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## Courses

### Accounting (Act)

**Department of Accounting**

**Curtis L. Carlson School of Management**

### Act 5100. Corporate Financial Reporting.** (4 cr; QP—Mgmt student, non acct major; SP—Mgmt student, non acct major; A-F only)

- **Overview of asset/liability valuation and income measurement. Focus on how economic events are reported in the financial statements. Examines accounting theory and the accounting standard-setting process.**

### Act 5101. Asset Valuation and Income Determination I.** (4 cr; QP—Minimum grade of B- in 1050, mgmt or grad mgmt student; SP—Minimum grade of B- in 2050, mgmt or grad mgmt student; A-F only)

- **Valuation, measurement, and reporting issues related to selected assets and liabilities of the firm. Students are expected to understand the theory that underlies accounting issues and to become technically proficient in the application of accounting principles.**

### Act 5102. Liability Valuation and Income Determination.** (4 cr; QP—3101 or 5101, mgmt or grad mgmt student; SP—5101, mgmt or grad mgmt student; A-F only)

- **Extends understanding of the basic valuation problems encountered in financial reporting, focusing on the valuation of liabilities. Covers accounting for leases, pensions, deferred taxes. Introduces consolidated financial statements.**

### Act 5125. Auditing Principles and Procedures.** (4 cr; QP—3101 or 5101, acct major; SP—5101, acct major; A-F only)

- **Auditing financial information systems. Independent audits and internal auditing. Ethics. Legal responsibilities.**

### Act 5126. Internal Auditing.** (2 cr; QP—3101 or 5101; SP—5101; A-F only)

- **Financial and operational auditing. Standards. Managing the function.**

### Act 5133. Fundamentals of Federal Income Tax.** (4 cr; QP—1050 or 5130 or 5131, mgmt or grad student; SP—1050 or 5131, mgmt or grad mgmt student; A-F only)

- **Introduction to the United States federal system of taxation. Concepts of gross income, deductions, and credits. Analysis of the structure of the Internal Revenue Code and its provisions with respect to specific areas of the law. Examination of the interrelationships between legislative, judicial, and administrative authority. Introduces the various methods, tools and techniques to conduct tax research.**

### Act 5150. Current Financial Accounting Issues.** (2 cr; QP—MBT student, 1050; SP—MBT student, 2050; A-F only)

- **Accounting principles and practices underlying preparation of financial statements and additional disclosures. Includes recent pronouncement on financial accounting.**

### Act 5160. Financial Statement Analysis.** (4 cr; QP—3101 or 5100 or 5101, acct or finance major; SP—5100 or 5101, acct or finance major; A-F only)

- **Interpretation and analysis of financial statements. Introduces basic techniques of financial statement analysis and applies them in different settings such as investment and credit decisions.**

### Act 5180. Consolidations and Advanced Reporting.** (2 cr; QP—5102; mgmt or mgmt grad student; SP—5102, mgmt or mgmt grad student; A-F only)

- **Theory underlying the preparation of consolidated financial statements, as well as the mechanical computations needed to prepare the statements themselves.**

### Act 5200. Tax Accounting Methods and Periods.** (4 cr; QP—MBT student; 5135; SP—MBT student; 5135; A-F only)

- **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.**

### Act 5220. Tax Research, Communication, and Practice.** (4 cr; QP—MBT student; 5135; SP—MBT student; 5135; A-F only)

- **In-depth treatment of tax research methodology including tax questions, locating potential authority, assessing potential authority, and communicating research results. Substantive material on dealing with the IRS including sources of IRS policy; processing returns, auditing returns; rulings and determination letters; closing agreements; assessments and collections.**

### Act 5230. Corporate Taxation I.** (2 cr; QP—MBT student; 5135; SP—MBT student; A-F only)

- **Federal income taxation of corporations and shareholders. Organization of a corporation; establishment of its capital structure; determination of its tax liability; dividends and other nonliquidating distributions; stock redemptions, and liquidations.**

### Act 5236. Introduction to Taxation of Business.** (2 cr; QP—5135, acct major; SP—5135, acct major; A-F only)

- **Introduction to the income tax laws governing the taxation of corporations, partnerships, limited liability companies, limited liability partnerships, and S corporations. Students will also increase their knowledge and skills related to tax research by writing research memoranda.**

### Act 5271. Accounting Information Systems.** (2 cr)

- **Topics Special in Financial Reporting.** (2 cr; QP—5102, mgmt or grad mgmt student; SP—5102, mgmt or grad mgmt student; A-F only)

- **Covers areas of financial reporting frequently covered on the CPA exam, including partnerships, foreign operations, and accounting for government and nonprofit organizations.**

### Act 5310. International Accounting.** (2 cr; QP—1050, mgmt or grad mgmt student; SP—2050, mgmt or grad mgmt student; A-F only)

- **Review of macroeconomic concepts of international economics including trade, international markets for capital, and the role of accounting. Survey of different accounting policies and approaches among nations. Reading and understanding financial statements produced in countries other than the United States.**

### Act 5320. Current Topics in Accounting.** (2 cr; QP—5102, acct major; SP—5102, acct major; A-F only)

- **Selected topics in accounting. Topics vary.**

### Act 5325. Advanced Tax Principles.** (2 cr; QP—5135, MBT student; SP—5135, MBT student; A-F only)

- **In-depth coverage of issues affecting all tax entities, focusing on topics pertaining to individuals and partnerships: at-risk provisions, passive activity loss limitations; Alternative Minimum Tax/AMT credit for individuals, tax benefit rule and claim of right doctrine, like-kind exchanges of personal property, net operating losses, hobby losses, and business/rental use of residences.**

### Act 5330. Taxation of Corporations I.** (2 cr; SP—MBT student; A-F only)

- **Corporate readjustments related to multiple corporations and consolidated returns.**

### Act 5333. Tax Aspects of Consolidated Returns.** (2 cr; SP—5230, MBT student; A-F only)

- **Covers aspects of filing, including federal income tax returns. Includes determining affiliated groups; election and filing requirements; intercompany transactions, limitations on certain loss and credit carryforwards; allocation of federal income tax liability; E&P and investment basis adjustments; loss allowance rules; and excess loss accounts.**

### Act 5335. Taxation of the Small Business Corporation.** (2 cr; SP—5135, MBT student; A-F only)

- **Federal income taxation of S corporations. Election eligibility; termination of status; treatment of income and deduction items; distributions of 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.**

### Act 5340. Taxation of Partners and Partnerships.** (2 cr; QP—5135, MBT student; SP—5135, MBT student; A-F only)

- **Reviews tax consequences associated with formation, operation, and dissolution of a partnership.**

### Act 5350. Taxation of Estates and Gifts.** (2 cr; QP—5135, MBT student; SP—5135, MBT student; A-F only)

- **Taxation of transfers under federal estate and gift tax laws. Includes property owned by the decedent; retained life estates; transfers taking effect at death; revocable transfers; joint interest; powers of appointment; valuation problems; debts and taxes; charitable bequests, marital deduction, taxable inter vivos gifts, splitting and credits.**

### Act 5351. Estate Planning.** (2 cr; QP—5135, MBT student; SP—5135, MBT student; A-F only)

- **Addresses various topics related to planning the transfer of property during lifetime and at death.**

### Act 5353. Income Taxation of Fiduciaries.** (2 cr; QP—5135, MBT student; SP—5135, MBT student; A-F only)

- **Simple, complex, and revocable trusts; estates; accumulation distributions, income in respect of decedents; trust accounting income and principal; distributable net income; terminations; and excess distributions.**

### Act 5356. Taxation of Compensation Arrangements.** (2 cr; QP—5135, MBT student; SP—5135, MBT student; A-F only)

- **Federal income taxation of corporate deferred compensation and fringe benefits with emphasis on pension plans, profit sharing plans, stock option plans, individual retirement accounts, annuities, and insurance, medical related compensation benefits, and reporting requirements.**

### Act 5360. State and Local Taxation.** (2 cr; QP—5135, MBT student; SP—5135, MBT student; A-F only)

- **Examines state levying of individual income, corporate income, property, sales, and excise taxes. Tax problems of businesses with multistate operations.**

### Act 5370. Taxation of Property Transactions.** (2 cr; QP—5135, MBT student; SP—5135, MBT student; A-F only)

- **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.**

### Act 5380. Tax Aspects of International Business I.** (2 cr; SP—5230, MBT student; A-F only)

- **Multinational business operations and transactions involving foreign income. Tax consequences of transactions with foreign organizations and by related foreign companies.**

### Act 5381. Tax Aspects of International Business II.** (2 cr; SP—5380, MBT student; A-F only)

- **Foreign tax credit and Subpart F planning opportunities, international structuring (including joint ventures and use of the new entity classification regulations), transfer pricing, and foreign currency. Recent legislative, regulatory, and judicial developments in the international tax area, and the challenges and opportunities presented by these developments.**
Courses

Adult Education

AdEd 5390. Topics in Taxation. (1-4 cr; QP- MBT student; SP- MBT student)
Current tax legislation and problems. Topics may vary.
S-N grading allowed with MBT program approval.

Modern macroeconomics and its effects on taxation and public finance including government expenditures. History of taxation and the institution and individuals affecting tax policy. Goals of an effective tax system and various proposed major tax reforms.

AdEd 8801. Empirical Research in Capital Markets. (4 cr; SP- Business admin PhD student or #; offered alt yrs)
Econometric studies of information contained in accounting numbers; volume and price reactions to accounting disclosure; earnings management; accounting based valuation; market microstructure.

AdEd 8802. Emerging Issues in Accounting. (4 cr [max 8 cr]; SP- Business admin PhD student or #; offered alt yrs)
Topics vary.

AdEd 8811. Information Economics I. (4 cr; SP- Business admin PhD student or #; offered alt yrs)
Asymmetric information, incentives, and contracts. Moral hazard, adverse selection, reputation, and signaling phenomena. Applications to accounting such as transfer pricing, signaling, cost allocations, performance measurement, audit pricing.

AdEd 8812. Information Economics II. (4 cr; SP- Business admin PhD student or #; offered alt yrs)
Information in capital markets; asset pricing with asymmetric information; economics of disclosure and information acquisition.

AdEd 8821. Experimental Economics. (4 cr; SP- Business admin PhD student or #; offered alt yrs)
Auction markets; price formation in experimental asset markets; experimental studies of information transfer, pricing efficiency, and experimental tests of strategic behavior, trust, and reciprocity.

AdEd 8822. Behavioral Research in Accounting. (4 cr; SP- Business admin PhD student or #; offered alt yrs)
Heuristics and biases in information processing, auditor judgment, mental accounting, and decision aids.

AdEd 8892. Readings in Accounting. (1-8 cr [max 16 cr]; SP- Business admin PhD student or #)
Readings appropriate to an individual student’s program or objectives that are not available in regular courses.

AdEd 8894. Research in Accounting. (1-8 cr [max 16 cr]; SP- Business admin PhD student or #)
Individual research on an approved topic appropriate to student’s program and objectives.

Adult Psychiatry

AdPy 5515. Neuropsychology: University Hospitals. (3-9 cr)

AdPy 5602. Clinical Psychopharmacology Seminar. (3-9 cr)

AdPy 5800. Case Conference: Psychiatry in Medicine. (3-9 cr)

AdPy 5801. Consultation-Liaison Psychiatry. (3-9 cr)

Aerospace Engineering and Mechanics (AEM)

Department of Aerospace Engineering and Mechanics
Institute of Technology

AEM 5401. Intermediate Dynamics. (3 cr; QP- IT upper div or grad student, 3036, Math 2261; SP- IT upper div or grad student, 2012, Math 2243)
Three-dimensional Newtonian mechanics, kinematics of rigid bodies, dynamics of rigid bodies, generalized coordinates, holonomic constraints, Lagrange equations, applications.

AEM 5501. Continuum Mechanics. (3 cr; QP- IT upper div or grad student, AEM 3016, Math 2261, or #; SP- IT upper div or grad student, 3031, Math 2243 or equiv or #; Concepts common to all continuous media; elements of tensor analysis; motion, deformation, vorticity; material derivatives; mass, continuity equation; balance of linear, angular momentum; geometric characterization of stress; constitutive equations.

AEM 5503. Theory of Elasticity. (3 cr; QP- IT upper div or grad student, 3515 or equiv, Math 2252 or #; SP- 4501 or equiv, Math 2263 or equiv or #; A-F only)
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 8000. Seminar: Aerospace Engineering and Mechanics. (1 cr [max 4 cr]; SP- DGS consent; S-N only)

AEM 8201. Fluid Mechanics I. (3 cr; QP- 5200 or equiv, Math 2252 or equiv, Math 2263 or equiv or #; SP- 4203 or equiv, Math 2263 or equiv or #; A-F only)
Mathematical and physical principles governing the motion of fluids. Kinematic, dynamic, and thermodynamic properties of fluids; stress and deformation; equations of motion; analysis of rotational and irrotational inviscid incompressible flow; two-dimensional and three-dimensional potential flow.

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

For definitions of course numbers and symbols, see inside back cover.
Courses

AEM 8203. Fluid Mechanics III. (3 cr; SP–8202) 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 cr; QP–8202; SP–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 cr; QP–8216; SP–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 8211. Rheological Fluid Mechanics. (3 cr; QP–8201; B350; SP–8201 or 5301 or #) Method of solution for flows of suspensions with general constitutive equations. Topics from viscometric flow, extensional flow, perturbations of the rest state with steady and unsteady flow, secondary flow.

AEM 8231. Physical Gas Dynamics. (3 cr; QP–5200 or equiv, 5204 or equiv, ME 3301 or equiv; SP–4201 or equiv, 4203 or equiv, ME 3324 or equiv) Molecular and chemical effects in gas flows. Use of collision theory to determine mean free path, velocity distributions; statistical mechanics; partition function; Maxwellian and Boltzmann distributions; nonequilibrium flows; applications in rarefied and hyper sonic flows.

AEM 8241. Perturbation Methods in Fluid Mechanics. (3 cr; QP–8202; SP–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 cr; QP–5200 or 8201, CSCI 3101 or equiv; SP–4201 or 8201 or equiv, CSCI 1107 or equiv) Development of finite-volume computational methods for solution of compressible Navier-Stokes equations. Accuracy, consistency, and stability of numerical methods; high-resolution upwind shock-capturing schemes; treatment of boundary conditions; explicit and implicit formulations; considerations for high performance computers; recent developments and advanced topics.

AEM 8261. Nonlinear Waves in Mechanics. (3 cr; QP–8510; SP–5501 or #) Theory of kinematic, hyperbolic, and dispersive waves, with applications to traffic flow, gas dynamics, and water waves.

AEM 8271. Experimental Methods in Fluid Mechanics. (3 cr; QP–5200, SP–4201, #) Overview of computer organization, including external computer 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. (1-4 cr; max 8 cr; SP–A) Includes individual student projects completed under guidance of a faculty sponsor.

AEM 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

AEM 8401. Modern Feedback Control. (3 cr; QP–5321; SP–4311 or #) State space theory for multiple-input-multiple-output (MIMO) aerostructures systems. Singular value decomposition (SVD) technique and its applications to performance and robustness. Linear quadratic gaussian (LQG) state space assignment design methodologies. Topics in H∞. Applications.

AEM 8411. Advanced Dynamics. (3 cr; QP–5438; SP–5401 or equiv) Lagrange’s equations; calculations of variations and Lagrange multipliers, kinematics and dynamics of rigid bodies, and Hamilton’s principle; applications to discrete and continuous systems.


AEM 8421. Robust Multivariable Control Design. (3 cr; QP–5411 or SP–8411 or equiv) Application of robust control theory to aerospace systems. Role of model uncertainty/modeling errors in design process. Control design and synthesis, including H∞ and H2 optimal control design and structural singular value μ techniques.

AEM 8431. Trajectory Optimization. (3 cr; QP–5321; SP–4311 or equiv; #) Parameter optimization problems. Topics in calculus of variations; necessary conditions for nonlinear optimal control problems; classification of trajectory optimization algorithms; steady-state aircraft flight; minimum-time climb aircraft trajectory; aero-assisted orbit transfer trajectories; optimal space trajectories.

AEM 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

AEM 8495. Selected Topics in Dynamical Systems and Controls. (1-4 cr; max 8 cr; SP–A) Includes individual student projects completed under guidance of a faculty sponsor.

AEM 8500. Seminar in Mechanics of Materials. (1 cr; QP–112 cr; SP–A; F-A only) Seminars given by students, faculty, and visitors on topics drawn from current research.

AEM 8511. Advanced Topics in Continuum Mechanics. (3 cr; max 6 cr; QP–8512; SP–5501 or #; A-A only) 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 deforming electromagnetic continua.

AEM 8521. Advanced Topics in Elasticity. (3 cr; QP–8594; SP–5503; A-A only) Contact stresses, finite deformations, and other topics.

AEM 8523. Elastodynamics. (3 cr; QP–5580 or 8510; SP–4581 or 5501 or #; A-A only) Waves and vibrations in rods, beams, and plates; dispersion; volume and surface waves; reflection; energy theorems; vibrations of bounded media and relation to technical theories; elements of nonlinear waves, inelastic waves, and stability of motion of elastic systems.

AEM 8531. Fracture Mechanics. (3 cr; QP–8594; SP–5503 or #; A-A only) Theories of mechanical breakdown. Kinetic rate theories and viscosity considerations; formation of equilibrium cracks and circular crack propagation under pulses; statistical aspects of strength and fracture of micromolecular systems; time and temperature dependence in fracture properties; and instability of compressed material systems.

AEM 8533. Theory of Plasticity. (3 cr; QP–8594; SP–5503 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 cr; QP–8510; SP–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 8555. Selected Topics in Mechanics and Materials. (1-4 cr; max 8 cr; SP–A) Includes individual student projects completed under guidance of a faculty sponsor.

AEM 8601. Finite Element Methods in Computational Mechanics. (3 cr; SP–A) Fundamental concepts and techniques of finite element analysis. Variational equations and Galerkin’s method; weak formulations for problems with non-symmetric differential operators; Petrov-Galerkin methods; examples from solid and fluid mechanics; properties of standard finite element families, implementation.


AEM 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

AEM 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

AEM 8880. Plan B Project. (1-3 cr; max 3 cr; SP–Grad aerospace engineering or mechanics major; A) Satisfies project requirement for Plan B Master’s degree. May appear on M.S. program but does not count toward 20-credit minimum in the major field. Topic arranged by student and adviser; written report required.

AEM 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Afro-American Studies (Afro)

Department of Afro-American Studies

College of Liberal Arts

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

Afro 5036. Islam: Religion and Culture. (3 cr; SP–# Afro 2036) Religion of Islam, faith, practices, sectarian splintering, expansion outside original home to status of world religion, institutions, status in world societies—Asia, Europe, Americas.

Afro 5072. Racism: Social and Psychological Consequences for Black Americans. (3 cr) Racism and its effects on African Americans; definitions, determinants, and dynamics. Examined in an experiential context to reflect individual and institutional racism.

Afro 5101. Advanced Arabic I. (4 cr; SP–Arab 3102 or equiv or #) Advanced readings in classical and modern Arabic. Compositions based on texts.

Afro 5102. Advanced Arabic II. (4 cr; SP–Arab 5101 or #) Continuation of Arab 5101. Readings of Arabic texts, and writing compositions based on texts.

Afro 5143. Geography of West Africa. (3 cr) West Africa from Senegal to Cameroon. Social geography of resource use, population, settlement, economic development, and international relations.

Afro 5145. Development in Africa. (3 cr) Economic, political, and social development in Africa from independence to the present, emphasizing the reordering of colonial landscapes, bases for North-South relations, big power interventions, and participation in the world economy.

Afro 5181. Blacks in American Theater. (3 cr) Historical survey of significant events in the development of American black theater traditions. Essays, plays, playwrights, and theaters from early colonial references to the Black Arts Movement.

Afro 5182. Contemporary Black Theater: 1960 to Present. (3 cr) 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 cr) Ideological, political, religious, and cultural ties that have informed African American and Black South African relations from late-18th century to the present.


Afro 5401. Field Studies in Afro-American and African Studies. (1-6 cr; SP–Major or minor, #) Supervised field study/internship focused on Afro-American and/or African culture(s), language(s), and development.

Afro 5491. Classical Islamic Civilization. (3 cr; SP–# Afro 2036) Islamic legacy in the classical age (800-1400) including the medical and natural sciences, mathematics, philosophy, literature, and their transmission to Europe.


Afro 5503. Arabic Drama in Translation. (3 cr) Emergence and development of drama as a European-inspired genre in Arabic literature. Emphasis on major trends and playwrights. All readings in English.

Afro 5551. Methods: Use of Oral Traditions as Resources for History. (3 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 5593. The Afro-American Novel. (3 cr) Contextual readings of 19th- and 20th-century black novelists including Chesnutt, Hurston, Wright, Baldwin, Petry, Morrison, and Reed.

Afro 5597. Seminar: Harlem Renaissance. (3 cr) A multidisciplinary review of the Jazz Age’s Harlem Renaissance: literature, popular culture, visual arts, political journalism, and major black and white figures.

Afro 5598. Seminar: African-American Film Studies. (3 cr) Exploration of African American cinematic achievements, from the silent films of Oscar Micheaux through contemporary Hollywood and independent films, using class screenings and critical readings.


Afro 5679. Seminar: Classic Works in Afro-American Studies. (3 cr) Exploration of classic works in Afro-American studies; conceptual frameworks; multidisciplinary focus.

Afro 5702. Seminar: Major Figures in Afro-American Studies. (3 cr) In-depth examination of major figures from various fields in Afro-American studies; bio-critical focus.

Afro 5741. Minorities and the Mass Media. (3 cr; SP–Jour major or minor, [our 3004, A-F; Jour major or minor, [our 3004, A-F] only) Analysis of relationships between mass media and communities of color in the United States. Focuses on issues of content and control.

Afro 5846. Seminar: African-American History. (3-4 cr; SP–#) 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, religion, sexuality, and religion.

Afro 5896. Seminar: Approaches to African Development. (3 cr) Study, critical analysis, and comparison of primary documents relevant to African development.

Afro 5900. Topics in Arabic Literature and Culture. (3 cr [max 9 cr]; SP–5102 or #) Readings and discussion of selected works in Arabic. Topics specified in Class Schedule.

Afro 5910. Topics in Afro-American and African Studies. (3 cr) Topics specified in Class Schedule.

Afro 5993. Directed Study. (1-3 cr; SP–#) Guided individual reading/study for qualified seniors and graduate students.

Afro 8101. Seminar: Studies in Africa and the African Diaspora. (3 cr; SP–#) Comparative frameworks, related theories, and pivotal texts.

Afro 8202. Seminar: Intellectual History of Race. (3 cr) 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 cr) 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 cr) Each term focuses on an individual writer, such as Toni Morrison, Paule Marshall, and Jamaica Kincaid. Critical studies.

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

Afro 8910. Topics in Studies of Africa and the African Diaspora. (3 cr) Topics specified in Class Schedule.

Agricultural Education and Extension (AgEE)

Department of Work, Community, and Family Education

College of Education and Human Development

AgEE 5111. Agricultural Education: Methods of Teaching. (4 cr) 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.

AgEE 5112. Agricultural Education Program Organization and Curriculum for Youth. (4 cr) Development of community school program in agriculture, agribusiness, and environmental science that meet graduation outcomes and determine student needs. Use classroom, FFA, and supervised agricultural experiences to develop activities.

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

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

AgEE 5220. Special Topics in Agriculture Education and Extension. (1-3 cr; max 12 cr)
Topics vary.

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

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

AgEE 5235. Advanced Supervised Agricultural Experience Programs. (2 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.

