management

WMB 5696. Developing a New High-Growth Business. (1.5 cr. [max 3.0 cr.]; A-F only; fall, spring, summer, every year)
Entrepreneurship as a business phenomenon, whether as a corporate or independent venture or as an alliance. How to apply knowledge to new-business development process.

WMB 5700. Developing Management Skills. (1.5 cr.; A-F only; spring, every year)

Water Resources Science (WRS)
College of Food, Agricultural and Natural Resource Sciences

WRS 5050. Special Topics in Water Resources Science. (1.0-3.0 cr.; A-F or Audit; fall, spring, offered periodically)
Special topics in Water Resources Science.

WRS 5101. Water Policy. (3.0 cr.; =PA 5723; prereq Graduate student or #; spring, every year)
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 5241. Ecological Risk Assessment. (3.0 cr.; prereq #; spring, every year)
Evaluating current/potential impact of physical, chemical, and biological agents on ecosystems. Identifying ecological stressors, assessing level of exposure, measuring ecological responses, communicating/managing risks. Class participation, two reaction papers, final exam, small-group project.

WRS 8050. Special Topics in Water Resources Science. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, spring, every year)
Special topics in water resources science.

WRS 8060. Directed Studies in Water Resources Science. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq #; fall, spring, every year)
Directed studies in water resources science.

WRS 8095. Plan B Project. (3.0 cr.; S-N or Audit; fall, spring, every year)
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. (0.5-3.0 cr.; fall, spring, every year)
Interdisciplinary Seminar in Water Resources.

WRS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

WRS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

WRS 8581. Research and Professional Ethics in Water Resources and Environmental Science. (0.5 cr.; S-N or Audit; =ICE 8581; prereq [Environmental engineering or water resources science] grad student or #; spring, every year)
Ethics of water resources science and environmental engineering research/practice. Societal responsibility, plagiarism, recording-keeping, authorship, confidentiality, conflicts of interest, professional relationships, fraud, reporting misconduct. Meets during first eight weeks of spring semester.

WRS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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 admission before summer 2007 may register up to four times, up to 60 combined cr; fall, spring, summer, every year)
TBD

WRS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

WRS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq [Max 18 cr per semester or summer]; 24 cr required; fall, spring, summer, every year)
Thesis credit: doctoral

Writing Studies (WRIT)
College of Liberal Arts

WRIT 5001. Introduction to Graduate Studies in Scientific and Technical Communication. (3.0 cr.; A-F only; prereq Grad student or #; fall, every year)
History of technical communication. Different audiences, purposes, genres, and emerging trends. International/intercultural issues. Students participate within a community of technical communication professionals.

WRIT 5051. Graduate Research Writing Practice for Non-native Speakers of English. (3.0 cr.; prereq Grad student; fall, spring, summer, every year)
Graduate-level writing techniques/formats for summaries, critiques, research, and abstracts. Persuasion, documentation, structure, grammar, vocabulary, field-specific requirements. Writing through several drafts, using mentor in specific field of study. Revising/editing to meet graduate standards. Discussions.

WRIT 5052. Graduate Research Presentations and Conference Writing for Non-Native Speakers of English. (3.0 cr.; prereq [Grad student, non-native speaker of English] or #; fall, spring, every year)
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, nonverbal presentation skills.

WRIT 5112. Information Design: Theory and Practice. (3.0 cr.; A-F or Audit; prereq Grad student or #; spring, offered periodically)
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. (3.0-6.0 cr.; S-N or Audit; prereq STC grad or #; fall, spring, summer, every year)
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. (3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically)
Topics specified in Class Schedule.

WRIT 5291. Independent Study, Reading, and Research. (1.0-3.0 cr.; prereq #; %; fall, spring, summer, every year)
Supervised reading/research on advanced projects not covered in regularly scheduled offerings.


WRIT 5531. Introduction to Writing Theory and Pedagogy. (3.0 cr.; A-F or Audit; prereq Grad student; fall, every year) Pedagogical philosophy/methodology in composition, primarily first-year writing. Theories underlying teaching/tutoring with technology.

WRIT 5532. Writing Pedagogy Practicum. (1.0 cr.; [max 3.0 cr.; S-N only; prereq Grad student; spring, every year) Discussion/activities that support development of sound pedagogical practices. Practical details of classroom. Professionalization, theory/research.

WRIT 5534. Designing Technical Intercultural Audiences. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) 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.

WRIT 5561. Editing and Style for Technical Communicators. (3.0 cr.; A-F only; prereq [Grad student, knowledge of grammar/punctuation rules] or #; spring, summer, every year) Proofreading, copy-editing, comprehensive editing. Students primarily use electronic editing methods. Editor’s responsibilities, relationship to writers, roles within an organization, style guides, ethical choices. Editing in global setting. Editing/style for visual and online documents.

WRIT 5570. Minnesota Writing Project Directed Studies. (1.0-3.0 cr.; [max 9.0 cr.]; A-F or Audit; summer, every year) Guided individual research into current theories/practices of writing and writing pedagogy.

WRIT 5671. Visual Rhetoric. (3.0 cr.; A-F only; prereq Jr or sr or grad student; spring, every year) Range/development of visuals, especially those in science/technology. Vocabulary for commenting on, criticizing, and creating visuals.

WRIT 5775. The Rhetorical Traditions: Classical Period. (3.0 cr.; A-F only; fall, every year) Rhetoric in the Classical world and recurring themes that constitute “the rhetorical tradition.” Epistemological/ethical status and sociopolitical importance of ancient rhetorical training and discourse. Works by Isocrates, Plato, Aristotle, Cicero, Quintilian, and others. Prepares students for preliminary examinations/seminars in rhetoric.

WRIT 5776. The Rhetorical Tradition: Modern Era. (3.0 cr.; A-F or Audit; spring, offered periodically) Core works in modern/contemporary rhetorical theory. Twentieth-century revivals of and challenges to the Aristotelian rhetorical tradition. Units devoted to Enlightenment rhetorics; the New Rhetorics of I. A. Richards, Kenneth Burke, and Chaim Perelman; feminist rhetorical theory, historiography, and critique; deconstruction/post-structuralism. Prepares students for preliminary examinations/seminars in rhetoric.

WRIT 8011. Research Methods in Writing Studies and Technical Communication. (3.0 cr.; A-F or Audit; prereq STC/RSTC grad student or #; fall, offered periodically) Survey of quantitative/qualitative research methods. Theoretical perspectives that demonstrate/test analytical approaches to scientific/technological rhetoric.

WRIT 8012. Applied Research Methods in Writing Studies and Technical Communication. (3.0 cr.; [max 6.0 cr.]; A-F or Audit; prereq [8011, grad student] or #; fall, every year) 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. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

WRIT 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

WRIT 8505. Professional Practice. (3.0 cr.; S-N only; prereq Grad student; fall, spring, summer, every year) Extended problem-solving situation in business, government, or industry. Student acts as consultant to explore problem, identify possible solutions, introduce solution, apply it.

WRIT 8510. Seminar in Rhetoric. (3.0 cr.; [max 12.0 cr.]; A-F or Audit; prereq 5775 or equiv; fall, spring, offered periodically) Topics may include theories, history, criticism, major figures, movements, visual or material rhetoric. Topics vary. See the Class Schedule.

WRIT 8520. Seminar in Scientific and Technical Communication. (3.0 cr.; [max 12.0 cr.]; A-F or Audit; fall, spring, offered periodically) Topics may include theories, landmark studies, history, gender, ethics. Topics vary. See the Class Schedule.

WRIT 8540. Seminar in Technical Communication and Composition
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 5316. Media & Youth: Learning, Teaching, and Doing. (2.0 cr.; =YOST 4316); prereq 1001 or 2101 or #; spring, every year)
Youth are targets, producers, and consumers of a variety of media. This course is about understanding and learning to use a variety of these sources with young people to enhance their development and civic engagement.

YOST 5319. Understanding Youth Subcultures. (3.0 cr.; =YOST 4319); prereq 2001 or one course each in [Anth, Soc] or #; summer, every year)
Young people's participation in and understanding of subcultures, life-stories, and event cultures. Place of these in young people's identity, friendship, and life chances.

YOST 5321. Work With Youth: Individual. (2.0 cr.; =YOST 4321); prereq 1001 or 2002W or #; fall, spring, summer, every year)
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. (2.0 cr.; =YOST 4322); prereq 1001 or 2002W or #; fall, spring, summer, every year)

YOST 5323. Work with Youth—Groups. (2.0 cr.; =YOST 4323); prereq 1001 or 2002W or #; fall, spring, summer, every year)

YOST 5340. Theatre Activities in Youthwork and Education. (2.0 cr.; =YOST 4340); prereq 1001 or 2101; spring, every year)

YOST 5315. Youthwork in Schools. (4.0 cr.; =YOST 4315); prereq Introductory course in education or #; fall, spring, every year)
Models of community/education, their intersections. Twentieth century practice of education in the community in the U.S. Examples from other cultures/times.
PHAR 6123. Pharmacotherapy III: Patient-Centered Pathophysiologic Approach. (3.0 cr.; A-F only; =PHAR 5700; prereq Medical terminology; fall, spring, every year)
Drug therapy/pharmacology. Recognition of brand/generic drug names. Therapeutic classes, common uses. How to review medication lists and other forms of health communication/documentation.

PHAR 3800. Pharmacotherapy for the Health Professions. (3.0 cr.; A-F or Audit; =PHAR 5800; prereq Anatomy/physiology, nursing or respiratory care; fall, spring, every year)
Drug therapy.Implications in patient care.

PHAR 4200W. Drugs and the U.S. Health Care System. (3.0 cr.; A-F only; =PHAR 5200, PHAR 4200) How to be informed/responsible participant in debates related to medication use within US health care system.

PHAR 4248. Drugs of Abuse. (2.0 cr.; A-F only; fall, spring, every year)

PHAR 4293. Directed Research I for Undergraduates . (1.0-5.0 cr.; prereq undergrad; #; fall, spring, summer, every year) Work with College of Pharmacy faculty.

PHAR 4294. Directed Study I for Undergraduates . (1.0-5.0 cr. [max 10.0 cr.]; prereq Undergrad; #; fall, spring, summer, every year) Individualized study. Students work with faculty on special projects.

PHAR 5200. Drugs and the U.S. Health Care System. (3.0 cr.; A-F only; =PHAR 5200, PHAR 4200; prereq grad or professional student; fall, spring, every year) How to be informed/responsible participant in debates related to medication use.

PHAR 5201. Applied Health Sciences Terminology. (2.0 cr.; prereq Basic knowledge of human anatomy/physiology; fall, spring, summer, every year) Identify/describe various medical conditions/processes. Medical abbreviations, surgical procedures, medical terminology. Analyzing words at roots.

PHAR 5205. Obesity: Issues, Interventions, Innovations. (2.0 cr.; A-F only; fall, spring, summer, every year) Information necessary for prevention, treatment, management of obesity, from individual adipose cell to entire public health community.

PHAR 5206. Applied Health Literacy and Communication. (3.0 cr.; A-F only; =PHAR 3206; fall, spring, summer, every year) Issues associated with health literacy. Dimensions associated with misunderstandings that occur in health-related communication.

PHAR 5207. Applied Leadership in Health Care. (3.0 cr.; A-F only; =PHAR 3207; prereq advanced undergraduates or professional health care students or grad students; fall, spring, summer, every year) Leadership skills/theories to create positive change in health care settings.

PHAR 5210. Diminishing Health Disparities Through Cultural Competence: Community Engagement. (2.0 cr.; A-F only; fall, every year) Various dynamics of health disparities, cultural competencies. Uses sociological framework.

PHAR 5212. Survey of Pediatric Metabolic, Genetic, and Oncologic Disease. (2.0 cr.; A-F only; prereq Second year or higher in College of Pharmacy or #; fall, summer, every year) Appraisal of major genetic/metabolic disorders and oncologic diseases of childhood. Disease state epidemiology, pharmacotherapy, monitoring, practical applications.

PHAR 5230. Principles of Clinical Pharmacology Research. (2.0 cr.; A-F only; prereq 3rd Year Pharmacy Student or #; fall, every year) Drug therapy investigation. Topics include experimental design of drug studies in human research subject volunteers. Topics related to individualization of therapy including effects of genetic polymorphisms, demographic variables, physiologic variables, age on drug disposition treatment outcomes.


PHAR 5700. Applied Fundamentals of Pharmacotherapy. (3.0 cr.; A-F only; =PHAR 3700; prereq Medical terminology and admission to grad program or #; fall, spring, every year) Drug therapy/pharmacology. Recognition of brand/generic drug names. Therapeutic classes, common uses. Review medication lists/other forms of health communication/documentation.

PHAR 5800. Pharmacotherapy for the Health Professions. (3.0 cr.; A-F only; =PHAR 3800; prereq Nursing grad program; fall, every year) Drug therapy, its implications in patient care.

PHAR 6122. Pharmacotherapy II: Patient-Centered Pathophysiologic Approach. (5.0 cr.; A-F only; prereq 6121, 6131, 6154, 6163, 6173, PHCL 5101, PHCL 5102, spring, every year) Pathophysiology/pharmacotherapy of common cardiovascular, endocrine, gastrointestinal disorders.

PHAR 6123. Pharmacotherapy III: Patient-Centered Pathophysiologic Approach. (5.0 cr.; A-F only; prereq 6122, 6163, 6175, PHCL 5101, PHCL 5102; fall, every year)
Pathopharmacology/Pharmacotherapy of common neurologic, psychiatric, pulmonary, geriatric disorders.

PHAR 6124. Pharmacotherapy IV: Patient-centered Pathophysiologic Approach. (5.0 cr.; A-F only; prereq 6121, 6122, 6123, 6155, 6163; spring, every year)

Pathopharmacology/Pharmacotherapy of common infectious diseases, oncologic/toxicologic disorders.