AgEE 5237. Mentorship for Supervising Agricultural Education Teachers. (2 cr)
Professional development training for experienced teachers to serve as mentors for beginning and student teachers of agricultural education. Emphasis on supervision and assessment of teaching performance. Focus on critical period of induction into the teaching profession.

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

AgEE 5280. Current Issues for the Beginning Agricultural Education Teacher. (1-3 cr; max 3 cr)
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.

AgEE 5290. Seminar: Current Issues in Agricultural Education and Extension. (1-3 cr; max 6 cr)
Exploration of current issues in agricultural education and extension, strategies of response, implications of response actions, and related leadership roles.

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

AgEE 5311. History, Philosophy, and Systems of Extension. (3 cr; A-F only)
History and philosophy of extension; modification and adaptation to worldwide methods and approved practices; extension methodologies; innovative approaches; systems appropriate to development environments.

AgEE 5341. Global Program Delivery Techniques and Technology of Extension. (2 cr; A-F only)
Educational activities, teaching, and communications methods and techniques, from outreach to extension services, with an emphasis on youth and adult education programs in different global settings.

AgEE 5351. Methods for Change in Developing Countries. (3 cr; A-F only)
Strategies and methodologies promoting change in developing countries. Examination of sociological and cultural parameters of improved practices in rural, community, and agricultural development. Project planning, implementation, and evaluation related to change in developing countries.

AgEE 5361. World Development Problems. (3 cr; A-F only)
Introduction to development problems throughout the world. Development in Third World countries.

Examples of First World development problems. Interdisciplinary focus on population, health and disease, education, agriculture, industry, finance, politics, and human rights.

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

AgEE 5993. Directed Study in Agricultural Education and Extension. (1-9 cr)
Topics may be chosen to permit study of areas within education or to supplement areas of inquiry not provided in the regular course structure.

AgEE 5995. Integrating Paper—Master of Education: Agricultural and Extension Education. (1-4 cr; A-F only)
Students will prepare a paper dealing with students in agricultural education applied to professional responsibilities.

AgEE 8090. Seminar: Agricultural Education and Extension. (1-3 cr; max 6 cr; SP-Ag ed grad student)
Topics on various aspects of agricultural education. Prepare, present, and critique a report.

AgEE 8094. Research in Agricultural Education and Extension. (1-6 cr; max 6 cr; SP-Ag ed grad student doing Plan B research; x,A-F only)
Select problems, prepare bibliographies, analyze and interpret data, and prepare manuscripts on studies.

Agricultural Engineering Technology (AgET)

Department of Biosystems and Agricultural Engineering

College of Agricultural, Food, and Environmental Sciences

AgET 5095. Special Problems in Biosystems and Agricultural Engineering. (1-5 cr; QP-SP-AF; max 15 cr)
Individual study project in biosystems and agricultural engineering at advanced level. Application of engineering principles to a specific problem.

AgET 5203. Environmental Impacts of Food Production. (3 cr)
Topics include crop production intensity, animal raising options, food processing waste alternatives, and pest control.

AgET 5212. Safety and Health Issues in Agricultural Work Environments. (2 cr; QP-Jr or sr or grad student in IT or COAFES or Plant or other major with interest in occupational and environmental health and safety; SP-Jr or sr or grad student in IT or COAFES or PUB or other major with interest in occupational and environmental health and safety)
Examine emerging agricultural occupational safety and health issues including injury, work-related disease, pesticide exposure, pollution, biotechnology, and social implications of changing demographics and technologies.

AgET 5999. Special Workshop in Biosystems and Agricultural Engineering. (1-4 cr; QP-SP-AF)
Workshops on a variety of biosystems and agricultural engineering topics offered at locations other than the Twin Cities campus. See Class Schedule or department for current offerings.

Agronomy and Plant Genetics (Agro)

Department of Agronomy and Plant Genetics

College of Agricultural, Food, and Environmental Sciences

Agro 5020. Introduction to Plant Breeding. (3 cr; QP-GCB 3022 or equiv; background in plant science; SP-GCB 3022 or equiv; background in plant science)
For non-plant breeding majors who will benefit from a basic understanding of how genetics is applied to plant improvement. Emphasis on sustainable production scenarios.

Agro 5310. Research Methods in Crop Improvement and Production. (1 cr; QP-Agro or Hort or PBgr grad student; SP-Plant Sciences grad student; S-N only)
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 5999. Special Topics/Workshop in Agronomy. (1-4 cr; QP-Jr or sr or sp-Jr or sr)
Workshops on a variety of topics in Agro offered at locations other than the Twin Cities campus. Presenters/faculty may include guest lecturers/experts. Topics specified in Class Schedule.

Agro 8005. Supervised Classroom or Extension Teaching Experience. (2 cr; SP-AF; S-N only)
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 8201. Plant Breeding Principles I. (3 cr; QP-Stat 5301 or equiv; SP-Stat 5301 or equiv; A-F only)
Principles and current methods involved in breeding agronomic and horticultural crops. Use of genotypic/environment data to increase genetic gain, population improvement, parent building, alternative selection strategies, breeding for special traits, and new approaches.

Agro 8202. Plant Breeding Principles II. (4 cr; QP-8201, Stat 5301, GCB 5042 or #; SP-8201, Stat 5301, EEB 5033 or #)
Breeding principles and methods; population concepts, constructing source populations, and varietal development. Use of quantitative genetics in decision making in plant breeding, emphasizing covariance of relatives, genotype by environment interactions, stability analysis, statistical methods of analysis, selection theory and application.

Agro 8205. Agroecology. (3 cr; QP-Coursework in ecology or ge science; SP-Coursework in ecology or ag science; A-F only)
Agroecology as the scientific investigation of agricultural systems. Formal methodologies of systems inquiry are developed and applied to problems in agricultural ecosystems.

Agro 8231. Cytogenetics. (4 cr; QP-GCB 5034; SP-GCB 5034 or #)
Genetic principles in relation to the eukaryotic chromosome. Molecular cytogenetics of chromosome structure, replication, pairing, and crossing over. Behavior of deficiencies, duplications, inversions, interchanges. Aneuploidy, autopolyploidy, allopolyploidy, and uses of cytogenetic stocks in molecular and classical genetics and plant breeding.

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

Agro 8270. Graduate Seminar. (1 cr; SP–Grad major in agr or grad student) Introduction to plants and their interactions in managed and natural ecosystems, including carbon and nitrogen allocation, root biology, microbial interaction, secondary metabolism, and plant response to abiotic and biotic stress.

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

Agro 8605. Advanced Management of Agroecosystems. (3 cr; SP–5050; SP–4605 or #) Problem-based learning approach to developing a holistic approach to agroecosystem-based crop management. Field trips combined with classroom discussion and decision-focused case studies. Students conduct research and develop a decision case.

Agro 8900. Advanced Discussions. (1-3 cr [max 12 cr]; SP–#) Special workshops or courses in applied plant sciences.

American Indian Studies (AmIn)

Department of American Indian Studies
College of Liberal Arts

AmIn 5890. Problems in American Indian History. (3 cr; SP–#) 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.

American Studies (AmSt)

Department of American Studies
College of Liberal Arts

AmSt 5101. Religion and American Culture. (3 cr; A-F only) Role of religion in shaping contemporary American cultural pluralism. Institutions and processes, intellectual frameworks, aesthetic and symbol systems that form religious communities and contribute to religious conflicts in U.S. society and culture.


AmSt 5920. Topics in American Studies. (3 cr; SP–A-F only) Topics as specified in Class Schedule.

AmSt 8201. Historical Foundations of American Studies. (3 cr; SP–Grad AmSt major) Exposition of American studies as a field of inquiry, including its history, major theoretical framework, and interdisciplinary methodologies.

AmSt 8202. Theoretical Foundations and Current Practice in American Studies. (3 cr; SP–Grad AmSt major or # A; A-F only) Analysis of central theoretical work in the field and survey of key methodologies.

AmSt 8239. Gender, Race, Class, Ethnicity, and Sexuality in the United States: Research Strategies. (3 cr; SP–A-F only) 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 groups defined by race, ethnicity, class, or sexual orientation.

AmSt 8240. Gender, Race, Class, Ethnicity, and Sexuality in the United States: Topical Development. (3 cr; SP–A-F only) 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 groups defined by race, ethnicity, class, or sexual orientation.

AmSt 8249. Popular Culture: Research Strategies. (3 cr; SP–A-F only) Study of the popular arts in their political and social context. Focuses on issues of race, gender, class, and nationalism.

AmSt 8250. Popular Culture: Topical Development. (3 cr; max 9 cr; SP–A-F only) Study of the popular arts in their political and social context. Focuses on issues of race, gender, class, and nationalism.

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

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

AmSt 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent) Training in teaching undergraduate courses in American studies.

AmSt 8401. Practicum in American Studies. (3 cr; SP–#; A-F only) Training in teaching undergraduate courses in American studies.

AmSt 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

AmSt 8520. Seminar: American Art and Material Culture. (3 cr [max 12 cr]; SP–#) Selected topics in American art, popular art, and material culture, with emphasis on methods and techniques of inquiry; creation and use of archives, oral history, sources for pictorial evidence, and current approaches to interpreting both traditional and non-traditional data.

AmSt 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral) AmSt 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max 18 cr per semester or summer; total required [Plan A only]) AmSt 8801. Dissertation Seminar. (3 cr; SP–AmSt doctoral student beginning dissertation work; S-N only) Conceptualizing the research problem for the dissertation and structuring the process of writing a chapter of it.

AmSt 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

AmSt 8970. Independent Study in American Studies. (1-9 cr [max 9 cr]; SP–A-F only) Independent study of interdisciplinary aspects of American civilization under guidance of faculty members of various departments.

Ancient Near Eastern (ANE)

Department of Classical and Near Eastern Studies
College of Liberal Arts

ANE 5501. Second Elamian (3 cr; SP–Adv undergrad with # or grad student) Introduction to cuneiform script. Basics of Old Babylonian morphology and syntax. Written drills, readings from Hammurabi laws, foundation inscriptions, annals, religious and epic literature.

ANE 5502. Second Akkadian. (3 cr; SP–5501) Survey of Akkadian literature including literary, legal, historiographical, and sacred texts. Topics specified in Class Schedule.

ANE 5503. Readings in Akkadian. (3 cr [max 18 cr]; SP–5011, 5022) Survey of Akkadian literature including literary, legal, historiographical, and sacred texts. Topics specified in Class Schedule.


ANE 5506. History and Development of Israelite Religion II (3 cr) 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, and Roman.

For definitions of course numbers and symbols, see inside back cover.
Courses

ANE 5701. Studies in Semitic Linguistics and Inscriptions. (3 cr; SP–Adv Hebrew or adv Arabic or #) Survey of comparative Semitic linguistics with emphasis on Northwest Semitic. Reading of Phoenician, Moabite, and Judean inscriptions.

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

ANE 5993. Directed Studies. (1–4 cr; SP–#, Δ, U) Guided individual reading or study.

Anesthesiology (Anes)

Department of Anesthesiology

Medical School

Anes 8265. General Anesthesia. (8 cr)

Anes 8266. Regional Anesthesia. (3 cr)

Anes 8267. Pre- and Postanesthetic Evaluation. (1 cr)

Anes 8268. Seminar. (1 cr)

Anes 8269. Research in Anesthesia. (1 cr)

Animal Science (AnSc)

Department of Animal Science

College of Agricultural, Food, and Environmental Sciences

AnSc 8111. Genetic Improvement of Animals. (3 cr; SP–#)

Appication 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 8311. Molecular Biology Techniques in Animal Science. (3 cr; SP–Bióc 3021, Biol 5003 or equiv; SP–Bióc 4332, Biol 4003; A-F only) Basic theory and current methodologies of molecular biology and recombinant DNA technology. Lab work includes DNA and RNA hybridization, gene transfer, and polymerase chain reaction techniques. Primarily for students with limited exposure to molecular biology.

AnSc 8134. Research in Animal Genetics. (1–3 cr; SP–#) Research in quantitative genetics, cytogenetics, molecular genetics, and other areas related to animal breeding.

AnSc 8211. Animal Growth and Development. (3 cr; SP–#)

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. (1–3 cr; SP–#) Research in selected areas.

AnSc 8311. Animal Bioenergetics. (3 cr; SP–Bióc 5331 recommended; SP–Bióc 4331 recommended; A-F only) Integrated systems approach to energy metabolism of animals. Application of classical techniques of calorimetry and comparative slaughter, development of systems for expressing energy content of feeds, and techniques for measuring whole body and organ metabolism of specific nutrients. Offered alternate years.

AnSc 8320. Concepts and Developments in Nutritional Physiology. (2 cr; max 6 cr; SP–#; A-F only) Review and critical evaluation of pertinent scientific literature.

AnSc 8330. Concepts and Developments in Ruminant Nutrition. (1 cr; max 2 cr; SP–#; A-F only) Review and critical evaluation of recent research reports.

AnSc 8333. FTE: Masters. (1 cr; SP–Master's student, adviser and DGS consent)

AnSc 8340. Concepts and Developments in Swine Nutrition. (1 cr; max 2 cr; SP–#; A-F only) Review and critical evaluation of scientific literature.

AnSc 8394. Research in Animal Nutrition. (1–3 cr; SP–#)

Research in selected areas: topics and animal species determined by consultation.

AnSc 8411. Physiology of Reproduction. (3 cr; OP–6 cr systemic physiology or equiv; SP–3305 or equiv; A-F only) Emphasis is on gametogenesis, conception, and implantation.

AnSc 8421. Physiology of Fertilization and Gestation. (3 cr; OP–5222; SP–3305 or #) Physiological events occurring during gametogenesis; capacitation and fertilization; period of the embryo; period of the fetus; and parturition.

AnSc 8431. Immunoreproduction. (3 cr; SP–5322; SP–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 cr; SP–Doctoral student, adviser and DGS consent)

AnSc 8451. Reproductive Endocrinology. (2 cr; OP–Bióc 3021; SP–3305 or 3327 or equiv; Bióc 3021; A-F only) 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. (1–3 cr; SP–#)

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 cr; max 2 cr; SP–#) Student presentations of literature, proposals, and research results; instructional guidelines and performance evaluation; preparation of visual material.

AnSc 8594. Research in Animal Physiology. (1–3 cr; SP–#)

Research including experimental studies in disciplines associated with animal production and research, with emphasis on interdisciplinary studies.

AnSc 8666. Doctoral Pre-Thesis Cr. (1–18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

AnSc 8777. Thesis Credits: Master's. (1–18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

AnSc 8888. Thesis Credits: Doctoral. (1–18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Anthropology (Anth)

Department of Anthropology

College of Liberal Arts

Anth 5025. Cultural Semantics. (3 cr) Understanding cultures and cognitive classification systems through lexical semantics.


Anth 5029. Philosophical Anthropology. (3 cr; SP–Sr or grad student or #; A-F only) Advanced survey of traditional problems associated with broad-ranging views on human nature and culture. Specific arguments of relativists, behaviorists, phenomenologists, and others in relation to social life. Structuralist and post-structuralist approaches.

Anth 5033. Feminist Anthropology. (3 cr; SP–3047 or grad student 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 cr; SP–3041, §8213; grad student or #) Concepts, theories, and methods of ecological anthropology (cultural ecology) show how humans interact with the biophysical environment. Compare biological and cultural interactions with the environment; examine adaptive strategies cross-culturally.

Anth 5045. Urban Anthropology. (3 cr; SP–4003 or grad student or #) Anthropological approaches to urban life in Western and non-Western settings. Topics include social networks and voluntary organizations; class, ethnicity, gender and power; migration and immigration; urban labor and economics; and urban “problems.”

Anth 5059. Anthropology of Religion. (3 cr; SP–1003 or #) Comparative study of myths, religious beliefs and rituals cross-culturally. Analysis of how religion and social relations are integrated. Careful examination of landmark cases and conceptual approaches in the anthropology of religion.

Anth 5128. Anthropology of Learning. (3 cr) Cross-cultural perspectives in examining educational patterns, and the implicit and explicit cultural assumptions underlying them; methods and approaches to cross-cultural studies in education.

Anth 8001. Foundations of Social and Cultural Anthropology. (3 cr; SP–Grad anth major or #; A-F only) Introduction to foundational concepts, methods, and ethnographic work in the field. Emphasis on theories that have shaped 20th-century thinking in cultural anthropology; explores connection of these theories to fieldwork and contemporary issues.

Anth 8002. Foundations of Social and Cultural Anthropology. (3 cr; SP–8001; A-F only) Further introduction to important concepts and perspectives in anthropology, with emphasis on past and contemporary American cultural anthropology. Includes recent work in semiotic, psychological, and feminist anthropology.

Anth 8003. Foundations of Social and Cultural Anthropology. (3 cr; SP–8001, 8002; A-F only) Builds on theoretical perspectives analyzed in 8001 and 8002; focuses on politics of culture and politics of ethnographic practice and writing.
Courses

Anth 8004. Foundations of Anthropological Archaeology. (3 cr; SP–Grad, 8002) Theoretical foundations of anthropological archaeology in historical and contemporary perspective.

Anth 8120. Problems in Culture Change and Applied Anthropology. (3 cr; SP–Grad) Comparative studies of change in cultural systems. Impact of global processes on local cultures. Roles of anthropology and anthropologists in policy, planning, implementation, and evaluation.

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

Anth 8205. Economic Anthropology. (3 cr; SP–§4053) Theoretical foundations of economic anthropology examined through critical readings of traditional, classical, and contemporary authors. Ethnographic puzzles of material life and issues of ecological degradation, development, market expansion, gender, and transglobal processes.

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

Anth 8209. Psychological Anthropology. (3 cr; SP–§4021) Self, emotion, cognitive processes, and child development in cross-cultural perspective.

Anth 8211. Symbolic Anthropology. (3 cr; SP–§4019) Advanced introduction to semiotic, structuralist, and interpretive approaches in anthropology. Reviews classic foundations and recent developments.

Anth 8213. Ecological Anthropology. (3 cr; SP–§5041) 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, and our understanding of human dimensions of ecosystem-based management.

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

Anth 8217. Pedagogy. (3 cr) Introduction to role of teaching in academic culture, active learning and critical thinking styles, learning style differences among students, and development of writing assignments, discussion groups, exams, and lectures that help students develop critical, observational, and integrative abilities most crucial to anthropology.

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

Anth 8220. Archaeology Field School. (3-9 cr; max 9 cr; SP–Grad anth major) Advanced archaeological field excavation, survey, and research. Intensive training in excavation techniques, recording, analysis, and interpretation of archaeological materials.

Anth 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent) Seminar on method, theory, and key problems in anthropological archaeology.

Anth 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent) Seminar on method, theory, and key problems in anthropological archaeology.

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

Anth 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral) Seminar discusses various aspects of the dissertation process and provides a forum for discussing ideas, problems, and progress.

Anth 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required (Plan A only)) Seminar examines particular aspects of method and/or theory. Topics vary according to student and faculty interests.

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

Anth 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required) Seminar discusses various aspects of the dissertation process and provides a forum for discussing ideas, problems, and progress.

Anth 8991. Independent Study. (1-18 cr; SP–#) Under special circumstances and with instructor approval, qualified students may register for a listed course on a tutorial basis.

Anth 8992. Directed Reading. (1-18 cr; SP–#) Students study an area in anthropology not covered in existing courses.

Anth 8993. Directed Study. (1-18 cr; SP–#) When a topic cannot be taken as a course, a student may work with a faculty member to design a course on a tutorial basis.

Anth 8994. Directed Research. (1-18 cr; SP–#) Students work under the direct supervision of a faculty member on research projects.

Applied Economics (ApEc)

Department of Applied Economics
College of Agricultural, Food, and Environmental Sciences


ApEc 5131. Applied Microeconomics: Firm and Household. (2 cr; QP–Econ 5151 or SP–Econ 5151 or #) Quantitative techniques for analysis of economic problems of firms and households. Links between quantitative tools and economic analysis developed to understand economic theory and develop research skills. Quantitative tools include regression analysis, mathematical programming, and present value analysis.

ApEc 5152. Applied Macroeconomics: Income and Employment. (2 cr; SP–Econ 5152 or #) Static general equilibrium open economy models and simple business cycle models examine economic growth, business cycles, and fiscal and monetary policy. Input-output analysis and large scale econometric models. Sources and properties of income and sector-wide data, and empirical applications.

ApEc 5321. Regional Economic Analysis. (3 cr; QP–3001 or Econ 3102 or #; SP–3006 or Econ 3102 or #; A-F only) Regional development patterns and role of resources, transportation, and institutional constraints. Trade, migration, and investments in regional growth and change. Regional economic information in investment and location decisions. Evaluation of economic development policies and tools. Economic impact analysis.

ApEc 5341. State and Local Public Services and Finance. (3 cr; QP–3001 or Econ 3101, SP–3001 or Econ 3101, A-F only) The organization, delivery, economic analysis and finance of state and local public services and functions.

ApEc 5401. Intermediate Market and Price Analysis. (3 cr; QP–3001 or Econ 3101 or #; Econ 3101 or #; Econ 1142 or #; SP–3001 or Econ 3101 or #) Development of analytical models and their application in various market situations. Study of unique market institutions in agriculture that have been developed in response to marketing and pricing problems.

ApEc 5481. Futures and Options Markets. (3 cr; QP–3001 or Econ 3101 or #) Economics of futures and options trading in theory and application; basis and price relationship in storable and nonstorable commodities; hedging and commercial use of futures and options contracts; speculation; pricing efficiency; market performances and regulation.

ApEc 5581. Human Capital and Household Economics. (3 cr; SP–3001 or Econ 3101 or #) Household economics and investment in human capital (e.g., children, education, health and nutrition); labor force participation, lifetime earnings, and nonmarket work; time allocation and substitution of capital for labor in the household in the western and third world.

ApEc 5611. Land and Water Economics. (3 cr; QP–3001 or Econ 3101 or #; SP–3001 or Econ 3101 or #) Land as an economic and cultural resource. Property rights concepts, valuation of resources, and policy analysis. Materials drawn from economics, forestry, public finance, planning, and agriculture.

ApEc 5637. Agricultural Law. (3 cr; SP–Sr or grad student or #; SP–Sr or grad student or #) Economic regulation of agriculture. Industrial organization and market structure in agribusiness, public lands and water law, agricultural cooperatives, farm labor, farm finance, crop insurance and disaster assistance, agricultural biotechnology, food and drug law, price and income regulations, and international agricultural marketing.

ApEc 5651. Economics of Natural Resource and Environmental Policy. (3 cr; QP–3001, 5610 or Econ 3101; SP–3001, 4611 or Econ 3101) Economic analyses including project evaluation of current natural resource and environmental issues. Emphasis on intertemporal use of natural resources, natural resource scarcity or adequacy, environmental quality and mechanisms for pollution control, and their implications for public policy.

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

ApEc 5721. World Agriculture: Problems, Policies, and Sustainability. (3 cr; QP–3001 or Econ 3101, SP–3001 or Econ 3101) Comparative agricultural systems and policies, issues of development and protection, resource use and sustainability in major production regions, international policy conflicts, international organizations and assistance, technological change, production and consumption balances.

ApEc 5751. Agricultural Trade and Trade Policy. Issues and Analyses. (3 cr; QP–3001 or Econ 3101, SP–3001 or Econ 3101) Trade policies of import and export nations, gains from trade, trade negotiations and agreements, free trade agreements, and contemporary perspectives.
Courses

Applied Economics (ApEc)

ApEc 5860. Economics of the Environment. (3 cr; SP–Econ 8004 or Econ 8104 or #)
   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. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

ApEc 8701. International Economic Development, Growth, and Trade. (3 cr; SP–Econ 8002 or Econ 8102 or #)
   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 cr; SP–Econ 8230, Econ 8002 or Econ 8102 or #)
   Sectoral economic activity in the United States; emphasizes changing role of agriculture. Role of macroeconomic forces and trade policy since World War II. Economic and institutional development in the international economy, including the World Trade Organization, regional trade agreements such as NAFTA, and the European Union.