PHAR 6131. Pharmacy and the Health Care System. (3.0 cr.; A-F only; prereq 2nd year pharmacy student; spring, every year)

Delivery of pharmaceuticals/pharmacy services in U.S. health care system. Issues in hospital/community practice, characteristics of pharmaceutical industry. Economic/financial issues in delivering pharmaceutical services.

PHAR 6133. Pharmacy Practice Management. (3.0 cr.; A-F only; prereq 3rd year pharmacy student; spring, every year)

Principles of pharmacy management, including inventory control, purchasing, pricing, financial analysis, personnel management.

PHAR 6135. Pharmacy Outcomes. (2.0 cr.; A-F only; prereq 6123, 6175; spring, every year)

How to integrate knowledge of basic sciences, pharmacotherapy, pharmacy practice management, pharmaceutical care, written communication, literature evaluation, drug information retrieval, law/ethics, and pharmaco economics to manage patients with multiple medical conditions.

PHAR 6136. Pharmacy Law. (1.0 cr.; A-F only; prereq 3rd yr pharmacy student; spring, every year)

Federal regulation of medications, regulation of controlled substances, federal/state regulation of pharmacy practice. Minnesota Pharmacy Practice Act, relevant federal regulations pertaining to pharmacy.

PHAR 6137. Ethics in Pharmacy Practice. (1.0 cr.; A-F only; prereq 3rd yr pharmacy student; spring, every year)


PHAR 6150. CoP Honors: Medicinal Chemistry Seminar. (1.0 cr. [max 2.0 cr.; A-F only; prereq #: fall, spring, every year)

Current topics in medicinal chemistry.

PHAR 6151. Biochemistry of Medicinals I. (3.0 cr.; A-F only; prereq 1st yr PHAR, 6171; fall, every year)

Biochemistry topics required for understanding pharmacodynamic action/therapeutic use of medicinal agents.

PHAR 6153. Pharmaceutical Immunology. (2.0 cr.; A-F; prereq 6151; spring, every year)

Basic biological mechanisms of immune system. Emphasizes drug allergies, immunosuppressives, monoclonal antibodies, and preparation/use of immunologic derived agents in diagnosing/treating disease.

PHAR 6155. Medicinal Agents II. (2.0 cr.; A-F only; prereq 6154, & 6174 and Phcl 5102; spring, every year)

Chemical/biological properties and therapeutic uses of drugs affecting central nervous system, endocrine, and intermediary metabolism systems.

PHAR 6156. Medicinal Agents III. (4.0 cr.; A-F only; prereq 6151, 6141; fall, every year)

Therapeutic properties/uses of antiviral, anti-infective, antineoplastic agents.

PHAR 6157. Human Nutrition and Drug Therapy. (3.0 cr.; A-F only; prereq 6152; spring, every year)

Basic concepts of human nutrition and clinical application.

PHAR 6158. Recombinant DNA-Derived Drugs. (1.0 cr.; A-F only; prereq 6151; spring, every year)

Biotechnology as it relates to basic/clinical pharmaceutical sciences. Emphasizes recombinant DNA techniques and preparation/use of biotechnology-derived agents in diagnosing/treating disease.

PHAR 6160. CoP Honors: Experimental and Clinical Pharmacology Seminar. (1.0 cr.; A-F only; prereq #: fall, spring, every year)

Selected topics in experimental/clinical pharmacology.

PHAR 6164. Biopharmaceutics. (3.0 cr.; A-F only; prereq 6161, 6162, 6163; fall, every year)

Applied theory of dosage form design for optimal drug activity/bioavailability for all routes of drug administration.

PHAR 6174. Pharmaceutical Care Skills IV. (2.0 cr.; A-F only; prereq 6122; spring, every year)

Basic/clinical science curriculum in lab setting. Longitudinal care in lab setting.

PHAR 6175. Pharmaceutical Care Skills V. (2.0 cr.; A-F only; prereq [6171, 6172, 6173, 6174, 6111, 6112] or #: fall, every year)

Integrates basic/clinical science curriculum lab setting.

PHAR 6180. Pharm.D. Paper & Seminar. (1.0 cr.; A-F only; prereq 3rd yr Pharmacy student; fall, spring, every year)

Research paper/research project plan. Professional behavior, patient confidentiality, universal precautions.

PHAR 6182. Pharm.D. IV Seminar. (1.0 cr.; S-N only; prereq 4th yr pharmacy student, 6181; fall, every year)

Students present thesis topics to peers and faculty evaluators.

PHAR 6183. Pharm.D. IV Paper. (2.0 cr.; S-N only; prereq 6181, 4th yr Pharmacy student; fall, spring, summer, every year)

Final paper describing hypothesis-driven research project, patient-care oriented project, management project, drug-usage evaluation, or extensive literature review.

PHAR 6200. Drugs and the U.S. Health Care System. (2.0 cr.; A-F only; prereq Pharmacy student; fall, spring, every year)

How to be informed/responsible participant in debates related to medication use within US health care system.

PHAR 6204. College of Pharmacy Community Outreach. (1.0-3.0 cr.; A-F or Audit; prereq Current student pharmacist in College of Pharmacy; fall, spring, summer, every year)

Apply knowledge gained in classroom and teaching laboratories to community-based patient care activities.

PHAR 6205. Interprofessional Teamwork for the Health Professions. (1.0 cr.; A-F only; prereq Major in [public health or nursing or medicine or dentistry or social work or pharmacy]; fall, every year)

Interprofessional education that provides an introductory experience to interprofessional teamwork skills with a focus on patient-centered care, especially end of life care.

PHAR 6206. Directed Study: Introduction to Pharmacy Research. (1.0 cr.; S-N only; prereq PharmD student; spring, every year)

Overview of principles to research in particular research topic areas. Forum for scientists involved in research in particular topic areas to discuss research, environment, careers with students.

PHAR 6208. Community-based Immunization Delivery. (1.0 cr.; S-N only; fall, every year)

Students will learn about, plan, and implement influenza immunization clinics.

PHAR 6210. Immunization Tour. (1.0 cr.; A-F or Audit; =NURS 4430; prereq 6175, Completion of CPR; fall, every year)


PHAR 6211. Non-Prescription Drug Therapy: Focus on Patient Self-Care. (2.0 cr.; A-F or Audit; prereq 6112; spring, every year)

Over-the-counter medications. Diagnostic/durable medical equipment available in community pharmacies. Use of alternative medications.

PHAR 6212. Dermatology. (1.0 cr.; A-F only; prereq 3rd yr Pharmacy student; fall, every year)

Pathophysiology/pharmacotherapy of dermatologic disorders.

PHAR 6215. Applied Pharmacokinetics. (2.0 cr.; A-F or Audit; prereq 6163; spring, every year)

Applying clinical pharmacokinetics and assay methodologies to patient care. Assessing drug therapy outcomes.

PHAR 6217. Advanced Pharmaceutical Care Clinic. (1.0-2.0 cr.; prereq [6230] or 3rd yr pharmacy student; spring, every year)

Expanded, direct patient care opportunities. Students conduct comprehensive pharmaceutical care assessments in presence of practitioners. Weekly student case presentations/discussions.
PHAR 6219. Building a Pharmaceutical Care Practice. (2.0 cr.; A-F only; prereq 2nd or 3rd year pharmacy student; spring, every year) Initiating pharmaceutical care practice. Building personal practice plan.

PHAR 6220. Pediatric Drug Therapy. (2.0 cr.; A-F or Audit; prereq 3rd or 4th yr pharmacy student; spring, every year) Pathophysiology/therapeutics of disease states. Common issues encountered in providing pharmaceutical care to pediatric patients.

PHAR 6221. Geriatric Pharmacotherapy. (2.0 cr.; A-F or Audit; prereq 3rd or 4th yr pharmacy student; spring, every year) Pharmacokinetic/pharmacodynamic changes and their implications in elders. Effects of drug-drug/disease interactions. Drug adherence barriers to provide optimum pharmacotherapy to elderly persons.

PHAR 6222. Advanced Pharmaceutical Compounding. (2.0 cr.; A-F only; prereq 2nd or 3rd year pharmacy student; fall, spring, every year) Expands skills gained in pharmaceutical care lab.

PHAR 6223. Pharmacokinetics Research Seminar. (1.0 cr. [max 2.0 cr.]; A-F or Audit; [PHM 8150]; prereq 6163 with grade of “B” or better; fall, spring, every year) Evaluate literature in pharmacokinetics/pharmacodynamics/drug metabolism.

PHAR 6224. Pharmacogenomics: Genetic Basis for Variability in Drug Response. (2.0 cr.; A-F only; prereq At least 2nd year or later in healthcare or related program or equivalent experience or #; spring, every year) Theory/practice of pharmacogenomics. Principles of human genetics/genomics. Applications to scientific education, problems in drug therapy optimization, patient care.

PHAR 6226. Interprofessional Diabetes Experience. (2.0 cr.; A-F only; prereq 2nd year or later pharmacy student; spring, every year) Diabetics mellitus through active, hands-on learning in interprofessional environment. Participate in week-long experience of living with diabetes. Online learning activities.

PHAR 6227. Leading Adaptive Change. (2.0 cr.; S-N only; prereq 6237, 6238, must have submitted declaration to complete Leadership Emphasis Area; fall, every year) Hands-on experience leading change initiative. Create vision for change, plan approach, implement plan, evaluate outcomes. Project focuses on area of pharmacy practice or education.

PHAR 6228. Leading Change Portfolio. (2.0 cr.; S-N only; prereq 6237 or 6238; spring, every year) Supports completion of Leadership Emphasis Designation. Documentation/self-reflection of leadership learning experiences pursued inside/outside of classroom.

PHAR 6230. Ambulatory Pharmaceutical Care Clinic. (2.0 cr.; prereq Enrolled pharmacy student; spring, every year) How to conduct pharmaceutical care assessments, for patients with actual drug-related needs, in a controlled clinic setting.

PHAR 6231. Community Pharmacy Management. (2.0 cr.; A-F only; spring, every year) Management techniques needed in community pharmacy practice. Emphasizes marketing/service.

PHAR 6232. Health System Pharmacy Management. (2.0 cr.; A-F only; prereq 2nd or 3rd yr pharmacy student; spring, every year) Management techniques needed in various institutional pharmacy settings. Integrating distributive/clinical components of institutional practice.

PHAR 6233. Drug Use Review and Management. (2.0 cr.; A-F or Audit; prereq 3rd yr PHAR; fall, every year) Principles of drug use review in various health care settings. Optimizing quality, minimizing cost.

PHAR 6234. Pharmaceutical Economics and Public Policy. (2.0 cr.; A-F only; spring, every year) Economic and public policy aspects of the U.S. health care system. Health economic principles and trends applied to the pharmaceutical market.

PHAR 6235. Pharmaceutical Industry: Business and Policy. (2.0 cr.; A-F or Audit; [PHAR 6235]; spring, every year) Developing, manufacturing, distributing, economically evaluating, purchasing, managing, and ordering pharmaceuticals in health sector. Unique market characteristics, complex regulatory processes, rapid technological change, high expense growth, public policy issues.

PHAR 6236. Clinical/Pharmacy Management in Modern U.S. Health-Care and Regulatory Landscape. (2.0 cr.; A-F only; fall, spring, every year) U.S. Food and Drug (FDA) law, civil liability of malpractice, duty of pharmacy professionals, implications of intellectual property rights of others. Business law topics ranging from contracts to non-compete agreements.

PHAR 6237. Leading Change in Pharmacy I. (2.0 cr.; S-N only; fall, every year) Mini-curriculum. Leadership development, its relation to advancing the profession of pharmacy.

PHAR 6238. Leading Change in Pharmacy II. (2.0 cr.; S-N only; spring, every year) Mini-curriculum. Leadership development, its relation to advancing the profession of pharmacy.

PHAR 6248. Drugs of Abuse. (2.0 cr.; S-N only; prereq Organic chemistry I/II or [organic chemistry I, biochemistry I]; spring, odd years) Basic medicinal chemistry of substances of abuse, associated paraphernalia.

PHAR 6249. Addiction Medicine, Substance Abuse, and Chemical Dependency. (2.0 cr.; A-F or Audit; prereq 2nd or 3rd yr Pharmacy student; spring, every year) Addiction, chemical abuse, chemical dependency. How pharmacists can impact those affected.

PHAR 6250. CoP Honors: Social and Administrative Pharmacy Seminar. (1.0 cr. [max 2.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Current topics in hospital pharmacy.

PHAR 6257. Leadership Best Sellers for Pharmacists. (2.0 cr.; A-F only; fall, spring, every year) Part of the leadership track in pharmacy.

PHAR 6260. CoP Honors: Pharmacuetics Seminar. (1.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Contemporary topics in pharmaceutics research.

PHAR 6270. CoP Honors: Critical Care Seminar. (2.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Research/topics of importance to experimental/clinical pharmacology.

PHAR 6293. Directed Research I. (1.0-5.0 cr.; [max 10.0 cr.]; prereq #; fall, spring, summer, every year) Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

PHAR 6294. Directed Study I. (1.0-5.0 cr.; prereq #; fall, spring, summer, every year) Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, experimental or clinical pharmacology.

PHAR 6301. Veterinary Pharmacotherapy. (2.0 cr.; A-F only; prereq 3rd year pharmacy student; spring, every year) Pharmacotherapy of common medical conditions of small animals.

PHAR 6393. Directed Research II. (1.0-5.0 cr.; [max 10.0 cr.]; prereq #; fall, spring, summer, every year) Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

PHAR 6394. Directed Study II. (1.0-5.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental or clinical pharmacology.

PHAR 6493. Directed Research III. (1.0-5.0 cr.; prereq #; fall, spring, summer, every year) Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

PHAR 6494. Directed Study III. (1.0-5.0 cr.; [max 10.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year) Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, and experimental or clinical pharmacology.

PHAR 6501. Ethics in Pharmacy Practice. (2.0 cr.; A-F only; prereq 3rd yr Pharmacy student; #; fall, every year)
PHAR 6610. Spiders, Scorpions, and Snakes: Clinical Toxicology. (2.0 cr.; A-F only; prereq 2nd yr student in health care or related program or equivalent experience or #; spring, every year) Spiders, scorpions, snakes. Delivery of venom. Toxins in venoms/pharmacological actions. Consequences of envenomation/relevance of toxin uses in clinical medicine/biomedical research. Clinical toxicology relating to envenomation.

PHAR 6700. Becoming a Pharmacist. (2.0 cr.; S-N only; fall, every year) Introduction to knowledge, skills, attitudes necessary for success in professional pharmacy curriculum/practice of pharmacy.

PHAR 6702. Integrated Biochemical Sciences. (4.5 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year) Foundation in structure/function of medicinals. Familiarize students with structural/physical properties of proteins, nucleic acids, lipids, carbohydrates, ligands/drugs. Basic concepts central to structure-function relationships of therapeutics.

PHAR 6704. Foundations of Social and Administrative Pharmacy. (2.5 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year) Foundation for how one should think about rational use of drugs in system of care. Content/skills learned will be applied in subsequent courses continuing through 4th year of curriculum. Module focused on Drug Literature Evaluation (DLE).

PHAR 6706. Foundations of Pharmaceutical Care. (1.5 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year) How pharmacist should think about rational use of drugs in caring for patients. Content/skills learned will be applied in/provide framework for all subsequent courses continuing through 4th year of curriculum/lifelong into practice.

PHAR 6708. Drug Delivery I. (2.5 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year) Fundamental physicochemical principles applicable to dosage forms. Foundational scientific principles (continued in DDII) illuminated with examples of solution drug dosage forms. Concepts relevant to current/future dosage forms.

PHAR 6710. Pharmaceutical Care Skills I. (2.0 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year) Introduction to profession/building skills necessary to become competent, caring pharmaceutical care practitioner. Course consists of laboratory section and lecture.

PHAR 6715. Professional Development and Assessment Sequence I. (1.0 cr.; S-N only; prereq Successful completion of Becoming a Pharmacist; spring, every year) Knowledge acquisition. Career/professional development.

PHAR 6716. Applied Pharmaceutical Care. (3.2 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist; spring, every year) Common medical conditions/medications students are likely to encounter during their introductory pharmacy practice experiences (IPPEs).

PHAR 6718. Drug Delivery II. (2.4 cr.; A-F only; prereq Successful completion of Drug Delivery I; spring, every year) Builds on Drug Delivery I: Dosage forms, mostly solid/dispersed. Chemical kinetics, chemical stability, buffer systems, polymers/proteins, rheology. Physiochemical principles relevant to design, preparation, storage, use, efficacy, evaluation of pharmaceutical dosage forms.

PHAR 6720. Pharmaceutical Care Skills Lab II. (2.0 cr.; A-F only; prereq Successful completion of Pharmaceutical Care Skills Lab I; spring, every year) Part of pharmaceutical care learning center curriculum spanning six semesters. Introduction to profession. Begin building skills necessary to become competent/caring pharmaceutical care practitioner.

PHAR 6722. Principles of Medicinal Chemistry. (2.1 cr.; A-F only; prereq Successful completion of Integrated Biochemical Sciences; spring, every year) Discipline of medicinal chemistry. Principles of drug design/drug metabolism.

PHAR 6724. Immune System and Infectious Disease. (3.1 cr.; A-F only; prereq Successful completion of Integrated Biochemical Sciences; spring, every year) Immunological, epidemiological, pathogenic basis of viral, bacterial, protozoal, fungal, helminthic disease. Biological composition of vaccines/immunologic response to live attenuated pathogens/microbial extracts. Chemical, cellular, biological principles of immune system.

PHAR 6726. Principles of Pharmacology. (2.3 cr.; A-F only; prereq Successful completion of Foundations of SAPh; spring, every year) Builds on information in basic science courses offered in first semester of PharmD program. Foundational content necessary for comprehension/application of all subsequent pharmacotherapy modules that require application of pharmacological concepts/knowledge.

PHAR 6728. Pharmaceutical Calculations. (0.7 cr. [max 3.1 cr.]; A-F only; prereq Successful Completion of Drug Delivery I; spring, every year) Accurately perform pharmaceutical calculations. How to prevent patient harm/possible fatality.

PHAR 6730. Professional Development and Assessment II. (0.54 cr.; S-N only; prereq PD&A I; fall, every year) Emphasis on reinforcing, supporting, developing, assessing competencies/skills exercised in multiple courses. Includes work in career/professional development.

PHAR 6732. Medicinal Chemistry and Pharmacology of Cardiovascular Agents. (2.3 cr.; A-F only; prereq Principles of Pharmacology, Principles of Medicinal Chemistry; fall, every year) Builds upon foundational concepts learned in Principles of Pharmacology/Principles of Medicinal Chemistry, applies them to drug classes primarily used for treatment of cardiovascular diseases.

PHAR 6734. Cellular Metabolism and Nutrition. (2.8 cr.; A-F only; prereq Integrated Biochemical Sciences; fall, every year) Basic principles of intermediary metabolism/how such processes are used by body. Basic nutrients used by body/their roles as OTC products in community pharmacies.

PHAR 6736. Cardiovascular Pharmacotherapy. (1.9 cr.; A-F only; prereq All PharmD one coursework, Physiological Competency Exam; fall, every year) Key topics critical to preparing generalist practitioner to have input on optimizing care of patients with common conditions such as hypertension, dyslipidemia, ischemic heart disease (angina, acute myocardial infarction) supraventricular arrhythmias (atrial fibrillation), chronic heart failure.

PHAR 6738. Pharmacokinetics. (3.7 cr.; A-F only; prereq Drug Delivery I & II; fall, every year) Designed to give generalist practitioners fundamental skills to solve pharmacokinetically-based problems in patient care, particularly in regards to dosage regimen design/adjustment. Builds on concepts learned in Drug Delivery I/II. Follows path of drug molecule from incorporation into dosage form to release disposition in biological system.

PHAR 6740. Pharmaceutical Care Skills Lab III. (2.0 cr.; A-F only; prereq Pharmaceutical Care Skills Lab I & II; Applied Pharmaceutical Care; fall, every year) Designed for second year pharmacy students to continue to build skills necessary to become pharmaceutical care practitioner. Laboratory section/discussion.

PHAR 6742. Colloquium I: Scholarly Presentation Skills. (0.8 cr.; A-F only; prereq Becoming a Pharmacist, Foundations of Social and Administrative Pharmacy, Foundations of Pharmaceutical Care; fall, every year) Practice skills necessary to research, prepare, present scholarly paper/seminar. Builds on Biostatistics/Drug Literature Evaluation material from Becoming a Pharmacist, Foundations of Social/Administrative Pharmacy, Foundations of Pharmaceutical Care.

PHAR 6800. Rehabilitation Pharmacotherapy. (2.0 cr.; A-F or Audit; prereq Enrolled physical therapy student; summer, every year) Impact of medications on rehabilitation, how rehabilitation affects medication use.


PHAR 6937. Directed Study: Leading Change in Pharmacy I. (2.0 cr.; S-N only; prereq PDI1 or PDIII Pharmacy student; fall, spring, every year) Leadership development/its relation to advancing profession of pharmacy.

PHAR 7001. Early Pharmacy Practice Experience I. (1.0 cr.; A-F only; prereq Criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, every year)
First in series of four courses. Focuses on patient perspective in managing/living with chronic conditions/chronic medication use. Community-based instruction, mentor program.

PHAR 7002. Early Pharmacy Practice Experience II. (1.0 cr.; A-F only; prereq 7001 or #, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; spring, every year)
Patient perspective in managing/living with chronic conditions/chronic medication use. Community-based instruction, mentor program.

PHAR 7003. Early Pharmacy Practice Experience III. (0.5 cr.; A-F only; prereq 7002 or #, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, every year)

PHAR 7004. Early Pharmacy Practice Experience IV. (0.5 cr.; A-F only; prereq 7003 or #, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; spring, every year)

PHAR 7005. Introductory Community-Practice Pharmacy Experience. (2.5 cr.; S-N only; prereq 6111, 6171, 7001, 1st year pharmacy student; spring, every year) Experience in patient care at community practice setting. Three weeks, 40 hrs/week.

PHAR 7006. Introductory Institutional-Pharmacy Practice Experience. (2.5 cr.; S-N only; prereq College of Pharmacy student completed 6121, 6122, 6131, 6132, 6173, 6174, 7003 and 7004 with passing grade, registered with Minnesota Board of Pharmacy as intern; spring, every year) Experience in patient care in hospital setting. Three-week, 40 hours/week.

PHAR 7010. APPE Continuing Professional Development Portfolio. (1.5 cr.; S-N only; prereq 3rd yr pharmacy student; spring, every year) Continuing professional development. Systematic maintenance, development, and broadening of knowledge, skills, and attitudes. Students self-assess performance/learning needs and create/follow/evaluate a learning plan. Documentation for peer review/support, regulatory review.

PHAR 7120. Community Practice Experience. (4.0 cr.; A-F only; prereq Pharm.D. IV, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, spring, summer, every year)
Experience in patient or outpatienet pharmacy practices where direct patient contact/care occurs for 5 weeks, or experience in non-patient care setting. Sites vary from governmental agencies to pharmacy associations to specialized practices for 5 weeks.

PHAR 7122. Acute Patient Care Practice Experience I. (4.0 cr.; A-F only; prereq Pharm.D. IV, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, spring, summer, every year)
Experience in an inpatient setting. Students responsible for all drug-related needs of individual patients. Full-time for five weeks.

PHAR 7123. Ambulatory Patient Care Practice Experience. (4.0 cr.; A-F only; prereq Pharm.D. IV, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, spring, summer, every year)
Experience in an ambulatory setting. Students responsible for drug-related needs of individual patients. Full-time for five weeks.

PHAR 7126. Patient Care Practice Experience. (4.0 cr.; A-F only; prereq Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, spring, summer, every year)
Experience in an inpatient setting. Students responsible for drug-related needs of individual patients. Full-time for five weeks.

PHAR 7128. Acute Patient Care Practice Experience II. (4.0 cr.; A-F only; prereq Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, spring, summer, every year)
Experience in an inpatient setting. Students responsible for drug-related needs of individual patients. Full-time for five weeks.

PHAR 7211. Elective Practice Experience I. (4.0 cr.; A-F only; prereq Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, spring, summer, every year)
Experience in inpatient or outpatient pharmacy practices where direct patient contact/care occurs for 5 weeks, or experience in non-patient care setting. Sites vary from governmental agencies to pharmacy associations to specialized practices for 5 weeks.

PHAR 7212. Elective Practice Experience II. (4.0 cr.; A-F only; prereq Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, spring, summer, every year)
Experience in inpatient or outpatient pharmacy practices where direct patient contact/care occurs for 5 weeks, or experience in non-patient care setting. Sites vary from governmental agencies to pharmacy associations to specialized practices for 5 weeks.

PHAR 7213. Elective Practice Experience III. (4.0 cr.; A-F only; prereq Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, spring, summer, every year)
Experience in patient or outpatient pharmacy practices where direct patient contact/care occurs for 5 weeks, or experience in non-patient care setting. Sites vary from governmental agencies to pharmacy associations to specialized practices for 5 weeks.

PHAR 7214. Elective Practice Experience IV. (4.0 cr.; A-F only; prereq Pharm.D. I-IV, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, spring, summer, every year)
Experience in patient or outpatient pharmacy practices where direct patient contact/care occurs for 5 weeks, or experience in non-patient care setting. Sites vary from governmental agencies to pharmacy associations to specialized practices for 5 weeks.

PHAR 7217. Elective Practice Experience V. (4.0 cr.; A-F or Audit; prereq Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; summer, every year)
Experience in patient or outpatient pharmacy practices where direct patient contact/care occurs for 5 weeks, or experience in non-patient care setting. Sites vary from governmental agencies to pharmacy associations to specialized practices for 5 weeks.

PHAR 7310. Introduction to Community Health, Community Engagement and Leadership I. (1.0 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year) Gain understanding of community/population health, professionalism, teamwork, leadership.

PHAR 7320. Early Pharmacy Practice Experience II: Planning and Implementing a Community Health Project. (1.0 cr.; A-F only; prereq Successful completion of EPPE I; spring, every year)
Series of interconnected active learning activities spanning first two years of professional program. Builds on learning from previous semester/infoms learning experiences. Continue into EPPE III (in following semester).
CVM 6000. Gopher Orientation and Leadership Experience. (2.0 cr. [max 4.0 cr.]; S-N only; prereq Admission to veterinary program; fall, spring, every year) Introduces first-year students to the veterinary college, program, and profession. Two-day and one-half off-site orientation program and monthly meetings are experiential in design and focus on leadership development, emotional intelligence, communication, and conflict management. Third orientation day on campus and subsequent noon meetings introduce students to the college facilities and resources and address logistics necessary for participation in the program. Students work in mentor groups of 9-11 students and 2-3 faculty mentors throughout the course.

CVM 6001. Opportunities in International and Cultural Immersion. (0.5 cr. [max 1.0 cr.]; S-N only; fall, spring, every year) Finding and applying for opportunities. Securing funding. Travel safety. Topics in cultural competence. Presentations from students who have participated in international projects.

CVM 6003. Clinical Correlations . (2.0 cr. [max 6.0 cr.]; S-N only; spring, every year) Principles of research in learning. Prepares students for clinical work senior year/career.


CVM 6006. Global One Health: Thailand. (3.0 cr.; S-N only; spring, offered periodically) Self-guided study. Monthly in person seminars prior to three week study abroad in Thailand. Journal on recommended topics. Assessment via evidence of reading provided references through active participation in discussions, presentation of learning topics, active participation.