ApEc 8777. Thesis Credits: Master's. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

ApEc 8793. Master's Paper: Plan B Project. (1-6 cr; SP–One yr MSc student; Plan B only)

Applied Plant Sciences (APSc)

Graduate School

APSc 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and DGS consent)

APSc 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

APSc 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

APSc 8777. Thesis Credits: Master's. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

APSc 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Arabic (Arab)

Department of Afro-American Studies

College of Liberal Arts

Arab 5505. Survey of the Middle East. (3 cr; SP–Arab 3505, §Hist 3505, §MELC 3505)
   Peoples, lands, and cultures of the Middle East. Historical survey from earliest civilizations to the present.

Arab 5541. Islam in the Catholic Age: Arab Phase 600 A.D. to 900 A.D. (3 cr; SP–Arab 3541)
   The rise of Islam in its Arabian setting. Roles of the prophet, the Orthodox and Umayyad Caliphs. Development of the Islamic state and empire. Status of Muslims and non-Muslims.

Arab 5542. Medieval Islam. (3 cr; SP–Arab 3542)
   Islamic dynasties, Mamluks and Mongols, and Crusaders and Assassins. Abbasid Caliphate’s disintegration and rise of Seljuk Turks.

Arab 5543. Arabs Under Mamluks and Ottomans: 1300-1920. (3 cr; SP–Arab 3543)
   Struggle against Crusaders and Mongols. Disintegration and reemergence under Muhammad Ali of Egypt; dynastic struggles in Syria; rise of Young Turks; Arab revolt.

Arab 5544. Arab World 1920 Until the Present. (3 cr; SP–Arab 3544)
   Struggle in the Arab world for independence and its course since independence. Emphasis on development, political stability and unity; political structures; the Arab-Israeli conflict.

Arab 5992. Directed Readings. [1-3 cr; SP–] Individual research and readings for advanced students.

Arab 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and DGS consent)

Aramaic (Arm)

Department of Classical and Near Eastern Studies

College of Liberal Arts

Arm 5011. Biblical Aramaic and Old Aramaic Inscriptions. (3 cr; SP–One yr Hebrew or Arabic or #)
   Biblical Aramaic—grammar, fluency in reading Biblical Aramaic and Old Aramaic inscriptions.

Arm 5012. Syriac. (3 cr; SP–One yr Hebrew or Arabic or #)
   Emphasis on fundamentals of grammar and reading Syriac texts fluently.
Architecture (Arch)

Department of Architecture
College of Architecture and Landscape Architecture

Arch 5123. Architectural Thesis. (8 cr; SP–5122, 5241, arch major; students must submit thesis plan in semester before writing thesis; A-F only)

Student’s choice, study and solution of an architectural problem to demonstrate proficiency in all phases of design.

Arch 5241. Principles of Design Programming. (3 cr; QP–For undergrads 5122, BA Arch major; for grads 8257, MArch major or #; SP–For undergrads 5122, BA Arch major; for grads 8255, MArch major or #; A-F only)

Concepts and techniques of architectural programming, including space and activity analysis, site selection, precedent study, code review, appropriate technology identification, hypothesis formulation and evaluation. Emphasis on conceptual development, research, and analytic drawing.

Arch 5281. Undergraduate Architecture Studio I. (6 cr; SP–3411, 3412, BA Arch major or #; A-F only)

Exploration of architectural questions found in settlement patterns and the architectural elements found in their formal organization. Study of mapping techniques, orthographic projections, analytic drawing, and models.

Arch 5282. Undergraduate Architecture Studio II. (6 cr; SP–5282, Arch major or #; A-F only)

Exploration of human response to the natural forces of gravity, light, and air and their influence on the organization of material form to create places of human habitation.

Arch 5291. Undergraduate Architecture Studio III. (6 cr; SP–5291, Arch major or #; A-F only)

Selected architectural problems developed by appointed faculty to deepen and enrich architectural ideas introduced in the required architectural studio sequence.

Arch 5292. Undergraduate Architecture Studio IV. (6 cr; SP–Arch major or #; A-F only)

Architectural problems with emphasis on development of structures as an integral part of design, site planning, and design process. For accelerated status undergraduates only.

Arch 5311. Theory of Architectural Representation. (3 cr; SP–5371, 5372, Arch grad student or #; A-F only)

Integration of emerging computer graphics with photography and architectural graphic conventions. Exploration of conceptual, theoretical, and critical issues of representation and the influence of visual media on the architectural field.

Arch 5313. Visual Communication Techniques in Architecture. (3 cr; QP–For undergrads 3311, BA Arch or BED major; for grads MArch major or #; SP–For undergrads 3301, arch or BED major; for grads MArch major or #; A-F only)

Exploration of delineation, presentation, and design techniques, using various visual media and methods of investigation.

Arch 5321. Architecture in Watercolor. (3 cr; QP–For undergrads 3311, arch or BED major; for grads MArch major or #; SP–For undergrads 3301, arch or BED major; for grads MArch major or #; A-F only)

Watercolor as a tool in the design process. Survey of foundation principles, techniques, medium, tools, and materials. Exploration of color relationships, mixing, composition, and applications to design.

Arch 5361. Topics in Architectural Representation: 3-D Architectural Modeling and Design. (3 cr; SP–For undergrads 5281 or 5351, arch major; for grads MArch major or #; A-F only)

Introduction to 3-D studio for architectural modeling, rendering, and animation. Video recording and editing.

Arch 5371. Computer Methods I. (1 cr; SP–#251, MArch major or #; A-F only)

Introduction to current techniques, computer programs, and their application to architectural computing.

Arch 5372. Computer Methods II. (1 cr; SP–#371, #252, MArch major or #; A-F only)

Current techniques, computer programs, and their application to architectural computing and design.

Arch 5373. Computer Methods III. (1 cr; SP–#372, #253, MArch major or #; A-F only)

Advanced techniques, computer programs, and their application to architectural computing in design, theory, and technology.

Arch 5374. Computer Methods IV. (1 cr; SP–#373, #254, MArch major or #; A-F only)

Advanced architectural computing applications in design, history, theory, representation, and technology.

Arch 5381. Introduction to Computer Aids for Architectural Design. (3 cr; SP–arch or BED major or MArch or graduate LA major or #; A-F only)

Introduction to electronic media for design, including 2-D drawing, 3-D modeling and animation, printing, and plotting. Introduction to electronic networking and communications, database management, spreadsheet analysis, land-use analysis, and project management.

Arch 5382. Computer Aids for Architectural Design. (3 cr; SP–For undergrads 5381, arch or BED major; for grads MArch or graduate LA major or #; A-F only)

Understanding computer-aided tools used in design and practice, including 2-D and 3-D CAD and image manipulation. Exploring advanced multimedia visualization techniques for design, including solid modeling, photo-realistic imaging, animation, and video-editing and recording.

Arch 5410. Topics in Architectural History. (1-3 cr; SP–For undergrads 3412, arch major; for grads MArch major or #)

Advanced study in architectural history. Readings, research, and seminar reports.

Arch 5411. Principles of Design Theory. (3 cr; SP–Arch and MArch major or #; A-F only)

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 5423. Gothic Architecture. (3 cr; SP–For undergrads 3411, arch major; for grads MArch major or #; A-F only)

History of development of architecture and urban design in Western Europe from 1150 to 1400. Emphasis on major figures (Brunelleschi, Alberti, Bramante, Palladio) and the evolution of major cities (Rome, Florence, Venice).

Arch 5425. Baroque Architecture. (3 cr; SP–For undergrads 3411, arch major; for grads MArch major or #; A-F only)

History of architecture and urban design in Italy from 1600 to 1750. Emphasis on major figures (Bernini, Borromini, Cortona, Guarini) and the evolution of major cities (Rome, Turin).

Arch 5426. Architecture and Nature, 1500-1750. (3 cr; SP–For undergrads 3411, 3412, arch major; for grads MArch major or #; A-F only)

History of the interaction of architecture and nature in Italy, England, and France in the 16th and 17th centuries. Major monuments, their relationship to theories of architecture and gardening, urban and rural life.

Arch 5431. 18th-Century Architecture and the Enlightenment. (3 cr; SP–For undergrads 3412, arch major; for grads MArch major or #; A-F only)

Architecture, urban planning, and garden design in Europe from 1700 to 1850.

Arch 5432. Modern Architecture. (3 cr; SP–For undergrads 3412, arch major; for grads MArch major or #; A-F only)

Architecture and urban design in Europe and the United States from the early 19th century to World War II.

Arch 5434. Contemporary Architecture. (3 cr; SP–For undergrads 3412, arch major; for grads MArch major or #; A-F only)

Developments, theories, movements, and trends in architecture and urban design from World War II to the present.

Arch 5439. History of Architectural Theory. (3 cr; SP–For undergrads 3412, arch major; for grads MArch major or #; A-F only)

History of architectural theory from antiquity to the 20th century.

Arch 5450. Topics in Architectural Theory. (1-3 cr; SP–Arch major or MArch major or #; A-F only)

Selected topics in architectural theory and criticism.

Arch 5451. Architecture: Defining the Discipline. (3 cr; SP–MArch major or #; A-F only)

Architecture as a discipline: its nature, role, purpose, and meaning discussed within a general, philosophical, and theoretical framework. Investigation and discussion of paradigms defining architectural theory and practice.

Arch 5452. Architecture: Design, Form, and Meaning. (3 cr; SP–MArch major or #; A-F only)

Architecture and the issues 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 5454. Semiotics and Deconstruction in Architecture. (3 cr; OP–#401, MArch major or #; SP–#411, MArch major or #; A-F only)

Expressive and cultural dimensions of architecture, especially those related to linguistic analogies, knowledge production, and contemporary philosophy. Broad critical perspective of architectural discussion and argumentation addressing current issues.

Arch 5455. Typology and Architecture: Theories of Analysis and Synthesis. (3 cr; OP–#401, MArch major or #; SP–#411, MArch major or #; A-F only)

Theoretical traditions and development of typology’s role in architecture. Investigates works of Laugier, Quatremere de Quincy, Viollet-Le Duc, Ledoux, Durand, Camillo Sitte, and Le Corbusier. Recent developments and theoretical positions of neo-rational and contextual arguments for contemporary applications of the idea of type.

Arch 5458. Architecture and Culture. (3 cr; SP–3412, arch major or grad student or #; A-F only)

Architecture as a cultural medium. Relationships among architecture, people, and culture; research findings and designs; vernacular and high style architecture. Physiological and symbolic messages; reception theory in architecture; cultural critique and change; implications for architectural practice.

Arch 5459. Gender and Architecture. (3 cr; SP–Arch or WoSt major or MArch major or #)

Examination of ideas related to gender and architecture, gendered and non-gendered places and practices, and their relations to cultural norms and change.

Arch 5461. North American Indian Architecture. (3 cr; SP–For undergrads 3412, arch or Amin major; for grads MArch major or #)

Historic and contemporary principles and theories of North American Indian architecture. Study of the culture, technology, environment, art and craft of North American Indians in their settlements and architecture.
Courses

Arch 5501. Environmental and Material Forces in Architecture. (3 cr; QP–5301, 5281, arch major or #; SP–5281, LA 3501, arch major or #; A-F only) Exploration of relationship between architectural form, human experience, and building technologies. Design principles and concepts of environmental technology (microclimate, thermal, aural, luminous design) and building technology (materials, methods of construction, structure). Impact of ecological issues, construction materials, and structural systems on architectural design.

Arch 5511. Construction Materials in Architecture. (3 cr; SP–5511, MArch major or #; A-F only) Study and analysis of building materials, assemblies, and construction operations shaping building designs. Examination of material properties for design and detailing of building systems, elements, and components, and their implications in design applications. Modeling and hands-on building experiences.

Arch 5512. Building Methods in Architecture. (3 cr; SP–5511, MArch major or #; A-F only) Analysis of architectural materials, building systems, and construction operations related to enclosure systems design, building infrastructure, and detailing. Application of legal constraints and regulations (e.g., ADA, building codes, life-safety issues) in preparation of drawings, specifications, and construction documents for building design.

Arch 5513. Environmental Technology I: Thermal Design in Architecture. (3 cr; SP–5Arch major or #; A-F only) 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 cr; SP–5Arch major or #; A-F only) 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 5525. Design in Masonry. (3 cr; QP–5521, MArch major or #; SP–5521, MArch major or #; A-F only) Design principles, construction methods, and document production for masonry structures.

Arch 5539. Daylighting and Architecture Design. (3 cr; QP–5511, MArch major or #; SP–5511, MArch major or #; A-F only) Role of daylighting in architectural design: principles, strategies, energy and environmental issues, psychology of light, roles of integration of electric lighting. Design projects investigate qualitative and quantitative issues through drawing, physical models, and photometric analysis.

Arch 5542. Building Energy Systems. (3 cr; QP–5541, MArch major or #; SP–5513, MArch major or #; A-F only) Understanding functions of building mechanical systems and their integration with other building components through case studies. Residential and commercial HVAC systems, alternative energy sources, energy efficiency, structural implications of mechanical systems, indoor air quality, and environmental control strategies.

Arch 5550. Topics in Architecture Technology. (1-3 cr; SP–Arch or MArch major or #) Selected topics in architecture technology, including construction, environmental management, energy performance, lighting, or materials.

Arch 5561. Building Production Processes. (3 cr; QP–5283, arch major or BED major or MArch major or #; SP–5282, 5501, arch major or BED major or MArch major or #) Introduction to design-build processes including document production, contract execution, and building project management. Case study and hands-on experiences examine construction industry organization, scheduling, consultant relations, legal and code restraints, contractual stipulations, budget and project resource allocations.

Arch 5571. Architectural Structures I: Wood and Steel Design. (3 cr; SP–MArch major or #; A-F only) Influence of history and culture on architecture and structure. Fundamentals of structural mechanics, structural analysis, structural form finding, and structural design by experimental, qualitative/intuitive, and quantitative methods. Vector-active and form-active structural systems, full-scale structures, bending and compression elements, plates and grids, tensile architecture, shells. Description of traditional construction materials.

Arch 5572. Architectural Structures II: Concrete and Masonry Design. (3 cr; QP–5573, MArch major or #; SP–5571, MArch major or #; A-F only) Overview of advanced materials: reinforced fiberglass, structural glass, and structural tensile fabrics. Impact of construction technology on architecture and methods of integrating knowledge of structural materials and construction methods into the design process.

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

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

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

Arch 5650. Topics in Architectural Practice. (1-3 cr; SP–5621, arch major or #; SP–5281, MArch major or #) Topics in architectural practice, methods of design production, marketing, operation, and relationships among clients, architecture, and society.

Arch 5670. Topics in Historic Preservation. (1-3 cr; SP–Arch or MArch major or #) Selected topics in the theory, philosophy, research, and methods of architectural historic preservation.

Arch 5671. Historic Preservation. (3 cr; SP–3412 or #) Philosophy, theory, and origins of historic preservation. Historic archaeology and research, descriptive analysis, and documentation of historic buildings. Government’s role in historic preservation, preservation standards and guidelines, preservation and building codes, neighborhood preservation, preservation advocacy, and future directions for historic preservation. Research on architectural and historical aspects of historic sites using primary and secondary resources and on controversial aspects of preservation.


Arch 5673. Historic Building Research and Documentation. (3 cr; QP–3412, 5512 or #; SP–3412, 5672 or #) Philosophy, theory, and methods of historic building research, descriptive analysis of buildings, building documentation, historical archaeology, and architectural taxonomy.

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

Arch 5724. Meanings of Place. (3 cr; SP–Arch or BED or Geog major or MArch or LA grad major or #; A-F only) Analysis of meanings and messages of surroundings, and examination of links between sense of place and feelings of well-being. Exploration of what present-day environments can reveal about the past. Survey of Twin Cities’ central district and selected neighborhoods, and other settings inside and outside Minnesota.

Arch 5750. Topics in Urban Design. (1-3 cr; SP–5711, MArch or LA grad major or #; A-F only) Special topics in theory and practice of urban design.

Arch 5993. Directed Study. (1-3 cr; SP–#; A-F only) Guided individual reading or study.

Arch 8101. Subjects and Methods in Architecture. (2 cr; SP–Grad arch major or #; A-F only) The discipline of architecture.

Arch 8250. Advanced Topics in Design. (1-6 cr; max 6 cr; SP–Grad arch major or #; A-F only) Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort.

Arch 8252. Graduate Architectural Design I. (6 cr; SP–Grad arch major or #; A-F only) Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort.

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

Arch 8253. Graduate Architectural Design III. (6 cr; QP–8253, SP–8252, grad arch major or #; A-F only) Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort.

Arch 8254. Graduate Architectural Design IV. (6 cr; QP–8254; SP–8253, grad arch major or #; A-F only) Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort.

Arch 8255. Graduate Architectural Design V. (8 cr; QP–8256; SP–8254, grad arch major or #; A-F only) Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort.

Arch 8256. Directed Graduate Architectural Design. (6 cr; SP–8251, grad arch major or #; A-F only) Supervised research to be undertaken by the student with the approval of a faculty advisor. A maximum of 6 credits for Arch 8252 – 8256.

Arch 8333. FTE Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

Arch 8350. Advanced Topics in Representation. (1-3 cr; QP–5309; SP–5311, grad arch major or #; A-F only) Theory and practice of visual representation in architecture.

Arch 8450. Topics in Theory. (1-3 cr; QP–5401, SP–5411, grad arch major or #; A-F only)

Arch 8494. Directed Research in Architectural History. (1-3 cr; SP–Grad arch major or #; A-F only)

Arch 8550. Topics in Technology. (1-3 cr; SP–Grad arch major or #; A-F only)

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Interpretations will be enhanced by experimentation from various metropolitan area locations. Field trips (2/3 of course) to draw or paint. Focus is on the search for personal content as inspired by the interaction of both two and three dimensions. Applications of spatial and painterly concepts with illusionary space applied to sculptural forms. Practical abstraction. Approached from the discipline of practice with attention to developing individual work. Exploration of abstraction as concept and studio or #)

Area 5940. Topics in Middle Eastern Studies. (3 cr) Topics vary.

Area 5950. Topics in Russian Area Studies. (3 cr) Topics vary.

Area 5960. Topics in South Asian Studies. (3 cr) Topics vary.

Area 5993. Directed Studies. (1-4 cr [max 12 cr]; QP–I or #; Δ,SP–3,4,5,6,7,8,9,10,11,12) Guided individual reading or study. Open to qualified students for one or more semesters.

Area 5994. Directed Research. (1-4 cr [max 12 cr]; QP–I or #; Δ,SP–3,4,5,6,7,8,9,10,11,12) Qualified students work on a tutorial basis.

Area 8061. Scope and Methods of Area Studies. (3 cr; A-F only) Introduction to subfields, problems, and methodologies. Scholarly norms and ethics of cross-cultural academic research.

Art (ArtS)

Department of Art

College of Liberal Arts

ArtS 5104. The Nature of Abstraction. (3 cr; SP–3102 or #) Exploration of abstraction as concept and studio practice with attention to developing individual work. Emphasis on understanding topics relevant to abstraction. Approached from the discipline of painting and open to various material sensibilities.

ArtS 5105. Advanced Dimensional Painting. (3 cr; SP–3105 or #) Illusionary space applied to sculptural forms. Practical applications of spatial and painterly concepts with emphasis on critical and visual judgment. Development of a cohesive body of work reflecting the interaction of both two and three dimensions.

ArtS 5106. Advanced Drawing: Interpreting the Site. (3 cr; SP–3106 or #) Focus is on the search for personal content as inspired by the site. Field trips (2/3 of course) to draw or paint from various metropolitan area locations. Interpretations will be enhanced by experimentation with new marks and symbols.

ArtS 5110. Advanced Drawing. (3 cr [max 12 cr]; SP–3101 or #) Development of personal direction in terms of form and content. Various media and aesthetic and conceptual approaches.

ArtS 5120. Advanced Painting. (3 cr [max 12 cr]; SP–3102 or #) Development of personal vision content through painting. Emphasis on critical thinking, self-evaluation, and the independent pursuit of ideas.

ArtS 5130. Advanced Painting: Watercolor. (3 cr [max 12 cr]; SP–3102 or #) Expressive and technical possibilities of transparent watercolor. Emphasis on pictorial structure, color relationships, and visual expression. Work from still life, nature, the life model, and imagination.

ArtS 5310. Advanced Sculpture: Direct Metal. (3 cr [max 12 cr]; SP–3301 or #) Direct metal sculpture in steel and other metals. Studio practice and investigation of historical and contemporary methods and concepts. Development of personal sculptural imagery.

ArtS 5320. Advanced Sculpture: Spatial Problems. (3 cr [max 12 cr]; SP–3302 or #) Sculptural practice outside traditional media and approaches. Installation, theater, public art, and architecture as topics for individual investigations into spatial organization.

ArtS 5330. Advanced Sculpture: Metal Casting. (3 cr [max 12 cr]; SP–3303 or #) Metal casting of sculpture in bronze, iron, aluminum, and other metals. Studio practice and investigation of historical and contemporary methods and concepts. Development of personal sculptural imagery.


ArtS 5350. Advanced Sculpture: Kinetics. (3 cr [max 12 cr]; SP–3305 or #) Studio practice in kinetic sculpture and investigation of historical and contemporary methods and concepts of sculpture produced by motion. Development of personal imagery.

ArtS 5360. Advanced Performance Art and Installation. (3 cr [max 12 cr]; SP–3306 or #) Studio practice in performance art and installation; investigation of historical and contemporary methods and concepts of interdisciplinary expression. Development of personal imagery.

ArtS 5370. Advanced Sculpture: Traditional Approaches. (3 cr [max 12 cr]; SP–3307 or #) Clay figure modeling. Mold making using historical and contemporary systems; casting in semi-permanent molds. Studio practice and investigation of traditional sculptural methods and concepts. Development of personal imagery.

ArtS 5400. Seminar: Concepts and Practices in Art. (3 cr [max 6 cr]; SP–BFA candidate or #) Discussion of various ideologies and cultural strategies that influence the practice and interpretation of art. Emphasis on diversity of viewpoints within the practice of contemporary art and culture. Application of these issues in development of the final B.F.A. exhibition.

ArtS 5402. Artist’s Books. (3 cr; SP–3402 or #) Advanced projects in the creation of unique, handmade books using a variety of structures, media, and techniques. Critical, historical, and theoretical issues surrounding contemporary book arts.

ArtS 5403. Women’s Images and Images of Women. (3 cr; SP–3101 or #) Women’s place in Western art from the artist’s perspective. Women as artists and the imagery they have created. Women as the object of imagery and the social and political attitudes those images convey.

Survey of women artists from late-Renaissance through contemporary feminism; relevant issues.

ArtS 5441. Professional Practices. (3 cr; SP–Grad student or #; S-N only) Intensive writing seminar provides a context for theoretical issues, business practices, and professional skills required for career management and development in the visual arts.

ArtS 5490. Workshop in Art. (1-3 cr [max 12 cr]) Selected topics and intensive studio activity. Topics vary.

ArtS 5510. Advanced Printmaking: Intaglio and Screen. (3 cr [max 12 cr]; SP–3501 or #) In-depth research of intaglio and screen printing with investigation of historical and contemporary applications. Development of imagery using color, photo-mechanical and digital processes, and cross-media approaches.