CVM 6025. Large Animal Hospital Practicum: Year 2. (1.0 cr.; S-N only; fall, spring, every year) Animal handling, evaluation, treatment protocols. Presentation/considerations related to veterinary diseases. Case care. Team skills. Hospital procedures for clinical rotations. Students provide primary case care and service support. Prereq-2nd yr DVM or instr consent.

CVM 6026. Small Animal ICU Practicum: Year 4. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, summer, every year) Management of dogs/cats requiring urgent medical care. Intensive medical management. Providing primary case support through patient evaluation, problem solving, health care delivery, equipment operation. Practicum in Small Animal Intensive Care Unit.

CVM 6027. Large Animal Practicum: Year 3. (1.0 cr.; S-N only; fall, spring, every year) Experience in procedures/policies involved in after-hours care of hospitalized/emergency cases in the large-animal hospital. Prereq-3rd DVM or [instr consent, college consent]

CVM 6028. Large Animal Hospital Practicum: Year 4. (4.0 cr. [max 12.0 cr.]; S-N or Audit; prereq All 4th year students in Food Animal, Equine, Mixed tracks, as well as affiliate students; fall, spring, summer, every year) Team leadership in procedures/policies involved in after hours care of hospitalized/emergency cases in large-animal hospital.

CVM 6029. Small Animal Hospital Practicum: Year 3. (1.0 cr. [max 2.0 cr.]; S-N only; prereq DVM 3rd yr or #; fall, spring, summer, every year) Management of dogs/cats requiring urgent medical care, intensive medical management. Providing primary case care and service support through patient evaluation, problem solving, health care delivery, equipment operation. Practicum is served in Small Animal Intensive Care Unit.

CVM 6030. Veterinary Community Public Health. (2.0 cr.; A-F or Audit; prereq 6201, 6202, 6220; spring, every year) Epidemiological approach to veterinary public health. Major zoonoses, animal sentinels, meat/milk inspection, preharvest food safety, environment, occupational health/safety, euthanasia, carcass disposal methods, cruelty investigations, welfare issues. Problem-solving examples.

CVM 6031. International Animal Diseases. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq DVM, [CVM grad student or #]; spring, every year) Epidemiology, clinical signs, differential diagnoses, pathology, economic effect of diseases not currently or intermittently present in the United States. International role of veterinarians in controlling disease, increasing food production, facilitating trade.

CVM 6042. Practice Management/Law and Ethics. (2.0 cr.; S-N or Audit; prereq DVM or #; spring, every year) Economic, marketing, personnel management, accounting issues in veterinary practice management. Legal/ethical parameters for veterinary practice. Attendance required.

CVM 6103. Veterinary Imaging II. (2.0 cr.; A-F or Audit; prereq [6100, 6101, 6102, 6103, DVM 3rd yr] or #; fall, every year) Musculoskeletal, general abdomen, and alimentary tract systems. Interpretation of radiographs (film or digital) germane to common animal diseases. Clinical applications. Lectures, lab exercises using body systems approach to imaging (primarily radiographic) of large/small animals.

CVM 6105. Small Animal Ultrasonography. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq [6100, 6101, 6102, 6103, 3rd yr DVM student] or #; spring, every year) Body systems approach to imaging (primarily abdominal) of small animals. Ultrasonographic physics/technique, normal anatomy. Portal vein-associated organs, general abdomen (masses, effusions, tissue echogenicity, bowel). Upper/lower urinary tracts, genital tract, echocardiography. Head and neck ultrasound (eye, thyroid, etc.). Background of image generation/interpretation of sonograms germane to common animal diseases.

CVM 6136. Small Animal Nutrition: Advanced Block. (2.5 cr.; prereq 3rd yr DVM or #; spring, every year) Clinical application in nutrition competencies expected of a practicing small or mixed animal veterinarian. Feeding of healthy pets. Nutritional assessment. Formulating a nutritional management plan for patients.

CVM 6137. Small Animal Clinical Nutrition. (2.0 cr. [max 6.0 cr.]; A-F only; prereq 3rd or 4th yr DVM or #; fall, spring, summer, every year) Students participate in clinical nutrition service of VMC, manage nutritional needs of patients, perform nutritional assessments of ICU patients, perform internal/referring nutritional consults, and see outpatient appointments.

CVM 6222. Advanced Clinical Epidemiology. (1.0 cr. [max 2.0 cr.]; A-F only; fall, every year) Apply epidemiologic principles to control of infectious diseases in animal populations. Scientific literature. Global impacts of infectious diseases. Diagnostic tests, disease outbreak investigation, economics of disease control/surveillance.

CVM 6305. Clinical Skills IV. (1.0 cr.; S-N only; prereq DVM 3rd yr or #; fall, every year) Domestic animal behavior. Basic animal handling/mangement skills. Small-animal clerk duty. Using an IV/syringe pump, setting up ICU order sheets, using glucometer/centrifuge to perform "big 4" daily ICU/T tests.

CVM 6306. Small Animal Clinical Skills: Advanced Block. (1.0 cr.; S-N or Audit; prereq [3rd or 4th] yr DVM or #; spring, every year) Advanced clinical skills used by small animal practitioners in private practice.

CVM 6312. Veterinary Dental Rotation (SDen). (2.0 cr. [max 6.0 cr.]; A-F only; prereq DVM 3rd yr or student or #; fall, spring, summer, every year) Routine/complex dental problems. Students diagnose and formulate treatment plans. Hands-on training. Basic periodontal procedures, single/multi-rooted extractions, dental radiographic techniques, instrument/equipment care, dental charting.

CVM 6404. Small Animal Dermatology: Advanced Block. (1.0 cr.; A-F or Audit; prereq [3rd or 4th] yr DVM or #; spring, every year) Case-base discussion of common dermatologic conditions that affect dogs/cats. Students work on clinical cases outside classroom. Cases are discussed in classroom.

CVM 6410. Large Animal Digestive Disorders. (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd yr or #; fall, every year) Digestive disorders of domestic large animal species, beginning with oral cavity.
Pathogenesis, clinical signs, diagnosis, treatment, prevention. Case examples, lab exercises.

CVM 6411. Small Animal Gastroenterology. (3.0 cr.; A-F only; prerequisite DVM 3rd yr or #; fall, every year)

CVM 6420. Musculoskeletal System Diseases. (3.0 cr.; A-F only; prerequisite DVM 3rd yr or #; fall, every year)
Presentation, pathophysiology, diagnostic, and therapeutic/management approaches for common disorders of locomotion.

CVM 6424. Small Animal Orthopedic: Advanced Block. (1.0 cr.; A-F or Audit; prerequisite [3rd or 4th yr DVM or #]; non-track students may audit lectures, but labs must be taken for grade; spring, every year)
Dog/cat pediatric, adult orthopedic problems frequently seen in clinical practice. For comparative information, selected human orthopedic problems are presented by guest lecturers. Attendance/participation required for grade.

CVM 6434. Critical Care: Advanced Block. (1.0 cr.; S-N or Audit; prerequisite [3rd or 4th yr DVM or #]; spring, every year)

CVM 6436. Small Animal Cardiology: Advanced Block. (0.5 cr.; S-N or Audit; prerequisite [3rd or 4th yr DVM or #]; spring, every year)
Diagnostic/therapeutic considerations related to small animal cardiovascular disorders beyond core in preparation for clinical rotations.

CVM 6442. Animal Behavior Elective: Advanced Block. (1.0 cr.; S-N or Audit; prerequisite [3rd or 4th yr DVM or #]; spring, every year)
Introduction to abnormal/undesired animal behavior, diagnostic procedures, and behavioral/pharmacological modifications.

CVM 6444. Ophthalmology. (2.0 cr.; A-F or Audit; prerequisite 2nd yr DVM student; spring, every year)
Common procedures for evaluation, diagnosis, treatment of eye disorders in domestic species.

CVM 6448. Veterinary Oncology. (2.0 cr.; A-F only; spring, every year)
Cancer biology/metastasis. Surgical oncology, chemotherapy, and radiation therapy. Pathophysiology, clinical presentation, diagnostic testing and therapeutic options (curative, palliative-intent) for neoplastic/paraneoplastic diseases in domestic animal species.

CVM 6451. Metabolic Disorders. (2.0 cr.; A-F only; prerequisite DVM 3rd yr or #; fall, every year)
Metabolic diseases of both companion and large animal species. Endocrinology, unique metabolic disorders of large animals. Introductions to pediatrics and geriatric medicine.

CVM 6452. Metabolic Disorders II. (3.0 cr.; A-F or Audit; prerequisite DVM 3rd yr or #)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, and management protocols for metabolic and endocrine based disorders of domestic species.

CVM 6461. A Clinician’s Analysis of Urinalysis. (1.0 cr.; S-N only; prerequisite 3rd yr DVM or #; spring, every year)
Informal, case-based, interactive, in-depth approach to evaluation of urinalyses of clinical cases recently admitted to Veterinary Teaching Hospitals. Improving observational interpretation skills. Recognizing invito factors that may alter results of urinalyses.

CVM 6464. Small Animal Urinary System Diseases: Case Based Discussion. (1.0 cr.; S-N only; prerequisite DVM 3rd or 4th yr or #; spring, every year)
Expands on disorders of small animal urinary system. Core/additional disorders.

CVM 6471. Problems in Small Animal Medicine. (2.0 cr.; A-F only; spring, every year)
Problem-based approach to clinical problems in dogs/cats. Logical, structured approach to problems. Interpretation of laboratory results. Discussion, weekly self-assessment quiz, in-class work on next case.

CVM 6472. Small Animal Infectious Diseases. (1.0 cr. [max 2.0 cr.]; A-F only; fall, every year)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, and management protocol of disorders of multisystemic infectious diseases of dogs and cats.

CVM 6473. Large Animal Infectious Diseases. (1.0 cr. [max 2.0 cr.]; A-F only; fall, every year)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, and management protocol of disorders of multisystemic infectious diseases of ruminants and horses.

CVM 6474. Hematologic and Immunologic Disorders. (1.0 cr. [max 2.0 cr.]; A-F only; fall, every year)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, and management protocol of disorders of immunologic/hematologic systems.

CVM 6481. Obstetrics Lab. (1.0 cr.; S-N only; spring, every year)
Techniques for pregnancy diagnosis, obstetric manipulation in large animal species.

CVM 6482. Small Animal Theriogenology. (1.0 cr. [max 2.0 cr.]; A-F only; prerequisite 3rd yr DVM or #; fall, every year)

CVM 6483. Theriogenology Diagnostic Techniques. (1.0 cr.; S-N only; prerequisite 3rd yr DVM or #; fall, every year)
Obstetric manipulation in domestic species.

CVM 6491. Avian Core. (2.0 cr.; A-F only; prerequisite 3rd yr DVM or #; spring, every year)
Avian nutrition, physiology, anatomy, and disease. Prerequisite DVM or instructor consent.

CVM 6494. Small Animal Anesthesia Advanced Block Core. (1.0 cr.; A-F only; prerequisite 3rd yr DVM or #; spring, every year)
Sedative techniques, combination injectable anesthesia, pediatric/geriatric small animal anesthesia, pain control, regional techniques, anesthesia in trauma cases, complications in anesthesia, ventilator use.

CVM 6497. Avian Medicine and Surgery: Advanced Block. (1.0 cr.; Student Option No Audit; prerequisite 3rd or 4th yr DVM or #; spring, every year)

CVM 6500. Veterinary Public Health and Regulatory Medicine. (1.0 cr. [max 2.0 cr.]; S-N only; prerequisite DVM 3rd or 4th yr or grad student or #; fall, spring, summer, every year)
Interacting with public health, regulatory, and community activities. Roles in food industry. Public/occupational health, environmental problems. Zoonotic disease problems, food/occupational safety, euthanasia, carcass disposal, epidemiologic investigations, animal transportation/control, emergency preparedness, USDA accreditation. Students select clinical case, prepare oral response to hypothetical questions, conduct occupational safety/hazard review, present findings.

CVM 6501. Advanced Veterinary Public Health: Current Topics. (1.0 cr. [max 2.0 cr.]; S-N only; prerequisite DVM or MPH or grad student or #; fall, spring, summer, every year)
Systems used to raise livestock/poultry, deliver through markets to slaughter or processing facilities, and deliver to consumers. Methods to assess/mitigate risks. Emphasizes public health/food safety issues. Field trips, problem solving, assignments.

CVM 6502. Necropsy. (2.0 cr. [max 4.0 cr.]; S-N only; prerequisite DVM 3rd or 4th yr or #; fall, spring, summer, every year)
Students perform necropsies, collect tissues for lab analysis, interpret clinicopathologic findings, prepare reports on animals submitted to Veterinary Diagnostic Lab, apply basic clinical science to diseases for animals and populations of animals. Students may participate in history taking. Case findings discussed daily. Student groups present case reports at weekly departmental seminar.
CVM 6503. Exotic Animal Necropsy Rotation. (2.0 cr.; A-F only; fall, spring, summer, every year)
Zoo/wildlife pathology service similar to required necropsy rotation (CVM 6502). Perform necropsies of incoming cases of "nontraditional" animals. Write report and after discussion with faculty member choose appropriate additional tests. Perform histologic evaluation of selected organs. Small projects pertaining to exotic animal pathology (and medicine). Present during lab's Thursday seminar series.

CVM 6505. Topics . (0.25-8.0 cr. [max 160.0 cr.]; fall, spring, summer, every year) Elective topics.

CVM 6506. Directed Studies in Large Animal Medicine (DistL). (1.0-2.0 cr. [max 40.0 cr.]; S-N or Audit; prereq DVM 4th yr or #; fall, spring, summer, every year)
Students, under guidance of a faculty member, conduct special project addressing an issue in large animal medicine. Project proposals include hypothesis, objectives, plan of study, and product for evaluation by adviser and approval by CVM's curriculum committee.

CVM 6507. Directed Studies in Small Animal Medicine (DistS). (1.0-2.0 cr. [max 40.0 cr.]; S-N or Audit; prereq DVM 4th yr or #; fall, spring, summer, every year)
Students, under guidance of a faculty member, conduct special project addressing an issue in small animal medicine. Project proposals include hypothesis, objectives, plan of study, and product for evaluation by adviser and approval by CVM's curriculum committee.

CVM 6508. Directed Studies: Pathobiology (DistB). (1.0-2.0 cr. [max 40.0 cr.]; S-N or Audit; prereq DVM 4th yr or #; fall, spring, summer, every year)
Students, under guidance of a faculty member, conduct special project addressing an issue in veterinary pathobiology. Project proposals include hypothesis, objectives, plan of study, and product for evaluation by adviser and approval by CVM's curriculum committee.

CVM 6509. Directed Studies: Diagnostic Medicine (DistD). (1.0-2.0 cr. [max 40.0 cr.]; S-N or Audit; prereq DVM 4th yr or #; fall, spring, summer, every year)
Students, under guidance of a faculty member, conduct special project addressing an issue in diagnostic medicine. Project proposals include hypothesis, objectives, plan of study, and product for evaluation by faculty adviser and approval by CVM's curriculum committee.

CVM 6510. MPH Project: PHP. (1.0-3.0 cr. [max 9.0 cr.]; S-N only; prereq DVM student or #; fall, spring, summer, every year)
Directed field research. Original or secondary analysis of data sets related to public health practice.

CVM 6511. Exotic Animal Medicine Rotation. (2.0 cr.; A-F only; fall, spring, summer, every year)
Develop knowledge/technical skills to manage common exotic pets through case-based examples, lectures, and labs. Two days a week in a field setting of choice from the following (DNR, Raptor Center, Wildlife Rehabilitation Center, Como Zoo, MN Zoo, private practices with an exotic case load).

CVM 6512. Zoo and Wildlife Rounds. (0.5 cr. [max 3.0 cr.]; S-N only; fall, spring, every year)
Zoo, wildlife, and exotic pet conservation. Seminars involving topics of exotic animal conservation, medicine, and pathology encountered at the Minnesota, Como, and Lake Superior zoos; Raptor Center; and Minnesota Veterinary Diagnostic Laboratory. Basic biology of the affected animals, clinical aspects, and pathology of encountered diseases will be presented and discussed by zoo keepers, case veterinarian, and/or case pathologist, and students. Apply principles of basic and clinical science to address the cause of disease for individual animals as well as populations of animals.

CVM 6513. Topics on Climate Change and Agriculture. (1.0 cr.; A-F only; spring, every year)
Science of climate change, role of agriculture and steps that are being taken to mitigate effects. Readings/discussions on a series of topics including, evidence for climate change, policy actions, carbon credits, soil sequestration, role of livestock, anaerobic digesters, and carbon footprint.

CVM 6514. Directed Studies in Food Animal Medicine (DistFA). (1.0-2.0 cr.; S-N only; fall, spring, summer, every year)
Conduct special project addressing issue in food animal medicine under guidance of faculty member. Project proposals include hypothesis, objectives, plan of study, product for evaluation by adviser/approval by CVM's curriculum committee.

CVM 6515. Externship (Extern). (1.0-2.0 cr. [max 24.0 cr.]; S-N or Audit; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year)
Students spend two weeks/rotation in a field setting of choice from the following: DNR, Raptor Center, Wildlife Rehabilitation Center, Como Zoo, Minnesota Veterinary Diagnostic Laboratory, and Minnesota Veterinary Diagnostic Laboratory. Hands-on biosecurity audits/develop used to prevent disease dissemination. Rotation offered allowing students to fulfill their externship rotation requirement at another accredited veterinary college.

CVM 6516. Field Experience in Public Health Practice. (0.5-8.0 cr. [max 24.0 cr.]; S-N only; =PUBH 7296; prereq DVM student or #; fall, spring, summer, every year)
Directed field experience or clinical rotation/practicum in selected community or public health agencies/institutions. Integration of knowledge/skills in population science for public health.

CVM 6519. Wildlife Rehabilitation Center Summer Internship. (0.1 cr.; S-N only; prereq DVM student; summer, every year)
Six-week summer internship (15 hr/week) at Wildlife Rehabilitation Center. Hands-on learning in clinical medicine; avian, waterfowl, and mammal nurseries; wildlife handling and management; and wildlife rehabilitation. Final project.

CVM 6520. Rotation at Other Institution (RAOI). (1.0-2.0 cr. [max 40.0 cr.]; S-N or Audit; prereq DVM 4th yr or #; fall, spring, summer, every year)
Students to spend one-six weeks in an organized program at another degree-granting institution, in an area either not offered at the University or in one that complements experience in a clinical rotation at the University.

CVM 6526. Dermatology Rotation at Other Institution. (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th year or #; fall, spring, summer, every year)
Rotation through which students may take a required dermatology course at another accredited veterinary college.

CVM 6527. Anesthesiology Rotation at Other Institution. (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th year or #; fall, spring, summer, every year)
Rotation offered allowing students to fulfill their anesthesiology rotation requirement at another accredited veterinary college.

CVM 6528. Radiology Rotation at Other Institution. (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th year or #; fall, spring, summer, every year)
Radiology core rotation taken at another accredited veterinary college and used to meet core requirements.

CVM 6529. Equine Medicine Rotation at Other Institution. (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th year or #; fall, spring, summer, every year)
Equine Medicine Rotation at another accredited veterinary college and used to meet a core medicine requirement.

CVM 6530. Orientation to Clinical Rotations. (1.0 cr. [max 2.0 cr.]; S-N only; prereq 3rd yr DVM; spring, every year)
Topics, issues, and procedures encountered during clinical rotations. Transition into clinics. Flow during rotations. Didactic lectures, group exercises, discussions. CVM/MC policies/procedures, patient flow, SOAPs, discharges, admissions, ICU/wards, patient care, UVIS, client communications, infection control, safety, pharmacy, licensure, rotation expectations.

CVM 6531. Biosecurity and Biocontainment for Food Animals . (2.0 cr.; A-F only; spring, summer, every year) Rotation. Biocontainment and biosecurity measures and strategies that are being used in the food animal industry (swine, poultry and dairy) to prevent the spread of disease. Hands on experience for students interested in developing biosecurity plans for farms. Pathogen transmission within and between populations, the routes of pathogen dissemination and measures and strategies used to prevent disease dissemination. Hands on biosecurity audits/develop recommendations for system improvement.

CVM 6532. Clinical Laboratory Medicine (Labs). (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr or #; fall, spring, every year)
One-week intensive rotation in veterinary clinical lab medicine. Hematology, cytology, clinical chemistry, endocrinology, microbiology. Sample submission. Lab test methodology. Didactic teaching, small group discussion, case-based/guided self-instruction, microscopy.
CVM 6540. Advanced Veterinary Toxicology. (2.0-8.0 cr. [max 40.0 cr.]; S-N or Audit; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) In-depth examination of toxins. Clinical, diagnostic, mechanistic, and therapeutic aspects of biotoxins, organic, and inorganic toxins that affect livestock, poultry, wildlife, and companion animals or that threaten public health.

CVM 6560. Public Health Issues and Veterinary Medicine Opportunities. (1.0 cr. [max 2.0 cr.]; A-F only; fall, spring, every year) Public health practice and veterinary medicine. Day-to-day work of public health professionals. Public health principles in context. Veterinary medicine related to public health research/practice. Students interact with advocacy groups, media, lobbyists, legislators, regulatory officials, industry leaders, and public health professionals.

CVM 6601. Small Animal Internal Medicine: (SAM A). (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Primary case responsibility for wide range of clinical diseases. History taking, physical examination, problem definition, diagnostic/therapeutic plans on assigned cases. Cases typically relate to gastroenterology, urology/nephropathy, urology, neurology, immunology, and cardiology. Daily rounds. Students present case discussion topics and interpret lab data, radiographic evaluations, and biopsy information. Emphasizes effective communications with clients/referring veterinarians.

CVM 6602. Small Animal Internal Medicine: (SAM B). (2.0 cr. [max 52.0 cr.]; prereq [6601, DVM 3rd or 4th yr] or #; fall, spring, summer, every year) Problem-solving skills, clinical skills, communication skills, record keeping, ethical issues in referral cases. Methods of knowledge acquisition, including computerized searches and diagnostic programs. Small group rounds discussions. Students assist clinicians in management of referral/emergency cases. Cases typically related to gastroenterology, nephropathy, urology, oncology, nutrition, neurology, and cardiology.

CVM 6605. Banfield Electrof Clinical Rotation. (2.0 cr. [max 4.0 cr.]; A-F only; fall, spring, summer, every year) Managing general/clinical caseload in non-referral setting. Working with patients at Banfield, The Pet Hospital, under supervision of mentor. Managing acute/chronic cases. Client communication. Clinical skills.

CVM 6609. Emergency/Critical Care (ECC). (2.0 cr. [max 4.0 cr.]; A-F only; prereq Sr; fall, spring, summer, every year) Emergency/critical-care cases in small animal practice or emergency practice. History taking, physical exams. Creating problem lists, proposing diagnostic/therapeutic plans.

CVM 6610. Small Animal Dentistry and Oral Surgery Elective. (2.0 cr.; A-F or Audit; spring, every year) Small animal dentistry and oral surgery (primarily canine and feline, but includes exotic animal dentistry) Clinical recognition, diagnosis, assessment, treatment of dental and oral, and maxillofacial pathology common to small animal clinical practice. Didactic lectures, laboratory teaching, small group learning exercises, and critical overview of published literature (that will be utilized in the group case presentations). Feline oral surgery; noninvasive maxillofacial fracture repair techniques. Critical grading on surgical procedures.

CVM 6611. Equine Dentistry Elective. (2.0 cr. [max 8.0 cr.]; prereq DVM[3rd or 4th yr] or grad student or #; fall, spring, summer, every year) Students participate in behavior consultations: history taking, diagnosis, outline of treatment protocols, sample collection, demonstration of training techniques, writing of treatment plans, case follow-up. Students present one case, prepare one topic of their choice for presentation during rounds. Daily rounds include discussion of cases, review of behavior-related articles, discussion of problem complexes.

CVM 6612. Dermatology (Derm). (2.0 cr. [max 20.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Routine dermatologic problems in companion animal practice. History taking, clinical diagnosis, patient management, client education. Students participate in all phases of diagnosis/management of cases. Small-group discussions.

CVM 6634. Comparative Ophthalmology (Ophth). (2.0 cr. [max 40.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Entry-level ophthalmology. Diagnosis, treatment. Outside readings, review papers, final essay exam.

CVM 6636. Cardiology (Card). (2.0 cr. [max 40.0 cr.]; prereq DVM 4th yr or CVM grad or #; fall, spring, summer, every year) Clinical problem solving. Cases of cardiopulmonary disease, including canine/feline congenital heart disease, acquired valvular/myocardial disease, dicrofilariasis, arrhythmias, pulmonary disorders. Hands-on experience in conducting physical exams, recording electrocardiograms/echocardiograms, and reading thoracic radiographs. Group discussions, rounds.

CVM 6644. General Practice (GenP). (2.0 cr. [max 40.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Students manage their own cases including developing diagnostic, treatment, and preventive health maintenance plans for each patient, performing routine medical/surgical procedures, and conducting client communication/education. Wide variety of cases.

CVM 6648. Advanced Clinical Oncology Rotation. (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or grad student or #; fall, spring, summer, every year) Case management, self-directed research. Students receive oncology referrals, work with emergency cases and special procedures, assist in treatment decisions and therapeutic options for new cases, and manage ongoing chemotherapy/radiation therapy patients. Emphasizes principles of oncology and patient care.

CVM 6651. Small Animal Ultrasound (SAUS). (2.0 cr. [max 8.0 cr.]; A-F only; prereq [3rd or 4th yr DVM or #; fall, spring, summer, every year) Students practice routine abdominal ultrasound. Principles for interpretation of exam. Learning through use of clinical caseload. Daily practice of particular ultrasound skills. Students scan clinical patients and interpret radiographic procedures as needed.

CVM 6662. Comparative Anesthesiology (Anes). (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr; fall, spring, summer, every year) Practical experience in sedating/anesthetizing routine clinical cases. Previously taught lab protocols/techniques are used in healthy normal clinical cases and adapted for high risk cases. Emphasizes problem solving in formulation of anesthetic plans, management of patients under anesthesia, team work, and pain management.

CVM 6663. Small Animal Surgery (SAS). (2.0 cr. [max 8.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Diagnostic/therapeutic management of surgical patients. History taking, physical examination, communication, problem solving, and surgical techniques. Economic issues. Students work as part of a surgical service team with faculty member, resident, and intern.

CVM 6664. Elective Small Animal Surgery (ESAS). (2.0 cr. [max 10.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Elective surgeries such as ovariohysterectomies, neuters, and declaws for small animals. Two-student teams are responsible for pre-surgical evaluation, anesthesia induction/maintenance, surgical procedure, and post-operative care of animals supplied by Humane Society for Companion Animals.

CVM 6665. Small Animal Physical Rehabilitation. (2.0 cr. [max 4.0 cr.]; A-F only; fall, spring, summer, every year) Students work closely with veterinary technician and physical therapist who are certified canine rehabilitation practitioners.
Evaluating a patient to determine a rehabilitation problem list. Establishing treatment goals. Application of basic physical modalities, proper passive range of motion, beginning therapeutic exercises. Students develop treatment goals and plan for one orthopedic and one neurologic case.

CVM 6666. Special Procedures in Veterinary Radiology. (2.0 cr.; prereq DVM 3rd or 4th yr or grad or #; fall, spring, offered periodically) Contrast agents and procedures used to examine various body systems or anatomical areas.