ArtS 5520. Advanced Printmaking: Relief and Lithography. (3 cr [max 12 cr]; SP–3502 or #) Relief printing and lithography for creative expression. Studio practice with stone, metal and wood. Investigation toward developing a contemporary visual language and aesthetics. Historical and contemporary awareness, evolving technologies and strategies.

ArtS 5550. Advanced Papermaking. (3 cr [max 12 cr]; SP–3505 or #) Focus on distinct expressive qualities of handmade paper and its versatility as a contemporary art form. Independent research interests are pursued in consultation with instructor.

ArtS 5610. Advanced Electronic Art. (3 cr [max 12 cr]; SP–3601 or #) Synthesis of artistic form and content using digital technologies. Independent projects pursued in consultation with instructor.

ArtS 5710. Advanced Photography. (3 cr [max 12 cr]; SP–Two semesters of 3xxx photography or #) Design and implementation of individual advanced projects. Demonstrations, lectures, and critique. Reading, writing, and discussion of related articles and exhibitions.

ArtS 5810. Advanced Ceramics. (3 cr [max 12 cr]; SP–3801, 3802 or #) Critical discourse of aesthetics, history, and contemporary issues in clay and ceramics. Independent, advanced projects.

ArtS 5821. Ceramic Materials Analysis. (3 cr; SP–3801 or 3802 or #) Ceramic materials and their interrelationships. Advanced investigation of glazes, slip formulation, and clay bodies in both high and low temperature ranges. Individual interests related to students’ aesthetic needs.


ArtS 5840. Advanced Neon. (3 cr [max 12 cr]; SP–3804 or #) Emphasis on the development of personal sculptural sensitivity. Studio practice with neon glass tubing and electrical components. A mixed media approach is encouraged.

ArtS 5990. Independent Study in Art. (1-4 cr [max 12 cr]; SP–Major or #) Independent study project designed by student in consultation with instructor.

ArtS 8100. Drawing and Painting: Theory and Practice. (3 cr [max 12 cr]; SP–Art MFA student) Tutorial in drawing and/or painting.
Courses

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

ArtS 8331. FTE: Master's, (1 cr; SP-Master's student, adviser and DGS consent)

ArtS 8400. Theoretical Constructions in Contemporary Art. (3 cr [max 6 cr])

ArtS 8401. Studio and Pedagogy: Philosophy and Practice. (3 cr [max 6 cr])
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 8500. Printmaking: Theory and Practice. (3 cr [max 12 cr])
Focus on the complexities and multi-disciplinary activities of printmaking. Development of concepts and personally significant imagery leading to thesis work.

ArtS 8600. Electronic Art: Theory and Practice. (3 cr [max 12 cr])
Tutorial issues related to creative visual work using the computer and other technologies. Interactivity, robotics, digitally based conceptual art, and time-based art.

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

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

ArtS 8990. M.F.A. Creative Thesis. (1-9 cr [max 18 cr]; SP-Art MFA candidate, passed oral and written prelim, #)

Art History (ArtH)

Department of Art History
College of Liberal Arts

ArtH 5103. Hellenistic and Early Roman Art and Archaeology. (3 cr; SP-Class/ArtH 3008, Jr or Sr)
Sculputure, architecture, painting, and topography in developing centers of Hellenistic culture in the eastern Mediterranean, and in Etruscan and Roman towns from 400 B.C. to the beginnings of the Roman Empire.

ArtH 5108. Greek Architecture. (3 cr; SP-Arh/Class 3008, Jr or Sr or grad student, or #)
Geometric through classical examples of religious and secular architecture and their setting at archaeological sites in Greece, Asia Minor, and Italy.

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

ArtH 5112. Archaic and Classical Greek Art. (3 cr; SP-Jr or Sr or grad student or #)
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 5120. Field Research in Archaeology. (3 cr [max 3 cr]; SP–#)
Field excavation, survey, and research at archaeological sites in the Mediterranean area. Techniques of excavation and exploration, interpretation of archaeological materials.

ArtH 5172. House, Villa, Tomb: Roman Art in the Private Sphere. (3 cr; SP-Intra art history course or #)
The architecture, painting, and sculpture of urban houses, country estates, and tombs in the Roman World. Relationships between public and private spheres, and literary and physical evidence; usefulness of physical evidence in illuminating gender roles.

ArtH 5182. Art and the State: Public Art in the Roman Empire. (3 cr; SP-Intra art history course or #)
Origins of Roman public art; use in maintaining community; exploitation by the first Emperor, Augustus; development and diffusion through the later Empire; varying capabilities to adjust to the demands of a Christian Empire.

ArtH 5234. Gothic Sculpture. (3 cr; SP-Jr or Sr or grad student or #)
The origin, character, and development of Gothic sculpture in France, the German empire, and the Netherland, 1150-1400. Emphasis on French sculpture of the cathedral age and the emergence of a court style in Paris and elsewhere in Europe (e.g. London, Prague).

ArtH 5252. History of Early Christian Art in Context. (3-4 cr; SP–5xxx ArtH course or #)
The role played by the formation of early Christian and Byzantine communities, and in establishing their relationships with the Pagan world and early Islam.

ArtH 5324. 15th-Century Painting in Northern Europe. (3 cr; SP-Jr or Sr or grad student or #)
The origin, character, and development of painting in France, the Netherlandish area, and the German Empire during the years 1350 to 1500. Emphasis on the Flemish school (e.g., Van Eyck brothers, Campin, Van der Weyden) and its influences.

ArtH 5346. 17th- and 18th-Century Art of Southern Europe. (3 cr; SP–3011 or grad student or #)
17th-century painting in Spain (e.g., Ribera, Velazquez, Murillo); 17th- and 18th-century architecture, sculpture, and painting in Italy (e.g., Caravaggio, Carracci, Bernini, Alvaro, Borromini, Piranesi).

ArtH 5347. 17th and 18th-Century Art of Northern Europe. (3 cr; SP–3022 or grad student or #)
17th-century painting in Holland and Belgium (e.g., Rembrandt, Rubens); 17th- and 18th-century architecture, sculpture, and painting in France (e.g., Versailles, Poussin, Watteau).

ArtH 5431. Age of Revolution: French Painting 1789 to 1870. (3 cr)
Major issues and movements in France and leading practitioners: neo-classicism-David; romanticism-Corot, Gericault, Delacroix; landscape and peasant painting-the Barbizon group; realism-Courbet; pre-impressionism-Monet, Van Gogh; post-impressionism and early 20th-century painting (e.g., Picasso, Braque, Cezanne).

ArtH 5454. Design Reform in the Era of Art Nouveau. (3 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 5463. Early 20th-Century Painting and Sculpture. (3 cr)
Primary movements of early 20th century: fauvism, German expressionism, cubism, futurism, dadaism, surrealism, non-objective painting, constructivism, Orphism, early abstraction. Framed against postimpressionism and internationalism at turn of century.

ArtH 5465. American Sculpture: The Public Monument. (3 cr)
Case studies in American public sculpture of the 19th and 20th centuries including the 1893 Chicago Fair, the two Jima and Vietnam Veterans Memorials, the Washington Monument, the Lincoln Memorial; careers of Daniel Chester French and Augustus St. Gaudens.

ArtH 5521. Modernism and Modernism in American Painting: 1876 to 1945. (3 cr)
Relationship between modernity and “modernism” in the visual arts between the Centennial Exposition of 1876 and World War II. Artists addressed include the Ash Can School and the Regionalists.

ArtH 5535. Style, Tradition, and Social Content in American Painting: Colonial Era to 1876. (3 cr)
America’s colonial, Revolutionary era, and 19th-century painters’ responses to the influence of European aesthetics. Key American painting types: portraiture, rural genre, and landscape from Copley and Gilbert Stuart to the Hudson River School and the chroniclers of the Western frontier.

ArtH 5536. Topical Studies in American Art. (3 cr)
Topics vary, depending on the current research interests of the instructor and the needs and interests of advanced undergraduate and graduate students in modern and American art.

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

ArtH 5572. Ceramics in the Far East. (3 cr)
Selective examination of representative pottery and ceramic wares produced in China, Korea, and Japan from the Neolithic era to modern times. Nearly every major ceramic type is represented.

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

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

ArtH 5767. Japanese Painting. (3 cr)
Japanese pictorial arts from the late tomb period to the modern era; emphasis on the development of indigenous traditions.

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

ArtH 5775. Formation of Indian Art: 2500 B.C.E. to 1300. (3 cr; SP-Art history course or #)
Sculpture and architecture from the Indus Valley civilization through the Kushana period.

ArtH 5776. Redefining Tradition: Indian Art 400 to 1300. (3 cr; SP-Art history course or #)
An examination of India’s art and architecture from the time of the earliest free-standing temples through the 13th century, focusing on temples and their associated sculpture, mural painting, and the beginnings of Islamic architecture in India.

ArtH 5777. The Diversity of Traditions: Indian Art 1200 to Present. (3 cr; SP-Art history course or #)
Issues presented by sculpture, architecture and painting in India from the prehistoric Indus Valley civilization to the present day.
ArTH 5781. Age of Empire: The Mughals, Safavids, and Ottomans (1-3 cr; SP–Max 18 cr per semester or summer; 24 cr required)
ArTH 5785. Art of Islamic Iran. (3 cr)
ArTH 5950. Topics: East Asian Gardens. (3 cr)
ArTH 6333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)
ArTH 8340. Seminar: Baroque Art. (3 cr; SP–Max 12 cr; SP–)
ArTH 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)
ArTH 8520. Seminar: Medieval Art. (3 cr; SP–Max 12 cr; SP–)
ArTH 8988. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)
ArTH 8920. Seminar: Film History and Criticism. (3 cr; SP–Max 18 cr per semester or summer; 24 cr required)
ArTH 8950. Seminar: Issues in the History of Art. (3 cr; SP–Max 12 cr; SP–)
ArTH 8970. Directed Studies. (1-3 cr; SP–Max 12 cr; SP–)

Astronomy (Ast)

Department of Astronomy Institute of Technology

Ast 5012. The Interstellar Medium. (4 cr; QP–3051, Phys 3513 or #; SP–2001, Phys 2601 or #)
Ast 5022. Relativity, Cosmology, and the Universe. (4 cr; QP–3051, Phys 3513 or #; SP–2001, Phys 2601 or #)
Ast 5201. Methods of Experimental Astrophysics. (4 cr; QP–3051, Phys 3512; SP–Upper div IT or grad student or #)
Ast 5202. Selected topics, with emphasis on current scholarly disputes. Topics specified in Class Schedule.
Ast 8020. Seminar: Medieval Art. (3 cr; SP–Max 12 cr; SP–)
Ast 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)
Ast 8990. Research in Astronomy and Astrophysics. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Biochemistry (BioC)

Department of Biochemistry
College of Biological Sciences

BioC 5309. Biocatalysis and Biodegradation. (3 cr; SP–§MdBc 5309; chem through organic chem; knowledge of word processing, e-mail, access to World Wide Web, access to college-level science library recommended; SP–§MdBc 5309; chem through organic chem; knowledge of word processing, e-mail, access to World Wide Web, access to college-level science library recommended)
Assess validity of information on biocatalysis and biodegradation; learn fundamentals of microbial catabolic metabolism as it pertains to biodegradation of environmental pollutants; biocatalysis for specialty chemical synthesis; display of this information on the Web.

BioC 5352. Applied Microbial Biochemistry. (3 cr; SP–§MdBc 5352; BioC 3021 or BioC 5321, Bio 5013 or #; SP–§MdBc 5352; BioC/3021 or BioC 4531 or BioC 4111, MicroB 4321 or Bio 3301 or #)
Biochemistry of microorganisms and enzymes of industrial interest. Heterologous peptide overproduction by microorganisms and yeasts; polymer, antibiotic, organic acid, and amino acid production; genetics of industrially useful microorganisms; biological systems useful for biotransformation and environmental remediation; introduction to fermentation technology.

BioC 5401. Advanced Metabolism and Its Regulation. (3 cr; QP–3021 or 3531; SP–3021 or 4331 or Biol 2011)
Underlying principles that determine the metabolism of both common and unusual compounds in plants, animals, and microorganisms. Regulation of carbon and energy flow in whole organisms.

BioC 5444. Membrane and Muscle: Biochemistry and Physiology. (3 cr; QP–3021 or 3531; SP–3021 or 4331 or Biol 2011)

BioC 5527. Physical Biochemistry: Biopolymer Structure, Energetics, and Dynamics. (4 cr; QP–§MdBc 5527; intro physical chemistry or equiv required, intro biochemistry desirable; SP–§MdBc 5527; intro physical chemistry or equiv required, intro biochemistry desirable)
Application of thermodynamics and statistical thermodynamics to solution behavior, binding, and helix-coil transitions of proteins and nucleic acids. Use of kinetics to elucidate enzyme mechanisms. Hydrodynamic, scattering, and crystallographic approaches to biopolymer structure.

BioC 5528. Physical Biochemistry: Spectroscopy. (4 cr; QP–§MdBc 5528; intro physical chemistry or equiv required, intro biochemistry desirable; SP–§MdBc 5528; intro physical chemistry or equiv required, intro biochemistry desirable)
Application of NMR, electron spin resonance, optical, infrared, and circular dichroism spectroscopies to proteins, nucleic acids, and membranes.

BioC 5530. Selected Topics in Molecular Biophysics. (1-3 cr; SP–Max 12 cr; SP–§MdBc/Chem 5530; BioC/MdBc/Chem 5525 or 5526 or 5527 or 5528 or equiv; SP–§MdBc 5530; BioC/MdBc 5527 or 5528 or equiv)
Discussion of topics from current literature on the biophysics of proteins, nucleic acids, muscles, and membranes. Content and instructors vary.

BioC 8001. Advanced Biochemistry I: Protein Structure, Function, and Metabolism. (5 cr; QP–§MdBc 8001; one qtr biochem, three qtr organic chemistry, two qtrs physical chemistry, SP–§MdBc 8001; one semester biochem, two semesters organic chem, one semester physical chem) or #

For definitions of course numbers and symbols, see inside back cover.
Protein structure, methods to determine structure, protein folding, forces stabilizing macromolecular structure, protein engineering and design. Dynamic properties of proteins and enzymes, enzyme substrate complexes, mechanism of enzyme catalysis. Enzymology of metabolic regulation and cell signaling.

BioC 8002. Advanced Biochemistry II: Molecular Biology and Regulation of Biological Processes. (3 cr; QP–§1402 or §1403; BioC/MdBi 8001; SP–§3401; BioC/MdBi 8002; BioC/MdBi 8003 or §)
Structure and stability of nucleic acids; genome mechanics, including DNA replication, recombination, and transposable elements. Mechanism and regulation of gene expression, including transcription, processing, and translation. Genetic and enzymatic controls; cell cycle controls; regulation of development

BioC 8084. Research and Literature Reports. (1 cr [max 5 cr]; SP–Grad BMBB major or §; S-N only)
Current developments.

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

BioC 8213. Selected Topics in Molecular Biology. (4 cr; QP–BioC/MdBi 8002; SP–§1402; BioC/MdBi 8211 or BioC/MdBi 8002 or §)
Discussion of current topics such as DNA replication, recombination and gene conversion, regulation of gene expression, chromatin structure and transcription, developmental gene regulation, organellar gene expression. RNA splicing, initiation and control of translation, animal viruses, transposable elements, somatic recombination, and oncogenes.

BioC 8216. Selected Topics in Regulatory Biology. (3 cr; QP–BioC/MdBi 8002; SP–§1402; BioC/MdBi 8210 or BioC/MdBi 8002 or §)
Literature-based course emphasizes cellular and molecular regulation in development. Both prokaryotic and eucaryotic systems used as models for discussion.

BioC 8290. Current Research Techniques. (3 cr [max 9 cr]; SP–§1402; grad BMBB major; S-N only)
Research projects carried out in laboratory of a staff member. Satisfies part of Ph.D. lab requirements.

BioC 8333. FTE: Master's. (1 cr; SP–Grad BMEn major, adviser and DGS consent)

BioC 8444. FTE: Doctoral. (1 cr; SP–Grad BMEn major, adviser and DGS consent)

BioC 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–§1403 or §1404; BioC/MdBi 8002 or §)

BioC 8777. Thesis Credits: Master's. (1-18 cr; SP–Grad BMEn major; S-N only)
Student presentations of current thesis research or student's normal academic or employment experience.

BioC 8777. Thesis Credits: Doctoral. (1-18 cr; SP–Grad BMEn major; S-N only)
Student presentations of current thesis research or other areas of biomedical engineering.

Biol 5409. Evolution. (3 cr; QP–§3409; 1009 or 1202, grad student or §; SP–§3409; 1001 or 1008, grad student or §)
Historical evolution through consideration of divergence of biological forms in fossil record and in presently existing biological diversity. Genetic mechanisms of evolution elucidated by examples of ongoing evolution in wild and domesticated populations and in disease-causing organisms.

Biol 5501. Biological Collections: Curation and Management. (1 cr; QP–1103 or 1106 or 3011 or 3012; SP–2012 or 2002 or 3007 or 3211)
Roles and value of biological collections in terms of biodiversity; natural history museum management and philosophy; conservation of museum specimens; data access and ethics. Students participate in various curatorial activities.

Biol 5511. Teaching the Biological Sciences. (3 cr; QP–9 cr in the life sciences; SP–6 cr in the life sciences; A-F only)
Methods and teaching styles used by outstanding university teachers including reviews and critiques from research on teaching. Opportunities for students to practice and evaluate teaching strategies.

Biol 5910. Special Topics in Biology for Teachers. (1-4 cr; QP–Grad BMEn major; SP–§3409; BioC/MdBi 8002 or §)
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.

Biomedical Engineering (BMEn)

Graduate School

BMEn 5001. An Introduction to Biomaterials. (3 cr; SP–§3409; graduate BMEn major; general chem, organic chem, biochem, polymer sci recommended; A-F only)
Commonly used biomaterials. Chemical and physical aspects; practical examples from such areas as cardiovascular and orthopedic applications, drug delivery, cell encapsulation. Methods used for chemical analysis and physical characterization of biomaterials. Effects of additives, stabilizers, processing conditions, sterilization methods.

BMEn 5041. Tissue Engineering. (3 cr; SP–IT upper div or grad student or §; A-F only)
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. Bioelectric Measurements and Therapeutic Devices I. (3 cr; SP–§4440, calculus, college physics, §)
Instrumentation, computer systems, and processing requirements for clinical physiological signals. Electrode characteristics, signal processing, and interpretation of physiological events by EEG, ECG, and EMG. Measurement of respiration and blood volume and flow.

BMEn 5102. Bioelectric Measurements and Therapeutic Devices II. (3 cr; SP–§5101)
Theory and application of electrical stimulation in areas of therapeutic and functional neuromuscular stimulation and pain control, cardiac pacing, defibrillation, tissue healing, and electrotherapy. Safety of electric fields. Electrical tissue impedance measurements.

BMEn 5201. Musculoskeletal Biomechanics. (3 cr; SP–IT upper div or grad student; A-F only)
Introduction to biomechanics of musculoskeletal system. Description of anatomy and tissue material properties. Kinematics, dynamics, and control of joints and limb movement. Analysis of forces and motions within joints. Application to injury, disease, and treatment of specific joints, design of orthopaedic devices, and implants.

BMEn 5301. Bioin Engineering (3-4 cr; SP–Enginnering upper div or grad student)
Introduces biomedical engineers to concepts of cell and tissue structure and function. Basic principles of cell biology and their utilization in engineering applications such as tissue engineering and artificial organs.

BMEn 5310. Biological Transport Processes. (3 cr; SP–IT upper div or grad student or §; Chem 5103 or ME 5342 recommended; A-F only)
Introduction to biological fluid, mass, and heat transport. Mass transfer across membranes; fluid flow in vessels and interstitium; heat transfer in cells, tissues, and body. Applications to blood oxygenation, respiration, drug delivery, and tissue engineering.

BMEn 5350. Cell Engineering. (3 cr; SP–Cell biol or equiv; SP–5301 or equiv; 5201 or equiv; IT upper div or grad student or §)
Survey of engineering approaches to cell-related phenomena important to cell and tissue engineering: receptor/ligand binding, trafficking and signaling processes; applications to cell proliferation, adhesion, and motility; cell-matrix interactions.

BMEn 5371. Biomedical Applications of Heat Transfer in Humans. (3 cr; SP–Phils 3053, Phils 3056, Phils 5441; SP–Phils 3053, Phils 3056, Phils 5441)
Overview of physiology underlying thermoregulation in humans, clinical applications of heat transfer in humans, and framework for a design project.

BMEn 5910. Special Topics in Biomedical Engineering. (2-4 cr)

BMEn 5920. Special Topics in Biomedical Engineering. (2-4 cr)

BMEn 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and DGS consent)

BMEn 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

BMEn 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

BMEn 8701. Biomedical Engineering Seminar. (1 cr; S-N only)
Lectures and demonstrations of university and industry research introducing students and faculty to methods and goals of biomedical engineering.

BMEn 8702. Biomedical Engineering Seminar. (1 cr; S-N only)
Lectures and demonstrations of university and industry research introducing students and faculty to methods and goals of biomedical engineering.

BMEn 8710. Directed Research. (1-3 cr)

BMEn 8720. Internship in Biomedical Engineering. (3 cr; SP–IT upper div or grad student; Grad BMEn major; S-N only)
Supervised lab or industrial experience unrelated to student’s normal academic or employment experience.

BMEn 8730. Biomedical Engineering Graduate Student Seminar. (1 cr; SP–Grad BMEn major; S-N only)
Student presentations of current thesis research or other areas of biomedical engineering.

BMEn 8777. Thesis Credits: Masters. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])
**Biomedical Science (B M Sc)**

**Graduate School**

**BMSc 8444. FTE: Doctoral.** (1 cr; SP–Doctoral student, adviser and DGS consent)

**BMSc 8666. Doctoral Pre-Thesis Cr.** (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

**BMSc 8888. Thesis Credits: Doctoral.** (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

**Research on a topic determined by interests of student in consultation with faculty supervisor. Requires approval by faculty supervisor and director of graduate studies.**

**Biophysical Sciences (B Phy)**

**Graduate School**

**BPhy 5138. Research Seminar.** (1-5 cr)

**BPhy 5139. Seminar and Journal Club.** (1-5 cr)

**BPhy 5170. Basic Radiological Physics.** (3 cr; SP–§TRad 7170; 5170 cr)

Theoretical and experimental aspects of radiological physics. Physical properties of various ionizing radiations; interactions of ionizing radiations with matter; methods of radiation dose measurement.

**BPhy 5171. Medical and Health Physics of Imaging I.** (3 cr; SP–§TRad 7171; 5170 cr)

Physics of diagnostic imaging: specification and quantification of image quality, X-ray production, image receptors, magnetic resonance imaging, radiation exposure and protection. Special imaging techniques, including mammography, computed tomography, and digital direct image capture.

**BPhy 5172. Radiation Biology.** (3 cr; SP–§TRad 7172; 5170 cr)

Effects of ionizing radiation on cells, tissues, and organisms; biochemical and physiological bases of radiation effects; biological rationale for radiation therapy practices.

**BPhy 5173. Medical and Health Physics of Radiation Therapy.** (3 cr; SP–§TRad 7173; 5170 cr)


**BPhy 5174. Medical and Health Physics of Imaging II.** (3 cr; SP–§TRad 7174; 5170 cr)

Physics of diagnostic imaging: ultrasound, theoretical and experimental applications of radionuclides in medicine and biology, counting statistics and imaging systems associated with radiopharmaceuticals, radiation dosimetry and safety in nuclear medicine.

**BPhy 6147. Advanced Physics of Magnetic Resonance Imaging (MRI).** (3 cr)

NMR (nuclear magnetic resonance) and MRI physics, spatial selection and encoding, imaging hardware and system engineering. Imaging sequences and associated contrast and resolution. Recent developments in MRI.

**BPhy 8148. Advanced Digital Imaging Science.** (3 cr)

Emphasizes role of digital image science in medical imaging, including measurement of image quality; digital radiography; image reconstruction for CT, SPECT, PET, and MRI; 3D image processing and image registration and visualization; picture archiving and communications systems.

**BPhy 8293. Directed Study in Biophysical Sciences and Medical Physics.** (1-12 cr; SP–Max 12 cr; SP–#)

**BPhy 8294. Directed Research in Biophysical Sciences and Medical Physics.** (1-12 cr; SP–Max 12 cr; SP–#)

**BPhy 8333. FTE: Master's.** (1 cr; SP–Master's student, adviser and DGS consent)

**BPhy 8444. FTE: Doctoral.** (1 cr; SP–Doctoral student, adviser and DGS consent)

**BPhy 8666. Doctoral Pre-Thesis Credits.** (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

**BPhy 8777. Thesis Credits: Master's.** (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**BPhy 8888. Thesis Credits: Doctoral.** (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

**Biosystems and Agricultural Engineering (BAE)**

**Institute of Technology**

**BAE 5095. Special Problems.** (1-5 cr; SP–#; SP–#)

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

**BAE 5513. Watershed Engineering.** (3 cr; SP–Upper div IT or grad student, 3052 or CE 3400, CE 3000, SP–3023, upper div IT)

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.

**BAE 8001. Seminar.** (1 cr; SP–#; S-N only)

Presentation and discussions on current research topics, research philosophy and principles, proposal writing, and professional presentations.

**BAE 8005. Supervised Classroom or Extension Teaching Experience.** (2 cr; SP–#; AEM 8000, §Hort 8000, §Pipa 8000, §Soil 8000; SP–#; AEM 8005, §Hort 8005, §Pipa 8005, §Soil 8005; SP–S-N only)

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.

**BAE 8013. Parameter Estimation in Biosystems and Agricultural Engineering.** (3 cr; SP–Q P–Stat 3021 or equiv, computer programming course; SP–Stat 3021 or equiv, computer programming course; A-F only)

**BAE 8094. Advanced Problems and Research.** (2-6 cr; SP–S-N only)

**BAE 8303. Machinery Modeling.** (3 cr; SP–AEM 3036, CE 3400; SP–AEM 2021, CE 3502)

Machinery systems modeling using multibody dynamics simulation software (MBDS). Students review models presented in the literature and report on limitations of modeling approaches used. Models are developed in the students’ areas of interest.

**BAE 8333. FTE: Master's.** (1 cr; SP–Master's student, adviser and DGS consent)

**BAE 8444. FTE: Doctoral.** (1 cr; SP–Doctoral student, adviser and DGS consent)

**BAE 8513. Hydrologic Modeling of Small Watersheds.** (3 cr; SP–CE 5405 or equiv, computer programming course; SP–CE 3502, hydrology course)

Study and representation of hydrologic processes by mathematical models: stochastic meteorological variables, infiltration, overland flow, return flow, evapotranspiration, and channel flows. Approaches for model calibration and evaluation.

**BAE 8523. Coupled Heat, Moisture, and Chemical Transport in Porous Media.** (3 cr; SP–#; Math 3261, Soil 5232, SP–CS 5301 or equiv, Math 5512-5513 or equiv, Soil 5232 or equiv, computer programming; A-F only)

Series of five projects to develop computer programs to solve governing equations.

**BAE 8666. Doctoral Pre-Thesis Credits.** (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

**BAE 8703. Managing Water in Food and Biological Systems.** (3 cr; SP–Chem 5501 or FScN 5314 or MatS 5011; SP–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, physicochemical properties and changes, and structural properties and changes in foods and biological materials.

**BAE 8777. Thesis Credits: Master's.** (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**BAE 8888. Thesis Credits: Doctoral.** (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

**Business Administration (BA)**

**Curtis L. Carlson School of Management**

**BA 8444. FTE: Doctoral.** (1 cr; SP–Doctoral student, adviser and DGS consent)

**BA 8666. Doctoral Pre-Thesis Credits.** (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

**BA 8888. Thesis Credits: Doctoral.** (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)
Business and Industry Education (BIE)

Department of Work, Community, and Family Education

College of Education and Human Development

BIE 5001. Teaching Marketing Promotion. (3 cr; A-F only)
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.

BIE 5011. Introduction to Microcomputer Applications. (3 cr)
Instructional uses of microcomputers and representative business and marketing education applications, including word processing, databases, spreadsheets, and graphics.

BIE 5012. Advanced Word Processing. (3 cr; SP–5011 or equiv)
Develop and apply solution methods for office problems using word-processing software, including advanced editing, printing and desktop publishing capabilities.

BIE 5013. Spreadsheet Analysis Using Microcomputers. (3 cr; SP–5011 or equiv)
Develop expertise in using spreadsheets to analyze data, monitor business records, and create models.

BIE 5014. Database Microcomputer Applications. (3 cr; SP–5011 or equiv)
Business needs requiring computerized databases. Use microcomputer database software to develop, maintain, and prepare reports.

BIE 5015. Integrated Microcomputer Applications in Business and Marketing Education. (3 cr; SP–5011, 5012, 5013, 5014 or equiv)
Use of realistic business microcomputer problems requiring the integration of two or more application packages. Pedagogical issues of learning advanced microcomputer application capabilities and teaching similar applications to designated groups of learners.

BIE 5080. Special Topics in Business and Industry Education. (1-4 cr [max 4 cr])
Topics vary.

BIE 5101. Technological Problem Solving. (3 cr; SP–5111, 5112, 5121, 5122; A-F only)
Capstone technology education course in which students research problems relative to various technological systems and develop solution(s) to the identified problems.

BIE 5151. Technical Development: Specialized. (1-12 cr [max 12 cr]; A-F only)
Students select and study technical processes and principles based on the particular subject matter areas they plan to teach. Experiences allow students to integrate specialized technical instruction in advanced and emerging areas.

BIE 5321. Vocational Guidance in Business and Industry Education. (2 cr; A-F only)
Self assessment, use of occupational and labor market information, job seeking skills, work and work satisfaction. For industrial teachers and trainers in school and industry settings.

BIE 5325. Foundations of Industrial Education. (3 cr)
Social, economic, psychological, philosophical, legislative, and pedagogical foundations of industrial education in the United States. Comparison with selected foreign countries. Analysis of contemporary trends against the backdrop of early foundations.

BIE 5344. Facilities Management in Business and Industry. (3 cr; SP–3112; A-F only)
Planning, evaluating, and managing industrial education shop and lab facilities.

BIE 5365. Curriculum Development in Technology Education. (2 cr)
Conceptualization and derivation of content for the K-12 technology curriculum. Comparison of U.S. approaches to technology curriculum with selected countries.

BIE 5401. Introduction to Business and Marketing Education. (3 cr)
Conceptual models of business and marketing education useful in the design and delivery of business and marketing education programs in secondary and post secondary schools, adult education settings, and business and industry.

BIE 5440. Business and Industry Observation and Seminar. (1-3 cr [max 6 cr])
Current operating practices and career opportunities in business and industry. Planned experiences in work environments and related seminars.

BIE 5452. Methods of Teaching Business Concepts. (3 cr)
Recent research and developments in teaching business concepts related to economics, business organization and management, business law, entrepreneurship, marketing, international business, information systems, accounting, risk management, and personal finance.

BIE 5457. Methods of Teaching for Business Employment. (3 cr)
Recent research and developments in teaching for business employment, including administrative support positions, accounting and information processing, marketing, sales, computer operations, and other occupations using desktop computing.

BIE 5463. Methods in Teaching Keyboarding and Word Processing. (2 cr; A-F only)
Implementing keyboarding and word processing; effective teaching strategies; expected learner outcomes; evaluation methods; selecting hardware; instructional materials (including print, software, Internet); organizing and managing labs.

BIE 5596. Occupational Experience in Business and Industry. (1-10 cr [max 10 cr]; S-N only)
Observation and employment in business and industry to developing technical or occupational competencies; 100 clock hours of supervised work experience per credit.

BIE 5597. Internship: Business and Industry Education. (1-8 cr [max 12 cr]; S-N only)
Practical experience in business or industry as a professional educator or supervisor. Requires an integrative paper.

BIE 5601. Student and Trainee Assessment. (2 cr; A-F only)
Development of tests of knowledge; effect and processes for programs focused on instruction of skills associated with business and industry; development of learning progress reporting systems; evaluation of instructional effectiveness.

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

BIE 5624. Sales Training. (3 cr; A-F only)
Training competent customer service employees as part of a marketing strategy. Explore training strategies using the appropriate instructional methods for different settings and situations.

BIE 5625. Technical Skills Training. (3 cr)
Analyze technical skills and training practices in business and industry; systems and process analysis; trouble-shooting of work behavior; design methods and developing training materials.

BIE 5626. Customer Service Training. (3 cr; A-F only)
Ongoing analysis of customer service strategies used by successful organizations and training practices used to develop customer-oriented personnel.

BIE 5627. Management and Supervisory Development. (3 cr)
Problems, practices, programs, and methodologies relating to the training and development of managers and supervisors, including needed competencies, needs assessment, delivery modes, and evaluation.

BIE 5616. Instructional Methods for Business and Industry Education. (2 cr)
Basic instructional strategies and techniques in instructional settings, from schools and colleges to business and industry.

BIE 5662. Computer Training in School and Industry Settings. (3 cr; SP–5011 or equiv)
Alternative teaching practices for business applications software: word processing, spreadsheets, graphics, desktop publishing, databases, and communications; public school and industry settings.

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

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

BIE 8995. Research Problems: Business and Industry. (3-6 cr [max 6 cr]; SP-Adviser approval; S-N only)
Individual research in business and industry education.

Business, Government, and Society (BGS)

Department of Strategic Management

Curtis L. Carlson School of Management

BGS 8841. Seminar: Theory and Methods of Measurement. (4 cr; OP–MBA 8045 or MBA 8210 or equiv; SP–MBA 8210 or equiv, business admin PhD student or # offered alt yrs)
Validity and reliability of measures developed as key indicators of constructs in a behavioral context. Methods for evaluating measures, such as indicators of reliability, Multi- Trait Multi-Method analysis, exploratory factor analysis, and confirmatory factor analysis using Lisrel.

Business Law (BLaw)

Department of Accounting

Curtis L. Carlson School of Management

BLaw 5078. Partnerships and Corporations. (2 cr)
Partnership and corporate forms of business entities, including methods of creating the relationships and the study of law used to regulate and control these organizations and their members.

BLaw 5088. Law of Personal Property, Real Property, and Commercial Paper. (2 cr)
Basic concepts of personal property, including rights of possessors, bailies, and finders and holders of security interests. Real property law. Transfers of ownership, control of and encumbering such interests. The law of paper (negotiable instruments).
Cell Biology and Neuroanatomy (CBN)

Department of Cell Biology and Neuroanatomy
Medical School

CBN 5058. Anatomy for Physical Therapy. (5 cr; SP—Regis physical therapy student; A-F only)
Lecture and lab dissection of bones, muscles, nerves, vessels, connective tissue, and selected internal organs plus joint structures of limbs, spinal column, head, and pelvis. Includes some histology and embryology. Correlation of all content to clinical conditions.

CBN 8136. Techniques of Biological Electron Microscopy. (4 cr; SP—)
Theory and methodology of transmission and scanning electron microscopy.

Chemical Engineering (ChEn)

Department of Chemical Engineering and Materials Science

Institute of Technology

ChEn 5103. Porous Media. (3 cr; QP—ChEn 5103, ChEn 5202; SP—#; MatS 8219; ChEn 4003; ChEn 4102; A-F only)

ChEn 5104. Coating Process Fundamentals. (3 cr; QP—ChEn 5103, ChEn 5202; SP—ChEn 4003, ChEn 4102; A-F only)
Basic process functions: viscous flow and rheology, capillarity, wetting; electrostatic effects; phase change, colloidal transformations, mass/heat transfer in drying; kinetics in curing; stress and property development in solidification. Illustrations drawn from theoretical modeling, flow visualization, and stopped-process microscopy.

ChEn 5302. Chemical Reaction Engineering and Catalysis. (3 cr; QP—ChEn 5301; SP—ChEn 4102; A-F only)
Continuous and batch reactors, heat management, catalytic reactions and reactors, nonlinear flow in reactors, polymerization, solids processing, multiphase reactors. Fundamentals and mechanisms of catalytic reactions. Industrial examples in petroleum/chemical industries.

ChEn 5751. Biochemical Engineering. (2 cr; QP—ChEn 5103 or SP—ChEn 4002; A-F only)
Basic principles applied to analysis and design of complex cellular and 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 5753. (Biological) Biomedical Transport Processes. (3 cr; QP—ChEn 5750; SP—SP—A-F only)

ChEn 5754. Food Processing Technology. (3 cr; QP—ChEn 5705; SP—ChEn 4002; A-F only)
Introduction to food processing as it interfaces with engineering. Case studies. Engineering economics and practical design problems in food processing. Heat transfer; freezing, conduction (unsteady state); thermal processing; extruder design; protein processing; order-of-magnitude estimating; and economic concepts such as ROI, discounted cash flow, and capital estimating.

ChEn 5759. Principles of Mass Transfer in Engineering and Biological Engineering. (2 cr; QP—ChEn 5103 or SP—ChEn 4002; A-F only)
Principles of mass transfer in gases, liquids, biological and macromolecular solutions, gels, solids, membranes, and capillaries. Porous solids interaction between mass transfer and chemical reaction. Applications in biological, environmental, mineral, and chemical engineering systems.

ChEn 8101. Fluid Mechanics I: Change, Deformation, Equations of Flow. (3 cr; QP—5103; SP—4002 or #; A-F only)
Equations of change of mass, momentum, angular momentum, etc. Kinematics of deformation and convective transport. Applications to fluid statics and dynamics of Newtonian fluids. Examples of exact solutions of Navier-Stokes equations and useful simplifications.

ChEn 8102. Principles and Applications of Rheology. (3 cr; QP—8181; SP—8101; A-F only)
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 8103. Fluid Mechanics III: Porous Media. (3 cr; SP—#; MatS 8219; A-F only)

ChEn 8104. Coating Process Fundamentals. (3 cr; SP—#; A-F only)
Basic process functions: viscous flow and rheology, capillarity, and wetting; electrostatic effects; phase change, colloidal transformations, mass/heat transfer in drying; kinetics in curing; stress and property development in solidification. Requires independent study and a report.

ChEn 8201. Applied Mathematics I: Linear Analysis. (3 cr; SP—#; A-F only)
Integrated approach to solving linear mathematical problems (linear algebraic equations and linear ordinary and partial differential equations) using theoretical and numerical analysis based on linear operator theory. Appropriate for first-year engineering graduate students.

ChEn 8202. Applied Mathematics II: Nonlinear Analysis. (3 cr; SP—#; A-F only)
Nonlinear mathematical problems (nonlinear ordinary and partial differential equations) using theoretical and numerical analysis. Appropriate for students who have had a graduate-level course in linear analysis.

ChEn 8301. Physical Rate Processes I: Transport. (3 cr; QP—5103; SP—#; A-F only)

ChEn 8302. Physical Rate Processes II: Mass Transfer. (3 cr; QP—8004; SP—8301; A-F only)
Applications of mass transfer. Membranes, including gas separation and reverse osmosis; controlled drug release, dispersion, including examples of pollution modeling; adsorption and chromatography; coupled heat and mass transfer, including cooling towers; double-diffusive effects.

ChEn 8333. FTE: Master’s. (1 cr; SP—Master’s student, adviser and DGS consent)

ChEn 8401. Physical and Chemical Thermodynamics. (3 cr; QP—5202; SP—#; A-F only)
Principles of classical thermodynamics and an introduction to nonequilibrium thermodynamics, with applications in chemical engineering and materials science. Background should include undergraduate engineering or chemistry courses in thermodynamics.

ChEn 8402. Statistical Thermodynamics and Kinetics. (3 cr; SP—Physical or statistical mechanics course; A-F only)
Introduction to statistical mechanical description of equilibrium and non-equilibrium properties of matter, emphasizing fluids and classical statistical mechanics.

ChEn 8444. FTE: Doctoral. (1 cr; SP—Doctoral student, adviser and DGS consent)
Courses

ChEn 8501. Chemical Rate Processes: Analysis of Chemical Reactions. (3 cr; SP–A–F only) Design of reactors for heat management and with catalytic processes through detailed analysis of steady state and transient behavior. Polymerization, combution, solids processing, and environmental modeling; design of multiphase reactors. Primarily for graduate students who have had a course in chemical reactor engineering.

ChEn 8502. Process Control. (3 cr; QP–5301; SP–4601 or equiv; A–F only) For linear systems: stability, controllability, observability, pole-placement via state feedback, state observers, output feedback, and robustness of control systems. For nonlinear systems: solution properties, stability analysis, singular perturbations, feedback linearization via state feedback, and direct synthesis via output feedback.

ChEn 8503. Chemical Rate Processes: Homogeneous Reactions. (3 cr; SP–Chemical rate processes course; A–F only) Description and 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. (1-18 cr per semester or summer; 10 cr total required [Plan A only])

ChEn 8777. Thesis Credits: Master’s. (1-18 cr per semester or summer; 10 cr total required [Plan A only])

ChEn 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Chemistry (Chem)

Department of Chemistry
Institute of Technology


Chem 5201. Solid State Chemistry. (4 cr; QP–3301, 5501 or 5534 or #; SP–3501 or equiv or #) Advanced introduction to materials chemistry. Basic structure of crystalline solids and fundamentals of crystallography and X-ray diffraction. Close packing applied to metals, covalent/ionic solids, and molecular crystals. Methods of synthesis of solid state compounds. Characterization techniques. Selected physical properties of materials.

Chem 5221. Introduction to Polymer Chemistry. (4 cr; QP–3302, 5502 or #; SP–2302, 3502 or #) Introduction to polymer chemistry. Condensation, radical, ionic, emulsion, ring-opening, and metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

Chem 5223. Polymer Laboratory. (2 cr; QP–5610 or #; SP–5221 or 8211 or #) Synthesis, characterization, and physical properties of polymers. Free radical, condensation, emulsion, and anionic polymerization; infrared spectroscopy and gel permeation chromatography; viscoelasticity, rubber elasticity, and crystallization. Applications.

Chem 5311. Chemistry of Industry. (4 cr; QP–Chem sr or grad student or #; SP–Chem sr or grad student or #) Industrial and polymer chemistry technology. Relation of basic properties to industrial utility. Economics, social problems, industrial environment.

Chem 5321. Organic Synthesis. (3 cr; QP–3302 or equiv; SP–2302 or equiv) Fundamental concepts, reactions, reagents, structural/ stereochemical issues, and mechanistic skills for organic chemistry.

Chem 5322. Advanced Organic Chemistry. (3 cr; QP–3302 or equiv; SP–2302 or equiv) Topics vary and include natural products, heterocycles, asymmetric synthesis, organometallic chemistry, and polymer chemistry. See instructor for details.

Chem 5352. Physical Organic Chemistry. (3 cr; QP–3302 or #; SP–2302 or #; 5011 or 8011) Fundamental concepts and mechanistic tools for analysis of organic reaction mechanisms. Topics include solvation, reactive intermediates, gas phase chemistry, and photochemistry or strained-ring chemistry or both.

Chem 5361. Interpretation of Organic Spectra. (3 cr; QP–3302 or equiv; SP–2302 or equiv) Application of nuclear magnetic resonance, mass, ultraviolet, and infrared spectral analyses to organic structural problems.

Chem 5411. Biorganic Chemistry. (3 cr; QP–3302 or equiv; SP–2302 or equiv) Chemistry of amino acids, peptides, proteins, lipids, carbohydrates, and nucleic acids. Structure, nomenclature, synthesis, and reactivity. Techniques to characterize biomolecules.

Chem 5412. Enzyme Mechanisms. (3 cr; QP–3302 or equiv; SP–2302 or equiv) Enzyme classification with examples from current literature; strategies to decipher enzyme mechanisms; chemical approaches to control enzyme catalysis.

Chem 5413. Nucleic Acids. (3 cr; QP–3302 or equiv; SP–2302 or equiv) Chemistry and biology of nucleic acids. Structure, thermodynamics, reactivity, DNA repair, chemical oligonucleotide synthesis, antisense approaches, ribozymes, techniques for nucleic acid research, interactions with small molecules and proteins.

Chem 5715. Physical Inorganic Chemistry. (3 cr; QP–5702 or equiv, chem major or #; SP–4701 or equiv, chem major or #) Physical methods (e.g., IR, UV–VIS, ESR, Mossbauer and mass spectrometry, magnetic measurements, X-ray diffraction) and concepts applied to inorganic and organometallic systems.

Chem 5725. Organometallic Chemistry. (3 cr; QP–5702 or equiv, chem major or #; SP–4701 or equiv, chem major or #) Synthesis, reactions, structures, and other properties of main group and transition metal organometallic compounds; electronic and structural theory, emphasizing their use as stoichiometric and homolytic catalytic reagents in organic and inorganic systems.

Chem 5735. Bioinorganic Chemistry. (3 cr; QP–5702 or equiv, chem grad student or #; SP–4701 or equiv, chem grad student or #) Role of metal ions in biology. Emphasizes structure, function, and spectroscopy of metalloproteins and their synthetic analogs.

Chem 5745. Advanced Inorganic Chemistry. (3 cr; QP–5702, chem major, or #; SP–4701, chem major, or #) Topics in main group and transition metal chemistry. Emphasizes synthesis, structure, physical properties, and chemical reactivity.


Chem 8081. M.S. Plan B Project I. (1-4 cr; SP–Grad chem major; A–F only) 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 8082. M.S. Plan B Project II. (1-4 cr; SP–Grad chem major; A–F only) 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 8091. Chemical Physics (ChPh)

Graduate School

ChPh 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

ChPh 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

ChPh 8602. Chemical Physics Seminar. (1 cr; SP–Grad chem physics major or #) Weekly seminar series on modern chemical physics and related topics.

ChPh 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

ChPh 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Chemical Physics (ChPh)

Chem 8152. Advanced Analytical Chemistry II. (4 cr; SP–Grad chem major or #) Survey of analytical spectrosopic methods. Design and application of spectroscopic instruments, including signal generation, acquisition, and interpretation. May include nuclear magnetic resonance, electron paramagnetic resonance, infrared and ultraviolet/visible spectrocopy, and mass spectrometry.

Chem 8153. Advanced Analytical Chemistry III. (5 cr; SP–5133 or equiv, differential equations course; SP–4101 or equiv, differential equations course; A-F only) Use of analog and digital electronics and computational methods in experiments. Passive circuits, operational amplifiers, filters, oscillators and Laplace transform techniques in analysis, domain conversion for data acquisition and control, statistics, experimental design. Introduction to chemometrics, Fourier analysis, convolution/deconvolution, curve fitting.


Chem 8157. Bioanalytical Chemistry. (2 cr; SP–5133 or equiv, BioC 5001 or equiv; SP–4101 or equiv, BioC 3021 or equiv; A-F only) Theory and practical aspects of analytical methods used in determination and characterization of biologically important materials. Enzymatic and kinetic methods in study of proteins, carbohydrates, lipids, and nucleic acids.