CVM 6668. Small Animal Radiology (RAD). (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Making high quality radiographs. Students practice routine and special procedures. Principles for interpretation. Exposure to CT and MRI. Daily radiographic interpretation in small animal species. Issues related to radiation protection.

CVM 6669. Radiology: Mixed Animal. (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Making high-quality radiographs. Students practice routine and special procedures. Principles for interpretation. Exposure to CT and MRI. Daily radiographic interpretation in small animal species. Issues related to radiation protection.

CVM 6681. Advanced Small Animal Theriogenology. (1.0 cr.; A-F only; spring, every year) Non-core small animal theriogenology topics. Online course.

CVM 6690. Integrative Medicine. (2.5 cr.; S-N or Audit; prereq 2nd yr DVM student or #; spring, every year) History/principles of acupuncture, chiropractic, and other commonly used complementary approaches to care of domestic animals. Training requirements for certification. Lectures, case examples, demonstrations.

CVM 6691. Veterinary Acupuncture (AcPunct). (2.0 cr. [max 6.0 cr.]; prereq 6690, [yr 3 or D DVM]] or #; fall, spring, summer, every year) Basic veterinary acupuncture theory, point combination, treatment, diagnosis of diseases, hands-on veterinary acupuncture technique.

CVM 6702. Large Animal Palpation Labs. (2.0 cr.; S-N only; prereq DVM or #; fall, every year) Hands-on clinical experiences in equine, bovine, or large animal reproductive status/disorders. Students select species.

CVM 6704. Reproductive Diseases of Cattle. (2.0 cr. [max 6.0 cr.]; A-F or Audit; prereq 3rd yr DVM or #; fall, every year) Common diseases affecting reproductive function in cattle, swine, and small ruminants.

CVM 6711. Large Animal Medicine (LAM). (2.0 cr. [max 8.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Medical diseases of horses, cattle, small ruminants, South American cameldids, and potbellied pigs. History taking, clinical diagnosis, patient management. Assessment of treatment responses. Clinic case material, opportunities to practice common procedures. Small group discussions on clinical diagnosis, treatment, and prevention of common medical disorders.

CVM 6712. Equine Ambulatory Rotation. (2.0 cr. [max 4.0 cr.]; A-F only; fall, spring, summer, every year) Equine ambulatory rotation meeting for two weeks performing farm calls, call backs, x-ray development, and restocking the van. Student and practitioner discuss cases as calls are being made.

CVM 6715. Large Animal Surgery and Lameness. (2.0 cr. [max 10.0 cr.]; prereq 3rd or 4th yr DVM student or #; fall, spring, summer, every year) General surgery, lameness cases. Emphasizes horses. Some cattle, small ruminants/camelids. Diagnostic/therapeutic management in hospital setting. Cases, rounds, exercises. Students work as part of surgical management or advanced diagnostic/therapeutic techniques available in a referral setting.

CVM 6720. Problem Solving in Equine Medicine. (2.0 cr.; A-F or Audit; prereq DVM 3rd yr or #; spring, every year) Evidence-based medicine and clinical epidemiology concepts are integrated into discussion of cases. Assignments include reading of journal articles, working through case scenarios on Web CT, and answering case-based questions.

CVM 6721. Large Animal Neonatology. (1.0 cr. [max 2.0 cr.]; S-N or Audit; fall, every year) Instruction, emergency duty, practical application of principles in evaluating/treating sick equine neonates. Seasonal participation in clinically managing hospitalized foals/penned case reviewing past cases.

CVM 6726. Developing Profound Conversations. (1.0 cr.; S-N only; spring, every year) Enhance skills essential for effective clinician-client and interdisciplinary health care delivery, including non-verbal communication, empathy, emotional intelligence, deep listening, and mindfulness. Horses are used as a non-judgmental indicator of behavior.

CVM 6727. Equine Palpation. (1.0 cr.; S-N only; prereq DVM or #; fall, every year) Hands-on clinical experience in evaluation of equine reproductive status and reproductive disorders.

CVM 6728. Reproductive Diseases of the Horse. (1.0 cr.; A-F or Audit; prereq DVM 3rd yr or #; fall, every year) Reproduction patterns, breeding practices, management, artificial insemination, economics of reproductive performance, and infertility in horses.

CVM 6732. Equine Dentistry and Preventative Medicine. (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq 3rd or 4th yr DVM or #; intended for equine track or mixed track students; fall, spring, summer, every year) Two-week rotation on dental health care and general preventative health care for horses.

Field trips, presentations, labs, case studies, clinical cases.

CVM 6733. Equine Dentistry and Nutrition. (2.0 cr. [max 4.0 cr.]; A-F only; fall, spring, every year) Equine dentistry and practical abilities for diagnosis/treatment of dental disorders. Equine nutrition and the practical application of common nutrition related health problems. Lectures, hands on activities, group work, and case correlates.

CVM 6736. Equine Lameness and Podiatry. (2.0 cr. [max 4.0 cr.]; A-F only; prereq Intended for equine track or mixed track students; fall, spring, summer, every year) Rotation introduces diagnosis/treatment of equine lameness/hoof disorders. Clinical cases, presentations, case studies, labs.

CVM 6737. Equine Sports Medicine. (2.0 cr.; A-F only; prereq 6736; spring, every year) Equine lameness and podiatry. Develop lameness and evaluation skills. Diagnostic principles for identifying lameness. Medical, surgical and rehabilitation therapies available to treat lameness. Didactic material, labs, and clinical cases.


CVM 6748. Equine Theriogenology Advanced (ETHA). (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, every year) Students are in charge of equine management decisions: select mares from teaching herd, use palpation and ultrasound/ pharmacologic aids to ensure timely breeding to frozen semen, which was frozen/assessed by students. Students participate in equine theriogenology cases admitted to Veterinary Medical Center.

CVM 6750. Equine Sports and Rehabilitation Medicine. (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr or #; intended for equine track or mixed track students; fall, spring, every year) Rotation on equine sports medicine, exercise physiology, and rehabilitation therapy. Common injuries, prevention/management protocols. Principles/practices of athletic conditioning, performance testing, and rehabilitation therapy. Field trips, presentations, labs, case studies, clinical cases.

CVM 6752. Advanced Equine Elective I. (1.0 cr.; A-F only; prereq Veterinary core curriculum for Advanced Equine Elective 1; summer, every year) More depth on equine health topics than offered in core curriculum. Includes cadaver lab and two live horse exercises.
CVM 6753. Advanced Equine Elective II. (3.5 cr.; A-F or Audit; prereq 6752; fall, spring, every year) Lecture format. Topics in equine medicine. More depth than core veterinary courses.

CVM 6789. Fresh Dairy Doe and Newborn Goat Kid Management. (2.0 cr. [max 4.0 cr.]; A-F only; spring, every year) Rotation at Poplar Hill Goat Dairy during fresh doe/goat kid season. How to recognize, diagnose, and treat kid illnesses. Health strategies to control Johne’s, caprine arthritis encephalitis virus, coccidiosis, nodular diarrhea, mastitis, parasitism, and nutritional deficiencies.

CVM 6790. Advanced Small Ruminant Practice. (1.5 cr. [max 3.0 cr.]; A-F or Audit; prereq DVM 3rd or 4th yr or #; spring, every year) Training beyond core in practice of small ruminants. Common diagnostic/therapeutic procedures.

CVM 6792. Small Ruminant Health and Production Rotation (5SmRu). (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Sheep, goat, llama, farmed-deer production, medicine, and health. Nutrition/health management, new stock, facility maintenance, husbandry, diagnosis, record keeping, zoonosis, necropsy. Reproductive management. Breeding soundness, body condition, vasectomy, ultrasound, castration, tail docking, disbudding, dehorning, vaccination, parasites, restraint/handling, venipuncture, foot trimming, tuberculin testing. Farm visits.


CVM 6794. Cameld Medicine, Surgery, Reproduction, and Health Management. (2.0 cr. [max 4.0 cr.]; A-F only; prereq 3rd or 4th yr DVM or #; spring, every year) Two-week rotation. Approximately 15 farm visits are made to alpaca/llama farms. Approximately 10 alpacas/llamas are evaluated at VMC. Hands-on learning environment. Physical exam: venipuncture, ultrasound, field surgeries such as castration, dental work, foot trimming, venipuncture, body condition score, preventive herd health management, pharmaceuticals. Common medical/reproductive problems. Interstate health certificates. Tuberculosis testing and necropsy.


CVM 6797. Beef Production Systems Medicine: Cow-Calf (SPSCC). (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Beef production medicine and health management. How cow-calf medicine fits within the larger North American beef production system. Cow-calf beef production system and related preventative/therapeutic health management programs, purchasing/introducing new stock, marketing systems, facility requirements/design, husbandry, field diagnostics, reproductive management, breeding soundness evaluations, vaccine protocols, record keeping and economics, calving management, body condition scoring, and calf scour management and treatment. Farm visits to evaluate production systems with field trips to high/low health cow-calf operations with focus on problem solving and discussions of on farm disease cases and important industry topics.

CVM 6800. Bovine Palpation. (1.0 cr.; S-N only; prereq DVM or #; fall, every year) Practice in diagnostic evaluation of bovine reproductive tract.

CVM 6803. Advanced Bovine Practice: Laboratory Block. (1.0 cr.; S-N or Audit; prereq [6802. [DVM 3rd or 4th yr]] or #; spring, every year) Cattle health, production medicine. Topics not included in core, more extensive discussion of conditions introduced in core.

CVM 6804. Bovine Surgery. (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Technical/theoretical skills in management of individual cow surgical diseases. Emphasizes abdominal/urogenital surgery of dairy cow. Discussion, labs. Students research topics and prepare for surgery.

CVM 6805. Food Animal and Exotic Animal Anesthesia. (0.5 cr.; S-N or Audit; prereq 5321 or equiv; spring, every year) Techniques/complications of sedation, local anesthesia, and general anesthesia in ruminants, pigs, and some large exotic species. Cases demonstrate anesthetic management of clinical problems common in veterinary practice.

CVM 6806. Food Animal Disease and Diagnostics. (2.0 cr. [max 4.0 cr.]; prereq 3rd or 4th yr DVM student or #; spring, every year) Two-week rotation. Food animal necropsies, diagnostic assays.

CVM 6810. Food Animal Basics. (2.0 cr.; S-N only; prereq Successful completion of first 2 years of DVM curriculum; spring, every year) Therapeutic principles and vaccinology; animal housing and welfare, diagnostic approaches for populations; genetic improvement and biosecurity. Holistic appreciation of major issues in animal health and production. Preparation for food animal rotations in senior year.

CVM 6811. Dairy Theriogenology Palpation (DThP). (2.0 cr. [max 20.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Palpating the reproductive tract of the cow per rectum. On-farm reproductive record systems. Evaluating dairy herd reproductive performance through DHI reports. Dairy Comp 305 and DairyCHAMP reports. Farm visits, case discussions, laboratories, student presentations.

CVM 6813. Miracle of Birth. (2.0 cr. [max 4.0 cr.]; A-F only; prereq 3rd or 4th yr DVM or #; fall, summer, every year) Delivery of calves, lambs, and piglets at the Minnesota State Fair/assist in public education about large animal veterinary medicine processes. Birthing and veterinary assistance of the birthing process. Media relations/ interviews. Students work with large animal veterinarians, FFA students, and instructors in this rotation.

CVM 6821. Dairy on Farm Clinical (DOFC). (2.0 cr. [max 12.0 cr.]; A-F only; prereq 3rd or 4th yr DVM student or #; fall, spring, summer, every year) Typical transition cow management, clinical veterinary care. Students assist in all aspects of day-to-day management of TMF. Fresh cow screening/therapies, calvings, routine animal management. Students live at TMF during rotation.


CVM 6827. Dairy Production Medicine 2. (2.0 cr. [max 4.0 cr.]; prereq 6818, 6826, [3rd or 4th yr DVM or #]; summer, every year) Rotation expand on topics listed under Dairy Production Medicine 1.

CVM 6828. Dairy Production Medicine 3. (2.0 cr. [max 4.0 cr.]; prereq 6818, 6826, 6827, [3rd or 4th yr DVM or #]; summer, every year) Rotation provides additional training following Dairy Production Medicine 2.

CVM 6829. Dairy Production Medicine 4. (2.0 cr. [max 4.0 cr.]; prereq [6818, 6826, 6827,
CVM 6830. Overview of Dairy Production Medicine. (2.0 cr.; A-F only; spring, every year)
Dairy production medicine concepts/skills. Reproductive management, mastitis, epidemiology, records, nutrition, youngstock, housing, lameness. Mix of lectures, in-class exercises or laboratory sessions. At least one field trip.

CVM 6831. Food Animal Medicine Directed Studies. (0.5 to 9.0 cr.; max 27.0 cr.; A-F only; prereq Submission of proposal, faculty member approval; fall, spring, every year)
Students work with faculty member on special topic project in food animal area.

CVM 6841. Swine Behavior. (0.5 cr. [max 2.0 cr.]; prereq [3rd or 4th yr] DVM or #; spring, every year)
Common considerations in swine behavior.

CVM 6842. Swine Disease Diagnostics, Therapeutics, and Prevention (SDxT). (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, every year)
Major diseases and high-health technologies. Field trips of high-flow/health farms, abattoir for slaughter checks. Problem solving, discussion of on-farm disease cases. In-clinic diagnostic techniques.

CVM 6845. Swine Production Training (SPTTr). (2.0 cr. [max 8.0 cr.; prereq 3rd or 4th yr DVM or #; fall, spring, summer, every year)
Day-to-day management of modern swine farm. Students assist with all techniques, protocols, and practices encountered daily in swine unit, conduct any necessary necropsies or surgical techniques, investigate production/health problems. On final day of rotation, students lead herd visit, summarize findings with producer and course coordinator, and write a herd report.