Chem 8159. Nuclear Magnetic Resonance Spectroscopy. (2 cr; SP–One semester of organic chem; SP–One semester of organic chem) Detailed understanding of relaxation processes, chemical exchange, quadrupolar effects, NMR, 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. (2-4 cr; SP–Grad chem major or #) Topics (and availability) vary depending on instructor and development of the field.

Chem 8211. Physical Chemistry of Polymers. (4 cr; SP–Undergrad physical chem course; SP–Mats 8211; undergrad physical chem course or #) Introduction to polymer physics chemistry. Chain conformations; thermodynamics of polymer solutions, blends, and copolymers; light, neutron, and X-ray scattering; dynamics in dilute solution and polymer characterization; dynamics of melts and viscoelasticity; rubber elasticity, networks, and gels; glass transition; crystallization.

Chem 8280. Special Topics in Materials Chemistry. (2-4 cr; SP–Grad chem major or #) Topics (and availability) vary depending on instructor and development of the field.

Chem 8321. Organic Synthesis. (4 cr; SP–3302 or equiv; SP–2302 or equiv) Core course; fundamental concepts, reactions, reagents, structural and stereochemical issues, and mechanistic skills necessary for understanding organic chemistry.

Chem 8322. Advanced Organic Chemistry. (4 cr; SP–3302 or equiv; SP–2302 or equiv) Modern studies. Topics vary and include natural products, heterocycles, asymmetric synthesis, organometallic chemistry, and polymer chemistry.

Chem 8333. FTE: Masters. (1 cr; SP–Master’s student, adviser and GGS consent) 

Chem 8352. Physical Organic Chemistry. (4 cr; SP–8002 or 3302 or equiv; SP–5011/8011 or Z302 or equiv; #) Fundamental concepts and mechanistic tools for understanding and critical analysis of organic reaction mechanisms. Solvation, reactive intermediates, gas phase chemistry, photochemistry, and/or strained-ring chemistry.

Chem 8361. Interpretation of Organic Spectra. (4 cr; SP–3302 or equiv; SP–2302 or equiv) Practical application of nuclear magnetic resonance, mass, ultraviolet, and infrared spectral analyses to solution of organic structural problems.

Chem 8380. Special Topics in Organic Chemistry. (2-4 cr; SP–Grad chem major or #) Topics (and availability) vary depending on instructor and development of the field.

Chem 8411. Bioorganic Chemistry. (4 cr; SP–3302 or equiv; SP–2302 or equiv) Chemistry of amino acids, peptides, proteins, lipids, carbohydrates, and nucleic acids; structure, nomenclature, synthesis, and reactivity; an overview of techniques used to characterize these biomolecules.

Chem 8412. Enzyme Mechanisms. (4 cr; SP–3302 or equiv; SP–2302 or equiv) Enzyme classification with representative examples from current literature; strategies used to decipher enzyme mechanisms; chemical approaches for control of enzyme catalysis.

Chem 8413. Nucleic Acids. (4 cr; SP–3302 or equiv; SP–2302 or equiv) Chemistry and biology of nucleic acids: structure, thermodynamics, reactivity, DNA repair, chemical oligonucleotide synthesis, base-pairing approaches, ribozymes, overview of techniques used in nucleic acid research, interactions with small molecules and proteins.

Chem 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and GGS consent)

Chem 8480. Special Topics in Biological Chemistry. (2-4 cr; SP–Grad chem major or #) Topics (and availability) vary depending on instructor and development of the field.


Chem 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Chem 8715. Physical Inorganic Chemistry. (4 cr; SP–5702 or equiv; SP–4701 or equiv, grad chem major or #) Physical methods and concepts applied to inorganic and organometallic systems, including many of the following methods: NMR, IR, UV-VIS, ESR, Mossbauer and mass spectroscopy, magnetic measurements, X-ray diffraction.

Chem 8725. Organometallic Chemistry. (4 cr; SP–5702 or equiv; SP–4701 or equiv, grad chem major or #) Synthesis, reactions, structures, and other important properties of main group and transition metal organometallic compounds; treatment of topics in modern electronic and structural theory; emphasis on their use as stoichiometric and homogeneous catalytic reagents in organic and inorganic systems.

Chem 8735. Bioinorganic Chemistry. (4 cr; SP–5702 or equiv; SP–4701 or equiv, grad chem major or #) Survey of role of metal ions in biology; emphasizes structure, function, and spectroscopy of metalloproteins and their synthetic analogs.

Chem 8745. Advanced Inorganic Chemistry. (4 cr; SP–8751; SP–8715, grad chem major or #) Survey of topics in main group and transition metal chemistry; emphasizes synthesis, structure, physical properties, and chemical reactivity.

Chem 8777. Thesis Credits: Masters. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Chem 8780. Special Topics in Inorganic Chemistry. (2-4 cr; SP–Grad chem major or #) Topics (and availability) vary depending on instructor and development of the field.

Chem 8880. Special Topics in Chemistry. (2-4 cr; SP–Grad chem major or #) Topics (and availability) vary depending on instructor and development of the field.

Chem 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)
Courses

Chic 5403. Chicana/Latina Feminisms. [3 cr; SP–Sr, #] The historical and social development of Chicana and Latina feminisms in general and their various specific types. Includes women activists who do not self-identify as “feminists,” but are fighting for equality.

Chic 5505. Indigenous Women and Land Issues. [3 cr] Legal experience of indigenous women defending their land and property interests. Encompasses a social ecology approach to their land struggles, including cultural and legal histories of Native Americans, Mexicans, and Chicanas.

Chic 5601. Migrant and Seasonal Agricultural Labor. [3 cr] Surveys the agricultural workforce with a focus on legal theory. While its approach is interdisciplinary, its emphasis is on the legal construct. A wide realm of case law and articles address several key issues confronting agricultural laborers.

Chic 5701. History of Ancient Mexico. [3 cr]
Chic 5702. Literature of Ancient and Colonial Mexico. [3 cr; SP–Chicana studies sr, #] Analysis and contextualization of ancient and colonial Mexican literature such as Popol Vuh, Rabinal Achi, Chilam Balam, Codex Mendoza, Juan Ruiz de Alarcon, and Sor Juana Ines de la Cruz.


Chic 5920. Topics in Chicana(o) Studies. [3 cr; SP–Grad student or Sr, #] Multidisciplinary themes in Chicano studies. Examine and analyze issues of current interest.


Chic 5993. Directed Studies. [1-3 cr; max 16 cr; SP–#] Guided individual reading, research, and study for completion of the requirements for a senior paper or honors thesis.

Child and Adolescent Psychiatry (CAPy)

Department of Psychiatry
Medical School

CAPy 5620. Disruptive Behavior Disorders I: Attention Deficit Hyperactivity Disorder Throughout the Life Span. [1 cr]

CAPy 5621. Workshop: Eating Disorders in Children and Adolescents. [1 cr]

CAPy 5623. Affective Disorders and Suicide in Children and Adolescents. [1 cr]

CAPy 5627. Workshop: Disruptive Behavioral Disorders II. [1 cr]

CAPy 5628. Workshop: Developmental Disorders: Perspectives on Etiology, Assessment, and Treatment. [1 cr]

CAPy 5629. Disruptive Behavioral Disorders IV: Medication and Behavioral Therapies. [1 cr]

CAPy 5630. Workshop: Psychotherapy in Children and Adolescents. [1 cr]

CAPy 5631. Workshop: Developmental Neuropsychiatry. [1 cr]

CAPy 5632. Workshop: Competence Enhancement Training Programs for Children with Disruptive Behavior. [1 cr]

CAPy 5633. Workshop: Anxiety Disorders in Childhood and Adolescence. [1 cr]

CAPy 5634. Workshop: Developmental Dyslexia: Theory, Research, and Clinical Differentiation. [1 cr]

CAPy 5635. Workshop: Disruptive Behavioral Disorders V. [1 cr]

CAPy 5636. Workshop: Disruptive Behavioral Disorders III. [1 cr]

CAPy 5638. Workshop: Prevention Science II. [1 cr]

CAPy 5639. Workshop: Behavior Problems in Preschool Children. [1 cr]


CAPy 5644. Workshop: Child Abuse/Neglect and Childhood Psychopathology: Implications for Assessment and Treatment. [1 cr]

CAPy 5645. Workshop: Innovative Methods in Psychotherapy. [1 cr]

CAPy 5646. Workshop: Methods of Measurement and Assessment in Psychopathology. [1 cr]

CAPy 5648. Workshop: Prevention Science IV. [1 cr]

CAPy 5649. Workshop: Personality and Social Development. [3 cr]

CAPy 5747. Workshop: Prevention Science III. [1 cr]

Child Psychology (CPsy)

Institute of Child Development
College of Education and Human Development

CPsy 5305. Multidisciplinary Perspectives on Aging. [4 cr] Sociological, psychological aspects of aging; theories of aging, death and bereavement; issues and problems of older adults in the United States; human services and their delivery systems (health, nutrition, long-term care education); public policy and legislation; environment and housing; retirement.

CPsy 5310. Special Topics in Child Development. [4 cr; max 12 cr; SP–CPsy 1301; SP–Psy 1001] Selected topics in child development are examined in depth; topics and credits vary.

CPsy 8301. Developmental Psychology: Cognitive Processes. [4 cr; SP–Doctoral student or #] 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 cr; SP–Doctoral student or #] Normative issues and individual differences in social development from infancy through adolescence, with special reference to developmental psychopathology; life span considerations.

CPsy 8304. Research Methods in Child Psychology. [3 cr; SP–Doctoral student or #] Review of principal research methods and designs in developmental psychology and consideration of special issues concerning research, including scientific integrity.

CPsy 8311. Seminar: History of Child Development. [1 cr; SP–Doctoral student or #] History of developmental psychology and child development movement in context of classic studies. Presentations by students and instructor.

CPsy 8321. Seminar: Current Issues in Teaching Developmental Psychology. [1 cr; SP–Doctoral student or #] Problems and issues in teaching introductory child psychology course.

CPsy 8333. FTE: Master’s. [1 cr; SP–Master’s student, adviser and DGS consent]


CPsy 8444. FTE: Doctoral. [1 cr; SP–Doctoral student, adviser and DGS consent]

CPsy 8606. Advanced Developmental Psychopathology. [3 cr; SP–Doctoral student or #] Alternative formulation of childhood disorders, emphasizing competency training rather than medical nosology.

CPsy 8666. Doctoral Pre-Thesis Credits. [1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral]

CPsy 8777. Thesis Credits: Masters. [1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only]]

CPsy 8888. Thesis Credits: Doctoral. [1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required]

CPsy 8980. Research Seminar in Child Psychology. [1-3 cr; max 15 cr; SP–Doctoral student] Participation in organized research group in developmental psychology.

CPsy 8993. Directed Study in Child Psychology. [1-4 cr; SP–Doctoral student or #]

CPsy 8994. Research Problems in Child Psychology. [1-6 cr; max 15 cr; SP–Doctoral student or #] Individual empirical investigation.

CPsy 8996. Directed Field Experiences in Child Psychology. [1-6 cr; max 6 cr; SP–Doctoral student, # S-N only] 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.

Chinese (Chn)

Institute of Linguistics and Asian and Slavic Languages and Literatures
College of Liberal Arts

Chn 5011. Research Methods. [4 cr; SP–3032 or 3112] Introduction to the sources and approaches of research in language and literature.


Chn 5120. Topics in Chinese Linguistics. [4 cr; max 8 cr; SP–4121 or 4122] Studies of the structure and change in the Chinese language.

Chn 5230. Topics in 20th-Century Chinese Literature. [4 cr; max 8 cr; SP–3032] Studies of representative literary works from May 4, 1919 to the present.
CE 5231. Pavement Management and Rehabilitation. (3 cr; QP–Upper div IT or grad student, 5603; SP–Upper div IT or grad student, 4301; GeoE 4301 or #; A-F only) Concepts and practices in monitoring, maintaining, and rehabilitating flexible and rigid pavement systems. Evaluation of pavement performance, structural and functional definitions of pavement performance, decision-making processes, and optimization.

CE 5232. Advanced Portland Cement Concrete. (3 cr; QP–Upper div IT or grad student, 4301, GeoE 4301 or #; A-F only) Advanced topics in cement chemistry and selection of materials for and design of portland cement concrete mixtures. Lab assignments pertaining to mixture design and short-term and long-term behavior. Use of admixtures and fiber reinforcement. Effects of proportioning of standard materials.

CE 5233. Advanced Bituminous Materials. (3 cr; SP–Upper div IT or grad student, CE 3402 or #) Advanced topics in selection and design of bituminous materials. Asphalt cement, rheology, emulsions, chip seals, hot-mix asphalt design, viscoelastic characterization. Lab assignments pertaining to rheology, mixture design and viscoelastic behavior.

CE 5311. Experimental Geomechanics. (3 cr; QP–Upper div IT or grad student, 5603; SP–Upper div IT or grad student, 4301, GeoE 4301 or #; A-F only) Machine stiffness, closed-loop testing. Small-strain theory. Measurement of deformation: strain gages, LVDTs, accelerometers, and associated circuits. Direct and indirect testing. Material behavior: experiments on anisotropic, damaged, and fluid-filled solids.

CE 5321. Geomechanics. (3 cr; QP–Upper div IT or grad student; SP–Upper div IT or grad student, 4301 or GeoE 4301; A-F only) Elasticity theory and solution of elastic boundary value problems. Wave propagation in unbounded elastic media. Elements of fracture mechanics and applications. Elements of poroelasticity and applications.

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

CE 5411. Applied Structural Mechanics. (3 cr; QP–Upper div IT or grad student, 5600, AEM 3036; SP–Upper div IT or grad student, C or better in 4401 or #; A-F only) Principal stresses and failure in 3 dimensions. Introduction to plane elasticity, energy methods, torsion of beams, bending of unsymmetrical beams.

CE 5412. Prestressed Concrete Design. (3 cr; QP–IT or grad student, 5611, 5612, 5613 recommended; SP–Upper div IT or grad student, C or better in 4412 or #; A-F only) Recommended; Design of prestressed concrete structures. Time dependent effects, behavior, flexure, shear, torsion, deflections, continuous systems.

CE 5413. Masonry Structures. (3 cr; QP–IT or grad student, 5600 or SP–Upper div IT or grad student, C or better in 3403 or #; A-F only) Masonry materials and their production; mortars and grouts; design of unreinforced, reinforced, and prestressed masonry or structural systems; walls, columns; lintels; arches. Codes and specifications, testing and inspection.

CE 5581. Water Resources: Individuals and Institutions. (3 cr; A-F only) Control of water resources by natural system functions, user actions, and influence of social, economic, and political institutions. Water resource policy in the United States. Case studies (e.g., flood/drought management).

CE 5591. Environmental Law for Engineers. (3 cr; QP–Upper div IT or grad student or #; SP–Upper div IT or grad student or #; A-F only) Environmental regulatory law relevant to civil and environmental engineering; specific provisions of federal statutory and regulatory laws such as NEPA, CWA, RCRA, CAA, and CERCLA.

CE 8022. Numerical Methods for Free and Moving Boundary Problems. (3 cr; QP–8605; SP–8401 or #; A-F only) 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. (1-4 cr; QP–Master’s, SP–#) Research or independent study in concrete, structural steel, soils, hydraulics, hydrology, and municipal, environmental, or transportational problems. Investigations, reports, tests, or designs.

CE 8211. Traffic Flow and Traffic Operations. (3 cr; SP–5211 or equiv) Macroscopic and microscopic traffic flow models, dynamic models, shock waves, traffic flow, speed and travel time. Simulation of traffic flow, capacity analysis for urban streets and highways, traffic control, use of computer programs in traffic engineering practice.

CE 8212. Advanced Travel Demand Modeling and Supply Analysis. (3 cr; QP–Stat 3091; SP–5211 or equiv, Stat 2001) Application of random utility theory to model travel demand; deterministic and stochastic trip assignment; network design problems; transportation planning software.

CE 8215. Stochastic Transportation Modeling. (3 cr; QP–8210 or #; SP–8211 or Stat 5201 or #) Random variables and estimation; time-series models, linear systems and Kalman filtering; discrete-time Markov processes and dynamic travel demand models; continuous-time Markov processes and traffic flow.

CE 8231. Advanced Pavement Engineering. (3 cr; QP–5304; SP–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; curvature induced stresses; mechanics of drainage.

CE 8300. Seminar: Geomechanics. (1-3 cr; QP–Master’s, SP–#; A-F only) Presentations on various topics.


CE 8311. Advanced Rock Mechanics. (3 cr; QP–5305; SP–IT grad student, 4311 or GeoE 4311 or #; A-F only) Stress transformations; principal stresses and directions. Friction behavior of rock joints; stability of frictional sliding. Elastic waves; acoustic emission and seismic measurements. Fragmentation and rock breakage.
Courses


CE 8322. Storage and Flow of Granular Materials. (3 cr; QP–5301 or 5302; SP–IT grad student, 4301 or #; A-F only) Plasticity of granular media. Static and dynamic method of slices. Storage and flow of granular materials in bins and hoppers. Stress concentrations, arching, piping. Experiments on granular material properties and flow.


CE 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

CE 8336. Boundary Element Methods I. (3 cr; SP–IT grad student; A-F only) 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 cr; SP–8336, GeoE 8336 or #; A-F only) Transient and nonlinear problems.

CE 8351. Advanced Groundwater Mechanics I. (3 cr; QP–5425; SP–4351 or GeoE 4351, IT grad student or #; A-F only) Solute transport; shallow flow in leaky aquifers; complex variable methods in groundwater flow. Analytic element method; potentials for line sinks, line doublets, line dipoles, area sinks, and special analytic elements; singular Cauchy integrals; analytic elements in domains with closed boundaries.

CE 8352. Advanced Groundwater Mechanics II. (3 cr; QP–5431; SP–IT grad student or #; A-F only) Applying complex methods, including conformal mapping, in groundwater mechanics; solving problems with free boundaries using the hodograph method; drainage anomalies with free boundaries; superposition of solutions with drains; singular Cauchy integrals; boundary elements.

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

CE 8400. Seminar: Structures. (1 cr [max 3 cr; A-F only]) 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 cr; QP–5601; SP–4411 or #; A-F only) Elements of calculus of variations; weak and strong formulations of dynamic system 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 8412. Shell Structures. (3 cr; SP–#; offered alt yrs; A-F only) Static analysis of thin elastic shells based on Love’s postulates. Membrane and bending theories. Thermal stresses in cylinders. Buckling of shells of revolution.

CE 8421. Structural Dynamics. (3 cr; QP–AEM 3036; SP–AEM 2012 or #; A-F only) Response of discrete and continuous systems to dynamic loading. Formulation and solution of problems of one or more degrees of freedom; modal analysis. Numerical integration and transform techniques. Response of dynamic systems to base motion using response spectrum methods.

CE 8422. Earthquake Engineering. (3 cr; QP–8620; SP–8421 or #; A-F only) 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 cr; SP–#; offered alt yrs; A-F only) Classification of discrete and continuous conservative and nonconservative systems. Buckling analysis of, e.g., structural members, frameworks, plates, by classical and numerical methods.

CE 8432. Analysis of Thin-Walled Members. (3 cr; QP–5610; SP–5411 or #; offered alt yrs; A-F only) 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 meltaxial material behavior on buckling.

CE 8441. Plastic Design of Steel Structures. (3 cr; QP–5610; SP–4413 or #; offered alt yrs; A-F only) Plastic analysis and design of structures with applications to gable frames. Minimum weight design. Collapse mechanisms and plastic deformations. Minimum weight design.

CE 8442. Nonlinear Analysis of Structural Systems. (3 cr; QP–5601, 5612, or equiv; SP–4411, 4413 or #; offered alt yrs; A-F only) Advanced theory and computational techniques for analyzing complex building structural systems. Using comprehensive geometric and material nonlinear analysis for designing steel and composite structures.

CE 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

CE 8451. Behavior of Reinforced Concrete Structures. (3 cr; QP–5611, 5613, 5615; SP–4412 or A-F only) Advanced topics; experimental and theoretical background to design code provisions. Moment-curvature analysis of members. Shear; torsion; disturbed regions; reinforcing columns joints; shear walls. Effects of earthquake loading. Limit analysis.

CE 8461. Structural Reliability. (3 cr; QP–5612, 5613 or equiv; SP–#; offered alt yrs; A-F only) Structural design standards and methods; uncertainties in structural design; basic probabilistic concepts and statistical distributions. Resistance and load statistics. First- and second-order reliability methods, systems reliability. Development of probability-based design codes.

CE 8490. Special Topics. (1-3 cr [max 3 cr]; SP–#; A-F only) Tailored offering depending on faculty and student interests.

CE 8500. Environmental Seminar. (1 cr [max 3 cr]; SP–Grad CE major or #; S-N only) 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 cr; QP–3400 or SP–3502 or equiv or #; A-F only) 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 inverse analysis. Laminar boundary layers and slender flows. Application to engineering and environmental problems.

CE 8502. Environmental Fluid Mechanics II. (4 cr; QP–5435; SP–8501 or #; A-F only) 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 cr; QP–3400, 3500 or equiv; SP–3502, 3501 or equiv or #; A-F only) Principles of intraphase and interfacial chemical transport and fate in the environment, specifically the processes of dispersion, diffusion, and convection. Application to surface water and atmospheric mixing, dispersion in groundwater, and transport between these media.

CE 8504. Theory of Unit Operations. (4 cr; QP–5500, 5501, 5506; SP–4541, 4531; A-F only) Theoretical basis, design, and operation of chemical engineering processes used in treating and controlling water quality, including adsorption, ion exchange, sedimentation, thickening, filtration, gas transfer, coagulation, flocculation, membrane processes, and disinfection.

CE 8505. Biological Processes. (3 cr; QP–5405, 5501; SP–4502, 4501 or #; A-F only) 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 cr; QP–Stat 5021; SP–Grad CE major or #; S-N only) 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 cr; QP–8407; SP–8506; A-F only) Notions of scale-invariance, scaling, and multiscale in geophysical processes; methods of multiscale analysis; wavelet transforms; time-frequency-scale analysis and fractal analysis. Applications in atmospheric, hydrologic, and geomorphologic processes.


CE 8541. Aquatic Chemistry. (3 cr; QP–5506; SP–4541 or #; A-F only) Advanced course on water chemistry; physical chemical principles and geochemical processes.
controlling the chemical composition of natural waters, soil- and sediment-water interactions. Emphasizes behavior of inorganic contaminants in natural waters and engineered systems and dissolved natural organic matter.

CE 8542. Chemistry of Organic Pollutants in Environmental Systems. (3 cr; QP–3506; SP–4541 or #; A-F only) Structural characteristics and physico-chemical properties of organic contaminants in aquatic systems. Emphasis on PCBs, PAHs, dioxins, insecticides, herbicides, and chlorinated solvents. Factors affecting their transport and transformation. Structure- and property-activity relationships and their use in predicting organic chemical behavior.

CE 8551. Environmental Microbiology: Laboratory. (4 cr; SP–Grad CE major or #; exposure to environ engr and microbiol; A-F only) Molecular biology techniques used for environmental microbiology; analysis of microbial activities important for bioremediation; construction of genetically engineered microorganisms and their uses in environmental engineering.

CE 8552. Groundwater Microbiology: Laboratory. (4 cr; SP–Grad CE major or #; exposure to basic environ engr and microbiol; A-F only) Subsurface microbial ecology, biogeochemical cycling, metabolic classification of subsurface bacteria, modeling bacterial transport, diagnosis of microbial induced fouling (MIF) events, bioremediation of contaminated aquifers.


CE 8562. Analysis and Modeling of Aquatic Environments II. (2 cr [max 4 cr]; QP–8550; SP–One semester grad work or #) Models for transport and 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. Workshop format.

CE 8563. Industrial Waste Treatment. (3 cr; QP–3500, 5401, 5402, 5501, 5501 or SP–3501, 4501, 4502, or equiv or A-F only) Introduction to industrial waste treatment. Individual industries, emitting various 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 cr; QP–3400; SP–3502 or #; A-F only) Lab and field methods and instruments for measuring hydraulic pressure, velocity, and discharge.


CE 8573. Computational Hydrodynamics II. (3 cr; QP–8418; SP–1 grad student or #; A-F only) Navier-Stokes and Euler equations, their physical meaning and implications to computational approach. Finite difference and finite volume methods. Viscous boundary layer and compressibility boundary layer. Turbulent flow modeling. Applications to industrial and environmental flow problems.
Courses

Clas 5794. Introduction to Classical and Near Eastern Studies. (1 cr; SP–Grad major or minor or #) Introduction to core research materials and reference materials in the various disciplines which make up classical studies.

Clas 5940. Topics in Classical Literature. (3 cr [max 9 cr]; SP–§3940; two literature courses or # Additional work for graduate credit. Topics specified in Class Schedule. Meets with 3940.)

Clas 5950. Aspects of Classical Culture. (3 cr; SP–§3950) Topics specified in Class Schedule. Meets with 3950.

Clas 5993. Directed Studies. (1-4 cr; SP–#, A, Q) Guided individual reading or study.

Clas 5994. Directed Instruction. (1-12 cr; SP–#, A, Q)

Clas 8190. Seminar: Issues in Ancient Art and Archaeology. (3 cr [max 12 cr]; SP–#) Selected issues, with emphasis on current scholarly disputes. Topics specified in Class Schedule.

Clas 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and DGS consent)

Clas 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

Clas 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Clas 8777. Thesis Credits: Master's. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Clas 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Clas 8950. Topics in Classical Studies. (3 cr [max 12 cr]) Topics such as slavery, women in antiquity, pagans and Jews, the taboo, and modern study of myth.

Clinical Laboratory Science (CLS)

Department of Laboratory Medicine and Pathology

Medical School

CLS 5064. Introduction to Clinical Immunohematology. (2 cr; SP–# A-F only) Principles of blood grouping, antibody identification, compatibility testing, serology, and immunology.

CLS 5065. Introduction to Clinical Immunohematology/Laboratory. (2 cr; SP–# A-F only) Exercises illustrating techniques in blood grouping, antibody identification, compatibility testing, and detection of antibodies by serological and immunological methods.

CLS 5090. Special Laboratory Methods. (1-2 cr; SP–#) 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 cr; SP–Microbiology course with lab, biochemistry course # A-F only) Lab diagnosis of viral, fungal, and parasitic infections. Lecture.

CLS 5102. Principles of Diagnostic Microbiology. (4 cr; SP–Microbiology course with lab, biochemistry course # A-F only) Techniques used in lab diagnosis of infectious disease; isolation and identification of bacteria and yeasts; antimicrobial susceptibility testing.

CLS 5120. Seminar: Clinical Laboratory Science. (1 cr [max 3 cr]; S-N only) Current literature; presentation and discussion of research.

CLS 5125. Practicum Teaching. (1-2 cr; SP–# A-F only) Supervised teaching experience; developing skills using instructional materials, tests, and measurements.

CLS 5127. Introduction to Management and Education I. (1 cr; SP–# A-F only)

CLS 5128. Introduction to Management and Education II. (1 cr; SP–5127, MedT 4127; A-F only)

CLS 5129. Elements of Laboratory Administration. (2 cr; SP–# A-F only) Leadership styles, employee selection and evaluation, communications, motivation, morale, discipline, job descriptions, record keeping, budgets, cost accounting, purchasing, product evaluation, lab safety, labor relations, government regulations.

CLS 5130. Practicum in Laboratory Administration. (2 cr; SP–# A-F only) Supervised experience and assignment of specific problems related to lab service and management in health care institutions.

CLS 5135. Advanced Clinical Microbiology. (3 cr; SP–#) Observation, study, and practice in special problems, advanced techniques, and methodology.

CLS 5140. Techniques for Teaching. (2 cr; SP–# A-F only) Developing objectives, classroom activities, and evaluation criteria for medical technology education.

CLS 5155. Advanced Clinical Hematology. (3 cr; SP–#) Observation, study, and practice in special problems, advanced techniques, and methodology.

CLS 5165. Advanced Clinical Immunohematology. (3 cr; SP–#) Observation, study, and practice in special problems, advanced techniques, and methodology.

CLS 5175. Advanced Clinical Chemistry. (3 cr; SP–#) Observation, study, and practice in special problems, advanced techniques, and methodology.

CLS 5251. Hematology I: Basic Techniques. (3 cr; SP–# A-F only) Theory and application of basic principles and techniques in clinical hematology and hemostasis. Lecture and lab.

CLS 5252. Hematology II: Morphology and Correlation. (2 cr; SP–5251 or MedT 4251; A-F only) Fundamentals of blood and bone marrow examination emphasizing the microscopic identification of immature and abnormal cells. Clinical correlation of laboratory findings in hematology and hemostasis. Lecture and lab.

CLS 5253. Hemostasis. (1 cr; SP–5251 or MedT 4251; A-F only) Theory and application of specific concepts and techniques in hemostasis and coagulation. Lecture and lab.

CLS 5310. Clinical Chemistry I: Lecture. (2 cr; SP–Organic chem course with lab, biochemistry course # A-F only) Principles and theory of clinical chemistry for assessing renal and metabolic disease/dysfunction, electrolyte balance, and acid-base balance. Principles and processes for quality management in the clinical lab.

CLS 5311. Clinical Chemistry I: Laboratory Applications. (2 cr; SP–Organic chem course with lab, biochemistry course, # A-F only) Application of chemical laboratory principles and lab techniques in analyzing urine, plasma, and body fluids. Emphasis on lab tests to evaluate renal function, electrolytes, and acid-base balance. Principles and processes for managing test quality.

CLS 5320. Clinical Chemistry II: Lecture. (2 cr; SP–Organic chem course with lab, biochemistry course, 5310 or MedT 4310; # A-F only) Principles and theory of clinical chemistry for assessing metabolic disease/dysfunction involving hormones, enzymes, lipids/lipoproteins, cardiac function, liver, and digestive tracts. Emphasis on measurement methods and physiological significance.

CLS 5321. Clinical Chemistry II: Laboratory Applications. (2 cr; SP–Organic chem course with lab, biochemistry course, 5310 or MedT 4310; # A-F only) Application of chemical laboratory principles and lab techniques in analyzing serum, plasma, and urine. Focus on tests to evaluate selected disorders. Developing lab and instrumentation use skills with emphasis on quality control and technique.

CLS 5768. Advanced Hematology. (5-10 cr [max 30 cr]; SP–#) Practical experience collecting bone marrow from patients. Diagnosing hematological disorders by evaluation and interpretation of cells from clinical specimens of bone marrow, peripheral blood, and, if applicable, lymph nodes.

CLS 5864. Research Seminar. (1 cr [max 10 cr]; SP–# S-N only) Departmental research seminar series.

CLS 5865. Departmental Seminar. (1 cr [max 10 cr]; SP–# S-N only) Departmental clinical lab research seminar series.

CLS 8193. Advanced Topics in Clinical Chemistry. (2 cr; SP–#) Includes use of molecular approaches to diagnosis and risk assessment of selected diseases.

CLS 8194. Research on Clinical Laboratory Problems. (1-3 cr; SP–#) Individual research project in a selected area.

CLS 8293. Educational Administration in Medical Technology. (2 cr; SP–#) 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 cr; SP–Master's student, adviser and DGS consent)

CLS 8777. Thesis Credits: Master's. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Cognitive Science (CogSc)

Graduate School

CogSc 8000. Philosophy of Cognitive Science. (3 cr; SP–Grad cog sci minor or #) Philosophical framework for analyzing cognitive sciences. Recent developments in metaphysics and epistemology. Nature of scientific theories, methodologies of cognitive sciences, relations among cognitive sciences, relation of cognitive science to epistemology and various philosophical problems.

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

CogSc 8360. Seminar Topics in Cognitive Science. (1-3 cr [max 6 cr]; SP–Grad cog sci minor or #) Lectures and in-depth discussion on a topic.
Communication Disorders (CDis)

Department of Communication Disorders
College of Liberal Arts

CDis 5401. Counseling and Professional Issues. (4 cr; QP–3301, 4501, or #)

CDis 5501. Fluency Disorders. (3 cr; QP–#; SP–4501 or #)
Description, nature, and treatment of fluency disorders in children and adults. Involvement in therapeutic and research activities.

CDis 5502. Voice and Resonance Disorders. (3 cr; QP–#; SP–3305, 4301, 4501, or #)
Normal and disordered aspects of voice and resonance. Organic and functional voice disorders, laryngectomy, and cleft palate. Basic information regarding the nature and clinical management of these disorders.

CDis 5503. Motor Speech Disorders. (3 cr; QP–#; SP–3305, 4301, 4501, or #)
Dysarthria, speech-production disorders resulting from neurologic disorders or lesions, and apraxia of speech, a disorder of the volitional control of speech. Nature and management of motor speech disorders in adults and children.

CDis 5504. Dysphagia. (3 cr; QP–#; SP–3305, 4301, 4501, or #)
Normal and disordered aspects of swallowing. The nature, etiology, evaluation, and management of swallowing disorders will be covered.

CDis 5602. Phonological Disorders. (3 cr; QP–#; SP–3305, 4601, or #)
Theory and research related to the nature, assessment, and treatment of phonological disorders in children.

CDis 5603. Communication Assessment and Intervention: Preschoolers and Persons With Severe Disabilities. (3 cr; QP–#; SP–4601 or #)
Assessment and intervention options for school-age children with communication delays or disorders and for older individuals who experience severe developmental disabilities.

CDis 5604. Language Assessment and Intervention: School Age Children. (3 cr; QP–#; SP–4601 or #)

CDis 5605. Language and Cognitive Disorders in Adults. (3 cr; QP–#; SP–3305, 4301, 4501, or #)
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.

CDis 5606. Introduction to Augmentative and Alternative Communication. (3 cr; QP–#; SP–4501, 4601, or #)
Description of the range of augmentative and alternative communication applications for persons with developmental and acquired disabilities.

CDis 5607. Electronic Communication Aids. (3 cr; QP–#; SP–5606 or #)
Operational procedures for dedicated augmentative communication aids and related software applications. Design and implement assessment and intervention strategies relevant to dynamic and fixed display devices. Focuses on common technical difficulties encountered by individuals using electronic communication aids.

CDis 5801. Audiologic Assessment I. (3 cr; QP–#; SP–4601 or #)
Basic audiometric battery including pure tones, speech, masking, and immittance in adults; industrial audiology and otocoustic emissions.

CDis 5802. Hearing Aids I. (3 cr; QP–#; SP–3305, 4301, 4501, or #)
Survey of modern hearing aids including history of development, electroacoustic functions, clinic and laboratory measurement techniques, sound field acoustics, techniques for selection.

CDis 5803. Hearing Loss in Children: Diagnosis. (3 cr; QP–#; SP–4601 or #)
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.

CDis 5810. Laboratory Module in Audiology. (1 cr; QP–#; SP–4601 or #)
Intensive study of clinical methods in audiology. Designed to supplement didactic courses in the audiology curriculum; enhance skills through laboratory study individually or in small groups.

CDis 5900. Topics: Communication Disorders. (1-4 cr)
Study issues relevant to the field of communication sciences and disorders. Topics listed in Communication Disorders office.

CDis 5993. Directed Study. (1-12 cr; QP–#; SP–#)
Directed readings and preparation of reports on selected topics.

CDis 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and DGS consent)

CDis 8410. Seminar: Research. (2 cr)
Advanced study exploring application of experimental and quasi-experimental research designs used in single-subject and group research.

CDis 8420. Seminar: Teaching. (2 cr; QP–#; SP–Grad com dis major)
Advanced study to prepare doctoral students for careers in undergraduate and graduate teaching.

CDis 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

CDis 8501. Interdisciplinary Management in Cleft Palate and Craniofacial Disorders. (3 cr; QP–#; SP–4601 or #)
Communication problems associated with cleft palate and craniofacial disorders within interdisciplinary context; structural bases for speech problems, and physical and behavioral approaches to speech treatment; interdisciplinary medical and dental concerns and management.

CDis 8502. Clinical Instrumentation in Speech-Language Pathology. (3 cr)
Laboratory-based instruction on instrumentation for evaluation and management of people with speech and language disorders.

CDis 8530. Seminar: Speech. (2 cr; QP–#; SP–Master's student, adviser and DGS consent)
Advanced study and analysis of research in speech science and speech pathology.

CDis 8602. Traumatic Brain Injury. (3 cr; QP–#; SP–4601 or #)
Survey of communicative/cognitive disorders in adults who have traumatic brain injuries. Consideration of demographics, neuropsychologic substrates, assessment and diagnosis, and clinical applications.

CDis 8630. Seminar: Language. (2 cr; QP–#; SP–Grad com dis major)
Advanced study and analysis of language in acquisition, language science, and language disorders.

CDis 8666. Doctoral Pre-Thesis Credits. (1-18 cr; QP–#; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

CDis 8720. Clinical Education in Speech-Language Pathology. (1-4 cr; QP–#; SP–Grad com dis major, S-N only)
Clinical experience.

CDis 8777. Thesis Credits: Master's. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

CDis 8801. Audiologic Assessment II. (3 cr; QP–#; SP–Grad com dis major)
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.

CDis 8802. Hearing Aids II. (3 cr; QP–#; SP–Grad com dis major)
Instrumentation and methods for fitting and evaluating personal hearing aids; ear impression techniques and materials; repair and modification of hearing aids.

CDis 8803. Signals and Systems in Audiology. (3 cr; QP–#; SP–Grad com dis major)
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.

CDis 8804. Evoked Potentials. (3 cr; QP–#; SP–Grad com dis major)
Research and methods used in measurement and application of evoked potentials. Early, middle, and late auditory evoked potentials and electroencephalography.

CDis 8820. Clinical Education in Audiology. (1-4 cr; QP–#; SP–Grad com dis major, S-N only)
Clinical experience.

CDis 8830. Seminar: Hearing. (2 cr; QP–#; SP–Grad com dis major)
Advanced study and analysis of research in hearing science and audiology.

CDis 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

CDis 8994. Directed Research. (1-12 cr; QP–#; SP–Grad com dis major, S-N only)

Comparative Literature (CLit)

Department of Cultural Studies and Comparative Literature
College of Liberal Arts

CLit 3232. Introduction to Comparative Literature. (3 cr)
A general introduction to the study of comparative literature. A review of major literatures and their textual, cultural, and historical contexts. An overview of the philosophical and methodological approaches to the field.

CLit 5321. Comparative Literature. (3 cr)
For definitions of course numbers and symbols, see inside back cover.

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Comparative Literature (CLit)

Department of Cultural Studies and Comparative Literature
College of Liberal Arts

CLit 5331. The Discourse of the Novel. (3 cr)
Comparative study of the novel, 18th century to present. Its relations to ordinary language practices, emergent reading publics, technologies of cultural dissemination, problems of subjectivity, and its role in articulating international cultural relations.

CLit 5555. Introduction to Semiotics. (3 cr)
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).

CLit 5751. Basic Concepts of Cinema. (4 cr)
Cinema as an object of theoretical and historical analysis. Emphasis on the concepts that have emerged to radically transform the scope and aim of film analysis since the 1960s. Readings of filmic and theoretical texts.

CLit 5910. Topics in Comparative Literature. (3 cr; max 24 cr)
Topics specified in Class Schedule.

CLit 5992. Directed Reading in Comparative Literature. (1-3 cr; max 9 cr; SP–#)
Guided individual reading and study.
Courses

CLit 8001. Basic Seminar in Comparative Literature I. (4 cr)
Key texts, positions, and problematics in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, and disciplinary genealogies.

CLit 8002. Basic Seminar in Comparative Literature II. (4 cr)
Key texts, positions, and problematics in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, and disciplinary genealogies.

CLit 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and DGS consent)

CLit 8362. Modernity and Its Others. (4 cr)
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.

CLit 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

CLit 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

CLit 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

CLit 8901. Pedagogy of Cultural Studies and Comparative Literature. (4 cr; SP–Grad comp lit major)
Prepares graduate majors for teaching. Issues of pedagogy. Preparing syllabi for specific courses that graduate instructors teach. Required for students planning to teach in Department of Cultural Studies and Comparative Literature.

CLit 8910. Advanced Topics in Comparative Literature. (4 cr [max 32 cr])
Practical applications of specific methodologies and theories to a determined area. Topics vary.

CLit 8920. Advanced Topics in Comparative Literature. (3 cr [max 15 cr])
Practical applications of specific methodologies and theories to a determined area. Topics vary.

CLit 8992. Directed Reading in Comparative Literature. (1-4 cr [max 12 cr]; SP–#)

CLit 8994. Directed Research in Comparative Literature. (1-4 cr [max 12 cr]; SP–#)

CLSD 5751. Basic Concepts of Cinema. (4 cr)
Examination of the cinema as an object of theoretical and historical analysis. Emphasis on the concepts that have emerged to radically transform the scope and aim of film analysis since the 1960s. Readings of filmic and theoretical texts.

CLSD 5910. Topics in Comparative Studies in Discourse and Society. (3 cr [max 24 cr])
Themes in comparative, sociohistorical analysis of discursive practices. Individually or team taught. Topics specified in Class Schedule.

CLSD 5993. Directed Study. (1-3 cr [max 9 cr]; SP–#)
Guided individual reading and study.

CLSD 8001. Basic Seminar in Comparative Studies in Discourse and Society I. (4 cr)
Key texts, positions, and problematics in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, and disciplinary genealogies.

CLSD 8002. Basic Seminar in Comparative Studies in Discourse and Society II. (4 cr)
Key texts, positions, and problematics in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, and disciplinary genealogies.

CLSD 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and DGS consent)

CLSD 8404. International Hierarchy. (4 cr)
Asymmetric structures and processes of international relations; systemic conditions and implications of informal empire and structures of dependency and hegemony.

CLSD 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

CLSD 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

CLSD 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

CLSD 8901. Pedagogy of Cultural Studies and Comparative Literature. (4 cr; SP–Grad CLSD major)
Prepares graduate majors for teaching. Issues of pedagogy. Preparing syllabi for specific courses that graduate instructors teach. Required for students planning to teach in Department of Cultural Studies and Comparative Literature.

CLSD 8910. Advanced Topics in Comparative Studies in Discourse and Society. (4 cr [max 32 cr])
Themes in comparative, sociohistorical analysis of discursive practices. Individually or team taught. Topics vary.

CLSD 8920. Advanced Topics in Comparative Studies in Discourse and Society. (3 cr)
Practical applications of specific methodologies and theories to a determined area. Topics vary.

CLSD 8993. Directed Study in Comparative Studies in Discourse and Society. (1-4 cr [max 12 cr]; SP–#)

CLSD 8994. Directed Research in Comparative Studies in Discourse and Society. (1-4 cr; SP–#)

Comparative Studies in Discourse and Society (CSDS)
Department of Cultural Studies and Comparative Literature
College of Liberal Arts

CSDS 5301. Society, Ideology, and the Production of Art. (3 cr)
Recent critical theories on the relation of the arts to social and ideological forces; selected artifices from Western culture (Renaissance to 20th century; high, popular, and mass culture). Music, visual art, literature.

CSDS 5302. Aesthetics and the Valuation of Art. (3 cr)
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 identity, an examination of judgment in post-Renaissance Western culture.

Computer Science (CSci)
Department of Computer Science
Institute of Technology

CSci 5103. Operating Systems. (3 cr; QP–5102; SP–4061 or #)
Conceptual foundation of operating system designs and implementations. Relationships between operating system structures and machine architectures. UNIX implementation mechanisms as examples.

CSci 5106. Programming Languages. (3 cr; QP–3322, 3327; SP–4011 or #)
Design and implementation of high-level languages. Course has two parts: (1) language design principles, concepts, constructs; (2) language paradigms, applications. Note: course does not teach how to program in specific languages.

CSci 5107. Computer Graphics. (3 cr; QP–3322; SP–4041 or # A-F only)
Introduction to theory and practice of graphics programming. Graphics programming fundamentals: overview of 2D graphics and algorithms, 3D modeling and rendering techniques, animation, and scientific visualization. Graphics language currently used is OpenGL.

CSci 5115. User Interface Design, Implementation and Evaluation. (3 cr; QP–3322; SP–4041 or #)
Theory, design, programming, and evaluation of interactive application interfaces. Human capabilities and limitations, interface design and engineering, prototyping and interface construction, interface evaluation, and topics such as data visualization and World Wide Web. Course is built around a group project.

CSci 5116. GUI Toolkits and Their Implementation. (3 cr; QP–5107 or 5110; SP–5115 or 5107 or #)
Structure and design of user interface toolkits and frameworks. Aspects of GUI toolkits (e.g., window system protocols, event processing, geometry management, resource management, data management, constraints). Course is built around implementation assignments and case studies of toolkits.

CSci 5131. Internet Programming. (3 cr; QP–5106 or 5211; 5180, 5702 recommended; SP–5106 or 5211 or #; 4081 or 5801, 5707 recommended)
Issues in internet programming: Java programming, concurrent programming, workflow, distributed databases, security, collaborative computing, object-oriented architecture/design, network publishing, messaging architecture, distributed object computing, internets.

CSci 5161. Introduction to Compilers. (3 cr; QP–5106; SP–4011 or #)
Theories and mechanisms of programming language processing tools. General compiler organization: lexical scanner, syntax parser, symbol table, internal program representation, code generator. Relationship between design and implementation. Run-time memory management mechanisms.

CSci 5201. Computer Architecture. (3 cr; QP–3327, SP–2021 or # EE 5361)
Introduction to computer architecture. Pipelining, memory hierarchy, and input/output systems. Performance metrics. Examination of each component of a complicated computer system.

CSci 5211. Data Communications and Computer Networks. (3 cr; QP–5102; SP–4061 or #)
Fundamental concepts, principles, protocols, and applications. Layered network architectures, data link protocols, local area networks, routing, transport, congestion/flow control, emerging high-speed networks, network programming interfaces, management, security, and applications. Ethernet.
Courses

ATM, TCP/IP, HTTP and WWW. Basic knowledge of computer architecture and operating systems is recommended.

CSci 5212. Network Programming and Administration. (3 cr; QP–5211; SP–5211 or #) Network and distributed programming concepts using C, C++, or Java on UNIX or PC platforms. TCP/IP, sockets, and RPC. Hands on experience with network components. Students plan, configure, install, diagnose, performance tune, operate, and manage state-of-the-art computer networks, internetworking devices, and protocols.

CSci 5283. Computer-Aided Design I. (3 cr; QP–3327; SP–2021 or #) CAD for digital systems. Emphasizes VLSI. Hardware description languages, synthesis, simulation, test generation.


CSci 5301. Numerical Analysis. (3 cr; QP–Math 3261; SP–Math 2243 or #) Fundamentals of numerical analysis. Solves from 2031 by covering different set of topics and in more detail. Floating point arithmetic and roundoff error, linear/nonlinear equations, matrix eigenvalue problems, linear programming.

CSci 5302. Analysis of Numerical Algorithms. (3 cr; QP–5303; SP–5301 (preferred) or 2031 or #) Additional topics in numerical analysis: interpolation, approximation, extrapolation, numerical integration and differentiation, numerical solutions of ordinary differential equations.