CVM 6854. Introduction to Swine Health and Production. (2.0 cr. [max 12.0 cr.;] summer, every year)
Clinical problem solving based on case examples, first-hand field experiences. Students visit/assess enterprises representing all components of pork chain, from feed milling, to animal production, to slaughter/process. Roles/responsibilities veterinarians have in food animal production. Problem definition/investigation. Formal follow up, report writing, oral presentation of recommendations.

CVM 6856. Advanced Swine Health and Production. (2.0 cr. [max 12.0 cr.;] summer, every year)
Capstone course. Complex field problems. Student teams take a field case, work it up, and propose steps for farm to resolve problems. Lectures, in-class exercises, field trips.

CVM 6860. Integrating Laboratory Diagnostics With Field Investigations of Swine Disease. (2.0 cr. [max 4.0 cr.;] prereq DVM 3rd or 4th yr or #; spring, every year)
Students follow selected swine disease investigations, from farm through diagnostic lab and back, determine impact of specific swine diseases on productivity and cost of production, design a control program, and collect/submit quality samples to diagnostic lab.

CVM 6865. Introduction to Swine Production Medicine. (1.0 cr. [max 2.0 cr.]; A-F only; prereq DVM student or #; spring, every year)
Contemporary approaches to swine practice. Swine production, disease diagnosis. Control, treatment, eradication.

CVM 6882. Companion Birds (ComB). (2.0 cr. [max 4.0 cr.;] prereq DVM 3rd or 4th yr or #; fall, spring, every year)
Avian medicine/surgery relating to companion birds. Hands-on experience in local avianries and breeding facilities. Acquisition of basic avian clinical skills in the Raptor Center.

CVM 6883. Raptor Center. (2.0 cr. [max 4.0 cr.;] prereq 6497, DVM 3rd or 4th yr, #; fall, spring, summer, every year)
Students participate in all aspects of raptor medicine, surgery, and rehabilitation and gain avian experience. Conservation medicine.

CVM 6884. Poultry Medicine Clerkship (PMC). (2.0 cr. [max 8.0 cr.;] A-F only; fall, spring, summer, offered periodically)
Broller, layer, and turkey industries, performance analysis, disease diagnosis, management techniques for prevention/control of disease, food safety problems and diagnostic pathology in a laboratory setting. Classroom presentations, discussions, on-farm evaluations.

CVM 6900. Microscopic Anatomy. (4.0 cr.; A-F only; fall, )
Identification, description, understanding of basic structure/elements of cells/basic tissues. Identify/describe structure/organization of organ systems presented.

CVM 6901. Physiology I. (5.0 cr.; A-F only; fall, every year)

CVM 6902. Veterinary Biochemistry, Nutrition & Genetics. (3.0 cr.; A-F only; fall, every year)
Principles of biochemistry, genetics, nutrition. Background information/how it is used to understand animal health/disease. Examples reinforced with in-class/out-of-class problems.

CVM 6903. Anatomy I. (5.0 cr.; A-F only; fall, every year)
Sequential integration of normal gross/radiographic anatomy of carnivore. Knowledge gained provides solid foundation for current/subsequent courses within veterinary professional curriculum.

CVM 6904. Clinical Skills I. (1.0 cr. [max 2.0 cr.;] S-N only; prereq 1st year clinical skills course; fall, every year)
Introduction to small/large animal species. Fundamental clinical skills for small/large animal species. Proper physical exam, safe handling/restraint, behavior/animal safety, frequently used clinical skill procedures. Large animal practicum.

CVM 6905. Professional Development I. (1.0 cr.; S-N only; )

CVM 6906. Critical Scientific Reading. (2.0 cr.; S-N only; spring, every year)
Skill development in reading of scientific literature. Papers critiqued for experimental design, statistical analysis, validity of results, contributions to literature, merit of study conclusions.

CVM 6907. Professional Development II. (1.5 cr.; S-N only; spring, every year)
Develop knowledge/proficiency needed to be successful veterinarian in areas such as communication, ethics, clinical decision-making, medical record keeping. Lecture, hands-on experiences, small group/mentor group discussions.

CVM 6908. Anatomy II. (3.0 cr. [max 5.0 cr.;] A-F only; spring, every year)
Sequential integration of normal gross/radiographic anatomy of ungulates. Knowledge gained will provide solid foundation for current/subsequent courses within veterinary professional curriculum.

CVM 6909. Clinical Skills II. (1.0 cr.; A-F only; spring, every year)
Domestic animal behavior. Basic small animal handling/management skills. Introduction to hospital. Small-animal clerk duty is required.

CVM 6910. Physiology II. (5.0 cr.; A-F only; spring, every year)
Anatomic strategies adopted by different animal species to achieve same/similar function. Important physiologic processes used by animals to maintain homeostasis. Neural, endocrine, paracrine regulation of organ systems. Intermediate metabolism.

CVM 6911. Immunology. (2.0 cr.; A-F only; spring, every year)
Immunology

CVM 6912. Basic Pathology. (2.0 cr.; A-F only; spring, every year)
Mechanisms in reactions of cells/tissues to injury. Retrogressive changes in cells, cell death, pigments, circulatory disturbances, inflammation, alterations of cell growth (including neoplasia). Applications to evaluation of gross/microscopic tissue alterations.

CVM 6913. Agents of Disease I. (4.0 cr.; A-F only; spring, every year)
Mechanics of agent-host interactions in important animal diseases. Become familiar using literature to understand/solve infectious disease problems, evaluate strategies for
controlling diseases. Basic structure of viruses, bacteria, parasites.
CVM 6914. Preventive Medicine . (4.0 cr.; A-F only; fall, spring, every year)
Concepts of preventive medicine. Information reinforced in other coursework. Short video lectures/notes on website for access throughout training.

CVM 6915. Clinical Pathology I. (2.0 cr.; A-F only; fall, every year)
Normal/abnormal function of hematopoietic system. Pathophysiologic changes underlying serum biochemical abnormalities. Principles/clinical application of cytology as diagnostic tool. How clinical laboratory data is generated/interpreted.

CVM 6916. Clinical Pathology II. (2.0 cr.; A-F only; spring, every year)
Normal/abnormal function of hematopoietic system. Pathophysiologic changes underlying serum biochemical abnormalities. Principles/clinical application of cytology as diagnostic tool. How clinical laboratory data is generated/interpreted.

CVM 6917. Agents of Disease II. (5.0 cr.; A-F only; fall, every year)
Extends foundational information obtained on viruses, bacteria, parasites in Agents of Disease I into understanding diseases caused by these agents in species of veterinary importance.

CVM 6918. Pharmacology I. (3.0 cr.; A-F only; fall, every year)
General knowledge of pharmacology important for later coursework in veterinary medicine/future successful veterinary practice.

CVM 6919. Systemic Pathology . (5.0 cr. [max 10.0 cr.]; A-F only; fall, every year)
Basic mechanisms of disease in various organ systems. Organ response to injury. Describe or interpret lesions in order to formulate morphological diagnoses/differential diagnoses (etiology). Correlate clinical/laboratory findings with clinical signs or lesions that might occur.

CVM 6920. Clinical Pathology I. (2.0 cr.; A-F only; fall, every year)
Understand/explain normal/abnormal function of hematopoietic system. Principles/clinical application of cytology as diagnostic tool. How clinical laboratory data is generated/interpreted.

CVM 6921. Clinical Skills III. (2.0 cr.; S-N only; fall, every year)
Builds on clinical application of first year veterinary skills. Include 2-3 clinical skills labs throughout year. Hands on practical experience with live animals. Other options include VMC mini rotations, Humane Society visits, SIRVS, RAVS, Gending Project, VIDA, VetTouch other student specific proposals.

CVM 6922. Clinical Epidemiology. (1.5 cr. [max 2.0 cr.]; A-F only; fall, every year)
Concepts, principles, applications of veterinary epidemiology.

CVM 6923. Public Health and Community Practice. (2.0 cr.; A-F only; fall, every year)
Mixture of didactic classroom lectures/in-class discussions/exercises to provide overview of common zoonotic agents/other veterinary public health issues. Emphasis on case-based public health situations.

CVM 6924. Small Animal Medicine I. (2.0 cr.; A-F only; fall, every year)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, management protocol of common/important hematologic, immunologic, infectious diseases of dogs/cats.

CVM 6925. Diagnostic Laboratory. (2.0 cr.; A-F only; fall, every year)
Laboratory experiences designed to help veterinary students practice common clinical tests, understand principles of various types of tests, gain better appreciation of test selection/interpretation. Urinalysis, hematology, serology, detection of parasitic/microbial agents of disease.

CVM 6931. Diseases of Zoo Animals and Exotic Pets. (1.0 cr.; S-N or Audit; prereq DVM or grad or #)
Diseases of and management procedures for zoo animals and exotic pets. Restriction procedures, medication, diagnosis.

CVM 6932. Introduction to Non-Domestic Veterinary Medicine. (1.0 cr.; S-N only; prereq 1st yr DVM or #; fall, every year)
Professions, including zoo, rehabilitation, wildlife, and conservation medicine. Job activities/availability, preparation to obtain a position. Restraint, evaluation, treatment and management of non-domestic species.

CVM 6933. Zoological Medicine (MNZM.). (2.0 cr. [max 20.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year)
Introduction to all aspects of health care of zoo animals. Housing, nutrition, preventative health programs. Students assist zoo veterinarians with immobilizations, examinations, necropsies, laboratory work, records keeping.

CVM 6934. Selected Topics in Zoo Animal Medicine. (2.0 cr. [max 10.0 cr.]; A-F only; prereq DVM 1st or 2nd yr or #; fall, spring, offered periodically)
Year-long course. Expertise needed by a zoo veterinarian, applications to specific captive species. Manage an animal problem or animal group problem, develop diagnostic/management/therapeutic recommendations, research three topics on an assigned species, build reference materials for case care, present findings to keepers at a selected zoo, develop an item for public education.

CVM 6939. Non-Traditional Pet Care. (1.0 cr.; A-F or Audit; spring, every year)
General/reproductive biology, behavior, husbandry, nutrition, handling, restraint, anesthesia. Common diseases, their treatments. Research animal issues. Special considerations of species commonly encountered in small/mixed animal practices (mice, rats, hamsters, gerbils, guinea pigs, chinchillas, rabbits, ferrets, basic aquarium species).

CVM 6941. Clinical Skills IV. (2.0 cr.; S-N only; spring, every year)
Builds on clinical application of first/2nd year fall clinical skills. Includes clinical skills labs throughout year. Hands on practical experience with live animals. Other options include VMC mini rotations, Humane Society visits, SIRVS, RAVS, Gending Project, VIDA, VetTouch other student specific proposals.

CVM 6942. Veterinary Clinical Pathology II. (2.0 cr.; A-F only; spring, every year)
Required readings, didactic classroom lectures, on-line tutorials, group discussions, homework to cover veterinary clinical pathology. Integration of all clinical pathology data available for patient with opportunity for students to distinguish diseases with similar clinical or clinic-pathologic findings.

Veterinary Medicine, Graduate (VMED)

VMED 5080. Problems in Veterinary Epidemiology and Public Health. (1.0-3.0 cr.; A-F or Audit; fall, spring, every year)
Individual study on problem of interest to epidemiology or public health student.

VMED 5082. Diagnostic Epidemiology of Infectious Diseases. (2.0 cr.; A-F only; prereq Statistics course or #; spring, every year)

VMED 5090. Seminar: Veterinary Epidemiology. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq Veterinary Medicine grad student; fall, spring, every year)
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 5101. Molecular and Cellular Basis of Nanoparticle Toxicity. (3.0 cr. [max 6.0 cr.]; A-F or Audit; #; fall, every year)
Use of nanotechnology in scientific research. Impact of nanomaterials on biological systems.

VMED 5165. Surveillance of Foodborne Diseases and Food Safety Hazards. (2.0 cr.; #; [PUBH 6181]; prereq [PUBH 5330, professional school or grad student]] or #; spring, every year)

VMED 5180. Ecology of Infectious Disease. (3.0 cr. #; [CMBI 5180, PUBH 6380]; fall, every year)
How host, agent, environmental interactions influence transmission of infectious agents. Environmental dissemination, eradication/ control, evolution of virulence. Use of analytical/molecular tools.

VMED 5181. Spatial Analysis in Infectious Disease Epidemiology. (4.0 cr.; Student...
Option No Audit; [CMB 5181]; prereq Intro to epidemiology, statistics, #; spring, every year)

VMED 5190. Seminar and Presentation Development. (2.0 cr.; S-N only; prereq Grad student; fall, every year)
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 for Veterinarians. (3.0 cr.; A-F only; fall, every year)
Concepts/tools of economic analysis needed to support decision making on dairy farms, particularly as those decisions relate to health, disease impact, nutrition, general farm management. Prereq Earned DVM, instr consent.

VMED 5196. Dairy Production Medicine. (4.0 cr.; A-F only; prereq DVM degree, #; fall, every year)
Intense eight week course designed to develop advanced knowledge/skills in dairy production medicine. Mixture of lectures, wetlabs, farm investigations, presentations. Held at Dairy Education Center at New Sweden Dairy.

VMED 5210. Advanced Large Animal Physiology I. (1.0-3.0 cr. [max 6.0 cr.]; fall, every year)
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. (1.0-3.0 cr.; A-F or Audit; prereq #; 5210 recommended; spring, every year)
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 5232. Comparative Clinical Veterinary Dermatologic Pathology. (1.0 cr. [max 2.0 cr.]; S-N only; prereq DVM degree or foreign equiv; fall, spring, every year)
Microscopic pathology of basic dermatologic reactions and of variable disease states.

VMED 5240. Advanced Small Animal Pathobiology I. (1.0 cr.; A-F only; fall, every year)
Biology, physiology, pathophysiology, and medicine of disciplines relevant to companion animals. Pathogenesis/treatment of diseases. Developing hypotheses that can be translated into clinical research. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5241. Advanced Small Animal Pathobiology II. (1.0 cr.; A-F only; spring, odd years)
Overview of biology, physiology, pathophysiology, and medicine of disciplines. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5242. Advanced Small Animal Pathobiology III. (1.0 cr.; A-F only; fall, odd years)
Overview of biology, physiology, pathophysiology, and medicine. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5243. Advanced Small Animal Pathobiology IV. (1.0 cr.; A-F only; spring, even years)
Overview of biology, physiology, pathophysiology, and medicine. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5295. Problems in Large Animal Clinical Medicine/Surgery and Theriogenology. (1.0 cr. [max 3.0 cr.]; A-F or Audit; prereq VMED grad student, possess DVM; fall, spring, every year)
Hospital cases using standardized format, audiovisual aids. Review literature pertaining to case. One or two cases presented by enrolled participants per month.

VMED 5310. Topics in Veterinary Clinical Pathology. (1.0 cr. [max 2.0 cr.]; S-N only; prereq Grad student in CVM; fall, spring, every year)
Modified rounds format. Cases from VMC used to explore cytology with associated chemistry/hematology data. Attendees/clinicians can request lab topics for dicussion. Past topics have included lab measurement of chemical analytes, test sensitivity or specificity (e.g., ethylene glycol test, FEV test), lab testing for infectious agents.

VMED 5319. Veterinary Gross Pathology. (1.0 cr. [max 3.0 cr.]; S-N only; fall, spring, every year)
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. Prereq Grad student in CMB or [VMED, [DVM degree or foreign equivalent], college consent]

VMED 5320. Advanced Veterinary Systemic Pathology I. (3.0 cr.; A-F only; prereq Grad student in VMED or [CMB, [DVM degree or foreign equiv]] or #; fall, even years)
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. (1.0 cr. [max 2.0 cr.]; prereq Grad student in VMED or [CMB, [DVM degree or foreign equiv]] or #; fall, spring, every year)
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 5410. Scientific Writing and Speaking. (2.0 cr.; A-F only; prereq Grad student in health sciences; fall, odd years)

VMED 5420. Molecular Epidemiology of Infectious Disease. (3.0 cr.; A-F only; prereq Basic course in microbiology; spring, every year)

VMED 5430. HIV/AIDS: Pathogenesis, Treatment, and Prevention. (1.0 cr.; prereq #)
Exposure to pathogenesis, treatment, and prevention of HIV/AIDS from clinical faculty who are dealing with AIDS patients. Developing new questions and design experiments that have greatest chance of translating to clinical setting.

VMED 5440. Microbial Risk Assessment of Foods. (3.0 cr.; Student Option No Audit; prereq Intro course in microbiology, [basics algebra, calculus, probability theory, probability distributions] or #; spring, every year)
Risk analysis process as part of science-based decision-making. Conduct microbial risk assessment by different steps of hazard identification, hazard characterization, exposure assessment/risk characterization. Qualitative/quantitative tools.

VMED 5496. Training in Swine Production and Management. (4.0 cr.; S-N only; prereq VMED grad student or #; fall, spring, every year)
Production module introduces techniques/protocols for swine production system operation. Research module covers applied research trials for viral/bacterial pathogens in pigs.

VMED 5594. Research in Veterinary Medicine. (0.5-4.0 cr. [max 8.0 cr.]; prereq Jr, #; fall, spring, summer, every year)
Independent study as determined by instructor. Usual activity includes conducting research in instructor's lab, though research in field may also be included.

VMED 5596. Swine Diseases and Diagnostics. (2.0-3.0 cr. [max 2.0 cr.]; fall, spring, every year) Review of recent advances in swine diseases; farm visits for on-farm disease diagnostics and control programs.

VMED 5621. Principles of Veterinary Anesthesiology. (2.0 cr.; A-F only; prereq VMed grad student; [DVM degree or foreign equiv], instr consent; spring, every year) In-depth training in principles of veterinary anesthesiology. Lectures, anesthesia labs, presentations by students.

VMED 5670. Bovine Surgery Practicum. (2.0 cr.; S-N only; prereq [VMed grad student, [DVM or equiv foreign degree]] or #; fall, spring, every year) Intensive training in ruminant surgery. Evaluation of food animal surgery principles, hands-on laboratory components.

VMED 5910. Grant Writing: What Makes a Winning Proposal?. (2.0 cr.; [S-N only; prereq Grad or professional student or #; fall, spring, every year) Components of a strong proposal. Grant submission process. What reviewers look for. How to locate grant announcements that match research interests.

VMED 5920. Food Defense: Prepare, Respond, Recover. (3.0 cr.; A-F only; prereq Grad or professional student or #; fall, every year) Basic principles of preparedness/emergency response. Instructor may substitute topics if timelier topic arises.

VMED 5921. Seminar in Food Protection and Defense. (1.0 cr.; fall, spring, every year) Complexities of our food systems. Natural/intentional threats to food security within various industry sectors. Which agencies are responsible for regulating food chains, monitoring food safety, responding to contamination events.

VMED 5991. Animal Health and Food System Policy and U.S. State government. (1.0 cr. [max 2.0 cr.]; S-N only; fall, spring, every year) Policy making process. Animal health, public health, food systems at state/provincial levels. Science, politics, belief in developing/implementing policy.

VMED 5992. Animal Health and Food System Policy and U.S. National Government. (0.0-1.0 cr.; S-N only; prereq DVM or equiv degree or current DVM student or #; spring, every year) Evidence-based policy development. Relevant global animal health and food system issue. Role of scientific evidence in developing/implementing policy. Policy-making process as it pertains to trade, animal health, and food system at national level, as well as role of scientific evidence.

VMED 5993. Animal Health and Food System Policy and Intergovernmental Organizations. (1.0 cr.; S-N only; prereq DVM or equiv degree or current DVM student or #; spring, every year) Evidence-based policy development. Relevant global animal health and food system issue. Role of scientific evidence in developing/implementing policy. Policy-making process as it pertains to trade, animal health, and food system across intergovernmental organizations. Role of scientific evidence in intergovernmental organization's policy development.

VMED 5994. Advanced Clinical Epidemiology. (1.0 cr.; A-F only; fall, every year) An in-depth focus on infectious disease epidemiology, with opportunities to apply epidemiologic principles to control infectious diseases in animal populations.

VMED 5995. Engaging Intergovernmental Organizations. (1.0 cr.; S-N only; fall, spring, every year) Relevant policy issue/roles of intergovernmental organizations. Discussions/debate about current issue, interact with key officials, perform group task assignments, develop/deliver presentation to relevant leaders.

VMED 5996. Professional Communications: Current Veterinary, Public Health and Food System Issues. (1.0 cr. [max 2.0 cr.]; S-N only; prereq Students must have a professional or graduate degree related to human, animal, or ecosystem health or be pursuing a graduate degree (MS/PhD) or professional masters (MPH/MPA) or #; spring, every year) Critical review of scientific/lay literature. Principles of risk communication. Presentation of scientific information. Prepare/critique executive summaries of current topics for CAHFS Daily News. Support media interactions of CAHFS faculty. Generate fact sheets for use on CAHFS website.

VMED 5997. Farm to Table Study Program. (1.0 cr.; prereq #; fall, every year) Explore food system within specific country while considering aspects of animal welfare/health, food safety, food protection, public health. Site visits along food supply chain. Discussions with government/private sector leaders. Interactive cross-culture group activities.

VMED 5998. Leadership to Address Global Grand Challenges. (1.5 cr.; Student Option No Audit; prereq Grad or professional student; spring, every year) Leadership strategies useful in addressing global grand challenges. Practices that foster collective action across diverse groups of people. Mapping polarities/balancing paradox. Inclusive decision-making processes.

VMED 5999. Professional Communications: Agendas, Minutes, Briefing Memos, Decision Memos. (1.0 cr.; S-N only; prereq Professional or graduate degree related to human, animal, or ecosystem health or be pursuing a graduate degree (MS/PhD) or professional masters (MPH/MPA) or #; fall, every year) Improve professional communications to increase effectiveness of meetings, conference calls. Enhance influence of emails, minutes, issue briefs/decision memos. Compose/critique meeting agendas, minutes, notes, summaries, e-mails, trip reports. Produce issue briefs/decision memos.

VMED 8090. Epidemiology of Zoonoses and Diseases Common to Animals and Humans. (3.0 cr.; A-F or Audit; prereq Epidemiology and infectious disease course or #; fall, spring, every year) Major human zoonotic diseases, methods of transmission, diagnosis, control, and prevention.

VMED 8134. Ethical Conduct of Animal Research. (3.0 cr.; A-F or Audit; #; spring, every year) 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 proper conduct. Societal impact on scientific investigations utilizing animal subjects.

VMED 8220. Advanced Nephrology/Urology Clinics. (1.0-3.0 cr.; #; fall, spring, every year) Clinical investigation of naturally occurring urinary diseases in patients admitted to Veterinary Medical Center.

VMED 8230. Medical Conference. (1.0 cr. [max 2.0 cr.]; prereq #; fall, spring, every year) Participation in weekly conference about internal medical disorders.

VMED 8250. Problems in Acid-base, Electrolyte, and Fluid Metabolism. (2.0-4.0 cr.; #; A-F or Audit; prereq #; fall, spring, every year) Clinical problems and physiology of acid-base, electrolyte, and fluid disorders of dogs and cats.

VMED 8292. Journal Club: Large Animal Internal Medicine. (1.0 cr. [max 3.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically) 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. (1.0-3.0 cr.; A-F or Audit; prereq #; spring, every year) Studies of urinary tract disease with goal of generating new knowledge.

VMED 8333. FTE: Master’s-. (1.0 cr. [max 2.0 cr.]; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

VMED 8360. Evidence-based Medicine. (2.0 cr.; #; A-F or Audit; prereq #; fall, spring, every year) Use of medicine literature in clinical problem solving.
VMED 8394. Research in Veterinary Medicine. (1.0-3.0 cr.; prereq #; fall, spring, every year)
Research problems relating to any aspect of internal medicine or to the various systems in animals.

VMED 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

VMED 8492. Seminar: Infectious Diseases and Swine Medicine. (1.0 cr. [max 2.0 cr.]; fall, spring, every year)
Students, faculty, and guest speakers present seminars on current research in diagnosis, control, and treatment of infectious diseases.

VMED 8520. Advanced Immunology. (2.0 cr.; spring, every year)
Lectures and case presentations.

VMED 8550. Veterinary Medicine Seminar. (1.0 cr. [max 2.0 cr.]; S-N only; prereq Grad student; fall, spring, every year)
Seminar. Exposure to research activities of CMB and VMED students and faculty. Students prepare/present a 20 minute seminar on their original research.

VMED 8592. Infectious Disease Journals: Critical Thinking. (1.0 cr.; fall, spring, summer, every year)
Reading and critical discussion of journal articles.

VMED 8593. Advanced Veterinary Virology and Serology. (1.0-3.0 cr.; fall, spring, every year)
Discussion and laboratory practice.

VMED 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year)
tbd

VMED 8682. Advanced Large Animal Surgery. (2.0 cr. [max 6.0 cr.]; A-F or Audit; prereq DVM or equiv degree; #; fall, spring, every year)
Surgery of various systems in large animals, with preoperative and postoperative evaluation and management.

VMED 8684. Surgical Physiology. (1.0-3.0 cr.; fall, spring, offered periodically)
Discussions on pathophysiology of surgical diseases in dogs and cats.

VMED 8685. Neurosurgery. (2.0-3.0 cr.; A-F or Audit; fall, spring, every year)
Advanced neurosurgical diseases of small animals amenable to surgical treatment.

VMED 8686. Thoracic and Cardiovascular Surgery. (2.0-4.0 cr.; A-F or Audit; fall, spring, every year)
Advanced thoracic and cardiovascular diseases of small animals amenable to surgical treatment.

VMED 8693. Seminar: Large Animal Surgery. (1.0 cr. [max 6.0 cr.]; A-F or Audit; prereq DVM or equiv degree; #; fall, spring, every year)
Discussion of current literature and surgery board preparation.

VMED 8696. Research in Critical Care/Emergency Medicine. (1.0-3.0 cr.; prereq DVM or equiv degree; fall, spring, every year)
Special problems course. Controlled study; prospective and retrospective models of evaluation are defined, critiqued, and used for experimental design and data collection to validate research methods.

VMED 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

VMED 8780. Advanced Avian Critical Care: Principles and Procedures. (2.0 cr.; A-F or Audit; prereq Course each in vet pathology, physiology, pharmacology, anatomy, small animal anesthesiology and critical care; spring, every year)
Procedures and protocols for managing avian medical emergencies such as starvation, toxicities, respiratory failure, and massive trauma.

VMED 8781. Seminar: Advanced Veterinary Anesthesiology. (1.0-3.0 cr.; A-F or Audit; prereq [CVM 6321, CVM 6322] or equiv], grad student; fall, every year)
Active interaction around topics of advanced anesthesiology in veterinary species.

VMED 8788. Seminar: Veterinary Critical Care/Emergency Medicine. (1.0 cr.; A-F or Audit; prereq DVM or equiv degree; fall, spring, every year)
Current topics.

VMED 8793. Seminar: Veterinary Anesthesiology. (1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq [CVM 6321 or equiv], DVM degree; fall, spring, every year)
Discussion and presentations; for veterinary anesthesiology and surgery residents and graduate students.

VMED 8796. Avian Anesthesia and Orthopedic Surgery. (1.0-3.0 cr.; A-F or Audit; prereq courses in vet anesthesia, vet small animal orthopedics; fall, spring, every year)
Current methods for anesthetizing raptors, psittacine birds, and waterfowl. Lecture and lab on current methods for avian fracture bone fixation.

VMED 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)