CSci 5403. Computational Complexity. (3 cr; QP–5400; SP–4041 or #) Computational models, complexity measures in each model, and related complexity classes.


CSci 5442. Computational Geometry and Applications. (3 cr; QP–5421; SP–5421 or #) Designing efficient algorithms and data structures for geometric problems; models of computation, convex hulls, geometric duality, multidimensional search, Voronoi diagrams and Delaunay triangulations, linear programming in fixed dimensions, lower bound techniques. Applications and advanced topics.

CSci 5451. Introduction to Parallel Computing: Architectures, Algorithms, and Programming. (3 cr; QP–3322; SP–4041 or #) Parallel architectures design, embeddings, routing, examples of parallel computers, fundamental communication operations, performance metrics, parallel algorithms for sorting, matrix problems, graph problems, dynamic load balancing, types of parallelisms, parallel programming paradigms, message passing programming in MPI, data parallel programming in HPF, shared-address space programming in threads.


CSci 5512. Artificial Intelligence II. (3 cr; QP–5511; SP–5511 or #) Advanced topics in AI for solving complex problems. Machine learning (symbolic and neural networks approaches), genetic algorithms, reasoning with uncertainty, utility theory and decision theoretic methods, natural language processing, perception robotics, introduction to Prolog programming language.


CSci 5551. Introduction to Intelligent Robotic Systems. (3 cr; QP–5511; SP–5511 or #) Transformations, kinematics/inverse kinematics, dynamics, control, Sensing (robot vision, force control, tactile sensing), applications of sensor-based robot control, robot programming, mobile robotics, and microelectronics.

CSci 5561. Computer Vision. (3 cr; QP–5511; SP–5511 or #) Issues in perspective transformations, edge detection, image filtering, image segmentation, and feature tracking. Complex problems in shape recovery, stereo, active vision, autonomous navigation, shadows, and physics-based vision. Applications.


CSci 5801. Software Engineering I. (3 cr; QP–5106; SP–2011, 1902 or #) Advanced introduction to software engineering. Reviews and expands on 4081. Software life cycle; development models; software requirements analysis; software design, coding, and maintenance.

CSci 5802. Software Engineering II. (3 cr; QP–5180; SP–5801 or #) 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 packages. Application of general software development methods and principles from 5801.

CSci 5980. Special Topics in Computer Science. (1-3 cr [max 9 cr] QP– or SP–) Lectures and informal discussions on current computer science topics.

CSci 5991. Independent Study. (1-3 cr [max 9 cr] QP– or SP–) May be repeated for credit; SP– may be repeated for credit. Independent study arranged with CS faculty member.

CSci 5994. Directed Research. (1-3 cr [max 9 cr] QP– or SP–) May be repeated for credit; SP– may be repeated for credit. Directed research arranged with faculty member.

CSci 8101. Advanced Operating Systems. (3 cr; QP–5103; SP–5103 or #) 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. Operating Systems Theory. (3 cr; QP–5801; SP–8101 or #) Fundamental principles underlying design of distributed and multiprocessing operating systems. Foundations of distributed computing systems; shared multiprocessor systems.

CSci 8115. Human-Computer Interaction and User Interface Technology. (3 cr; QP–5111; SP–5116 or #) Current research issues in human-computer interaction, user interface toolkits and frameworks, and related areas. Research techniques, model-based development, gesture-based interfaces, constraint-based programming, event processing models, innovative systems, and HCI in multimedia systems.

CSci 8161. Advanced Compiler Techniques. (3 cr; QP–5102; SP–4061 or #) 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 8203. Advanced Computer Architecture. (3 cr; QP–3327; SP–2021 or #) Design of high-performance unprocessors. Today’s high-performance processors incorporate advanced design, but also create many challenging problems. Advanced pipeline design, dynamic instruction scheduling, and branch penalty reduction schemes.

CSci 8205. Parallel Computer Organization. (3 cr; QP–3327; SP–2021 or #) Parallel machine organization and system design, difference between parallel and uniprocessor machines, and obtaining good performance. Architectural differences and their influence on programming models, synchronization and communication, and different topologies and message routing strategies.

CSci 8211. Advanced Computer Networks and Their Applications. (3 cr; QP–5211; SP–5211 or #) Current research issues in traffic and resource management, quality-of-service provisioning for integrated services networks (such as next-generation Internet and ATM networks) and multimedia networking.

CSci 8283. Research Problems in Computer-Aided Design for Electronic Circuit Design. (3 cr; QP–5201 or 5283; SP–5201 or 5283 or equiv or #) Large sparse systems. Sparse methods; methods like Jacobi, Gauss-Seidel, relaxation, and conjugate gradient preconditioning; and parallel implementation.
CSci 8323. Numerical Solutions of Linear Least Square Problems. (3 cr; QP–5304; SP–5304 or #) Numerical methods for linear and nonlinear least square problems; designing efficient and accurate algorithms. Sensitivity of least squares problems, modification of decompositions, generalized least squares, special methods for structured problems, and nonlinear least squares.

CSci 8333. FTE: Master’s. (1 cr; SP–Master’s student, advisor and DGS consent)

CSci 8335. Advanced Parallel Numerical Methods. (3 cr; QP–5301, 5151; SP–5301, 5451 or #) Parallel methods for solving problems in numerical linear algebra. Review of vector and parallel architectures; programming environments; parallel methods for linear least squares; eigenvalue problems, singular value decomposition, structured matrices, and linear systems.

CSci 8363. Numerical Linear Algebra in Dynamical Systems. (3 cr; QP–5304; SP–5304 or #) Computational methods in linear algebra, matrix decompositions for linear equations, least squares, eigenvalue problems, conditioning, stability, state space methods in dynamical systems, controllability, poles, zeros, Lyapunov and Riccati equations, norms of dynamical systems and model reduction.

CSci 8404. Design and Analysis of Approximation Algorithms. (3 cr; QP–5421; SP–5403 or #) Because an exact solution is often unfeasible for computationally difficult problems in important applications, approximation algorithms are a significant area of study. Introduces techniques for design of approximation algorithms; theory for evaluating the algorithms’ performance.

CSci 8421. Advanced Algorithms and Data Structures II. (3 cr; QP–5421; SP–5421 or #) Advanced algorithms for many important problems in computer science and related fields. Parallel algorithms for sorting, selection, graph problems, computational geometry, matrix problems, FFT, combinatorial search algorithms, dynamic programming, and data mining.

CSci 8521. Neural Computing and Neural Networks. (3 cr; QP–5511; SP–5511 or #) Introduction to Artificial Neural Networks (ANNs). Network architectures and learning rules; design of ANNs.

CSci 8551. Intelligent Agents. (3 cr; QP–5511; SP–5511 or #) 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. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

CSci 8701. Overview of Database Research. (3 cr; QP–5703; SP–5708 or #) Research papers from journals and conferences on current topics in databases, such as database research methodologies, relational implementation techniques, active databases, storage systems, benchmarking, distributed and parallel databases, new data models, prototype systems, data mining, and future directions.

CSci 8703. Distributed and Parallel Databases. (3 cr; QP–5703; SP–5708 or #) Distributed database management systems (DBMS) architecture, including client-server, distributed DB design, distributed query optimization and processing; distributed transaction management (consistency and control and recovery); federated/multibases (definition and issues); database machines (concepts, successes, and failures); parallel databases.

CSci 8705. Scientific Databases and Applications. (3 cr; QP–5703; SP–5708 or #) Application domains of geographical information systems, common data types, queries and analyses, data models, languages to query, query optimization, access methods, clustering methods and file structures, system architectures and design (e.g., parallelism, extensibility), and new trends (e.g., spatial graphs).

CSci 8760. Plan B Project. (3 cr; SP–Comp sci MS student, may not be applied toward course minimum in major; S-N only) Project arranged between student and faculty.

CSci 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required) Plan A only)

CSci 8801. Advanced Software Engineering. (3 cr; QP–5180; SP–5801 or #) Software reusability, internet/intranet programming, software reengineering, and software safety.

CSci 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

CSci 8970. Computer Science Colloquium. (1 cr [max 3 cr; S-N only]) Recent developments in computer science and related disciplines. Students must attend 13 of the 15 lectures.

CSci 8980. Special Advanced Topics in Computer Science. (1-3 cr [max 9 cr]; SP–#) Lectures and informal discussions.

CSci 8991. Independent Study. (1-3 cr; SP–#) Current research topics, work on an individual project, student project arranged between student and faculty.

CSCL 5147. Teaching as Dialogue. (3 cr) 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 5154. Theoretical Constructions of Space. (3 cr) 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 5256. Suburbia. (3 cr) 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.

CSci 5301. Society, Ideology, and the Production of Art. (3 cr) Recent critical theories on the relation of the arts to social and ideological forces; selected artifacts from Western culture (Renaissance to 20th century; high, popular, and mass culture). Music, visual art, literature.
CSCL 5302. Aesthetics and the Valuation of Art (3 cr)
Society, ideology, and aesthetic value considered in
light of recent critical theories of visual art, music, and
literature. Meditations of place, social class, gender
and ideology on aesthetic judgment in post-
Renaissance Western culture.

CSCL 5331. The Discourse of the Novel (3 cr)
Comparative study of the novel, 18th century to
present. Its relations to ordinary language practices,
emergent reading publics, technologies of cultural
dissemination, problems of subjectivity, and its role in
articulating international cultural relations.

CSCL 5555. Introduction to Semiotics (3 cr)
Problems of the nature of the sign; sign function; sign
production; signifying systems as articulated in
philosophy, linguistics, anthropology, psychoanalysis,
and art theory. Application of semiotics to various
signifying practices (literature, cinema, daily life).

CSCL 5711. Sociocriticism (3 cr)
Sustained consideration of the modern tradition of
sociological reflection on literature. Early and late
Birmingham School, Frankfurt School, Bakhtin circle,
and the French ferment associated with both
Les Temps Modernes and Tel Quel.

CSCL 5751. Basic Concepts of Cinema (4 cr)
Examination of the cinema as an object of theoretical
and historical analysis. Emphasis on the concepts that
have emerged to radically transform the scope and
aim of film analysis since the 1960s. Readings of films
and theoretical texts.

CSCL 5771. Basic Concepts of Literary Study (3 cr)
Examination of literary discourse as an object of
theoretical and historical analysis. Emphasis on the
concepts that have emerged to radically transform the
scope and aim of literary analysis since the 1960s.
Readings of literary and theoretical texts.

CSCL 5835. Richard Wagner’s “Der Ring des
Nibelungen”: Music, Myth, and Politics (3 cr; SP; –#)
Literary and musical analysis and historical context of
the four works of Wagner’s “Ring”: Das Rheingold,
Die Walküre, Siegfried, Götterdämmerung. Critical
assessment of Wagner’s achievement and influence.

CSCL 5910. Topics in Cultural Studies and
Comparative Literature (3 cr [max 24 cr])
Topics specified in Class Schedule.

CSCL 5993. Directed Study (1-3 cr [max 9 cr])
Guided individual reading or study.

Curriculum and Instruction (CI)
Department of Curriculum and Instruction
College of Education and Human Development

CI 5008. Theory and Practice of Teaching Art in
Elementary Schools (2-3 cr; A-F only)
Art concepts, skills, and processes appropriate for
elementary school; methods of art instruction; and
children’s production of and responses to art.

CI 5045. Advanced Contemporary Crafts (2 cr; A-F only)
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 (1-4 cr; A-F only)
Lectures, demonstrations, studio labs and critique
session on creative processes; handling specific media.
Topics vary.

CI 5052. Introduction to Art Therapy (2 cr; A-F only)
History, current conceptions, and practices of art
therapy.

CI 5055. Postmodern Visual Culture and Global
Education (1-3 cr; SP-Grad student; A-F only)
Representations of knowledge. Postmodern conditions
of education and relationships to the influences of
visual culture. Introductions to issues concerning the
representation of visual imagery; influence of
computer networking, mass communication, and other
image sources.

CI 5058. Issues in Art Education (1.4 cr [max 12 cr];
A-F only)
Issues and trends, current practices, and recent
research.

CI 5065. Improving Art Programs in the Schools (3 cr;
SP-IUC students majoring in art; A-F only)
Issues of art instruction, including teaching methods
and evaluation, philosophical frameworks of
pedagogy, and critical issues concerning art programs
in primary and secondary schools; social and
structural cultures of schooling, practical issues of
teaching art.

CI 5069. Curriculum Innovations in Art Education (3 cr;
A-F only)
Study and analysis of innovations; evaluation of
materials for teaching units and projects.

CI 5075. The Social and Historical Foundations of Art
Education (1-3 cr; SP-Grad students; A-F only)
Issues of culture in education; examination of various
forms of art as representations of knowledge, belief,
and cultural capital. Epistemology, 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 cr; A-F only)
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 (1-6 cr [max 6 cr];
A-F only)
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 cr;
SP-Licensure student in art ed-SN only)
Observation of, participation in, and supervisory
experiences with various types and levels of art
classes.

CI 5111. Introduction to Elementary School Teaching (3 cr;
SP-Elementary ed init lic; A-F only)
Curriculum organization, instruction, management,
assessment, and professional decision making.

CI 5113. Classroom Management in the Elementary
School (3 cr)
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 5131. Introduction to Curriculum Studies (3 cr;
SP-Grad student; A-F only)
Curriculum theory and practice. Definitions of
curriculum, historical and current issues in curriculum,
principles and theories of curriculum, and alternative
models and methods of design and evaluation.

CI 5133. Curriculum Planning and Design (3 cr;
SP-Grad student; A-F only)
Application of the theoretical and practical bases of
disciplinary and interdisciplinary curriculum design to
the problem of designing, implementing and
evaluating the quality of a course or program of study.

CI 5136. History of the American Curriculum (3 cr)
Survey of formation of public school subjects and
curriculum theory in United States, Social, political,
and economic implications of curriculum theory.

CI 5137. Multicultural Gender-Fair Curriculum (3 cr;
SP-Grad student; A-F only)
Issues related to diversity in learning settings and the
exploration of culture in educational contexts.
Explores rationale for and process of considering a
cultural and gender fair curriculum; cultural issues inherent in curricular change; language, culture,
social preference, special needs students, and the
conflicts between culture and curriculum.

CI 5138. Multicultural and Moral Perspectives on
Classroom Instruction (3 cr; SP-SP-MEd or PhD student)
Factors leading to effective instruction in
ethically diverse classroom, preschool to adult.
Communication techniques and classroom structures
that have cultural and moral implications.

CI 5139. Moral Education Programs (3 cr; SP-Social or
moral development course)
Review of history, traditions, and efficacy of moral
education programs in the schools; current school and
district programs. Includes site visits to schools that
are implementing social skills programs.

CI 5141. Reflective Teaching and Professional Ethics (3 cr;
SP-Tchg license and one yr tchg exper)
Students will develop their professional identities as
educators by considering their world views and values in
relation to their professional role and
capabilities in the context of a diverse society.
Encourages reflective practice and critical review of
research.

CI 5147. Language, Culture, and Education (3 cr;
SP-MEd or grad student; A-F only)
Applies current sociolinguistic and discourse theory
and 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 and
second-language instruction.

CI 5149. Issues of Diversity in Schools and
Classrooms (3-4 cr; SP-Grad student or Teacher
Leadership program)
Examination of issues in schools and classrooms that
affect people from diverse groups, using historical,
communication, value, and intercultural frameworks.

CI 5150. Curriculum Topics (1-6 cr; SP-Grad student;
A-F only)
Special topics and current trends in curriculum
including issues of subject integration, curriculum
contexts, development, implementation, and
evaluation.

CI 5155. Contemporary Approaches to Instruction
and Assessment (3 cr; SP-Grad student only; A-F only)
Examination of a variety of contemporary approaches
to instruction and assessment, as well as the skills to
implement these approaches.

CI 5162. Peer Coaching for Teachers (1-2 cr; SP-
Tchg exper; A-F only)
Teachers coaching teachers: acquiring concepts, skills,
and dispositions necessary for observing classroom
instruction and providing constructive feedback.

CI 5172. Teaching Students with Learning Difficulties (3 cr;
SP-Elem tchg exper or #A-F only)
Theory and practice in teaching students with learning
difficulties across the curriculum.

CI 5177. Practical Research (3 cr; SP-CI MEd student, or
CI or EdPA Teacher Leadership MEd student; A-F only)
Preparation for identifying a research and
development topic, reviewing the existing knowledge
on the topic, planning and carrying out a project,
fan further investigating the topic, and writing a report on
the project.

CI 5178. Project in Teacher Leadership (3-6 cr; SP-Cl or
EdPA teacher leader MEd student)
Create, implement, evaluate, and present a leadership
project design to effect change in educational environments.
Review of related literature, proposal development, project
development, implementation and evaluation, critical reflection, and
sharing learning outcomes.

For definitions of course numbers and symbols, see inside back cover.
CI 5181. Clinical Experience in Elementary School Teaching. (1-2 cr; SP—Elem Ed init lic only; S-N only) Students spend full days in the elementary classroom gradually assuming responsibility for teaching the class. Supervised experience in elementary classrooms.

CI 5186. School-Related Projects. (1-3 cr; SP—MEd student; A-F only) Research or evaluation project related to teaching, curriculum, or other aspect of schooling. Approved and supervised by faculty adviser.

CI 5187. Practicum: Improvement of Teaching in Elementary or PreKindergarten Schools. (3 cr; SP—MEd student in elem or early childhood ed; S-N only) Elementary school classroom teaching project designed to improve specific teaching skills. Approved and directed by adviser.

CI 5190. Directed Individual Study in Curriculum and Instruction. (1-6 cr [max 12 cr]; SP—Grad students only; A-F only) Directs students to individual studies that focus on producing and evaluating curriculum materials; literature review; problems and assessing curriculum processes.

CI 5250. Social and Philosophical Foundations of Early Childhood Education. (3 cr; SP—MEd student in ECE or ECSE; or #; A-F only) Surveys imagery, history, philosophy, and psychology of early childhood education. Emphasis on analyzing and interpreting current trends in early education including diversity, special needs, legislation, public policy, and educationally appropriate practice.

CI 5330. Instructional Systems and Technology. (1-3 cr) Topics are related specifically to the needs of the in-service teacher. Topics, location, credits, and duration will be highly flexible.

CI 5331. Introduction to Instructional Systems and Technology. (3 cr) Orientation to the field to examination of various issues affecting the use of technology. Advanced students identify research topics for investigation in future courses and identify key literature in the field in preparation for masters and doctoral examinations.

CI 5336. Principles and Procedures in Designing Instruction. (3 cr) Examine theory, research, and practice in the field of instructional design; generic components of the instructional design process; application of principles of instructional design to the design and development of instructional materials.

CI 5351. Technology Tools for Educators. (3 cr; SP—Basic knowledge of Macintosh operating system and a word processing program; A-F only) Develop skills in using selected technology applications to support teaching and learning. Internet applications, presentation software, multimedia authoring tools, desktop publishing software, Web page creation. May also include a field-site project.

CI 5361. Teaching Via the Internet. (3 cr) Examines the capabilities of the Internet for professional development and instructional use. Use of specific client/server software for accessing the Internet; instructional issues and opportunities; implications for K-12 student involvement and classroom management; and Web page development by teachers and their students. Previous experience with computers desirable.

CI 5363. Introduction to Computer-Based Instructional Design. (3 cr; A-F only) Learn to design and develop computer-based instructional materials using a state of the art authoring language. Introduction to principles of courseware design; multimedia components in instruction; development of computer courseware using the authoring language; tutorial design.

CI 5364. Computer-Based Instruction: Games and Simulation. (3 cr; SP—5363; A-F only) Principles and procedures of computer simulation and game design. Types of computer simulation, the components common to simulation design, and the theory underlying educational simulation design.

CI 5367. Interactive Multimedia Instruction. (3 cr; SP—Knowledge of principles and procedures of CBI design and one multimedia authoring system; A-F only) 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 5391. Technology in the Postsecondary Development Curriculum. (3 cr) Examines ways in which use of technology is transforming learning environments, teaching practices, and the curriculum in developmental education for postsecondary students. Course taught on-line.

CI 5401. Literature for the Elementary School. (3 cr; SP—Children’s lit course or #; A-F only) Evaluative survey of books for children; research related to children’s reading interests; selection of literature for themed instruction.

CI 5402. Introduction to Special Collections. (2-4 cr; SP—Children’s lit course or #; A-F only) Special collections of children’s literature as research material. Study of manuscripts, original art, and letters. Materials from the Kerlan Collection in Walter Library will be available.

CI 5403. Creative Writing For and By Children. (2-4 cr; SP—Children’s lit course or #; A-F only) Creative aspects of writing and illustrating children’s literature and children’s own writing. Features authors and illustrators of children’s books.

CI 5410. Special Topics in the Teaching of Literacy. (1-3 cr; SP—Children’s lit course or #; A-F only) Topics related specifically to the needs of in-service teachers. Topics, location, credits, and duration will be highly flexible.

CI 5411. Teaching Reading in the Elementary School. (3 cr; A-F only) Aids the in-service elementary classroom teacher in the development of knowledge of theory and practice in the teaching of reading.

CI 5412. Reading Difficulties: Instruction and Assessment. (3 cr; SP—5411 or 5451; A-F only) Causes, diagnosis and assessment, prevention and correction; intervention practices useful to the classroom teacher and special teacher of reading.

CI 5413. Teaching Students with Reading Difficulties. (3 cr; SP—5412; A-F only) Assessment and tutoring of individual children who have difficulty reading in school.

CI 5415. Literacy Development in the Primary Grades. (3 cr; SP—Elem tchg exper or #; A-F only) Integration of skill and aesthetic activities in graded language arts, and children’s literature. Major topics include emergent literacy, reading process, strategy instruction for word recognition and comprehension, methods of word recognition, authentic assessment strategies, and teaching diverse students.

CI 5441. Literature in the Secondary School. (2-3 cr; SP—Elem ed init lic only, 2 cr; other sections, 3 cr; A-F only) Current theories of teaching literature; critical approaches to analyzing literature; theory and research on response to literature; adolescent literature and reading interests; methods for devising response activities and units; incorporating multicultural literature; relating media and literature; linking writing of literature to understanding literature; designing literature curriculum; evaluating and assessing students’ growth in literary response.

CI 5442. Literatures for Adolescents. (3 cr; A-F only) Characteristics of literatures designed for adolescents; rationale for using adolescent literature; adolescents’ reading interests and attitude; analysis of quality and appeal; individualized reading programs; methods of promoting reading; multicultural literature; developing teaching activities.

CI 5451. Teaching Reading in Content Areas. (3 cr; SP—Fall, English init lic only; A-F only) Methods of accommodating to students’ abilities and facilitating reading in regular content classes.

CI 5461. Teaching Composition in the Secondary School and College. (3 cr; SP—Spring, English init lic only; A-F only) Current theories of composition instruction, methods for teaching various composing processes within social contexts, uses of informal writing, linking reading and writing, describing and evaluating features of student writing, using and modeling conference strategies, using computer-mediated software, teaching writing of fiction and non-fiction, grammar and writing, editing instruction, writing assessment, uses of portfolios.

CI 5462. Evaluating and Assessing Writing. (3 cr; SP—5461; A-F only) Methods of evaluating writing; identifying rhetorical and linguistic features of and explaining difficulties in writing; strategies for giving descriptive feedback to informal and formal writing; training for peer conferences; strategies for portfolio writing; evaluation and assessment; methods for conducting large-scale writing assessments; issues of validity and reliability with writing assessments with particular application to the Minnesota Graduation Standards basic skills writing test.

CI 5472. Teaching Film, Television, and Media Studies. (3 cr; A-F only) Methods of teaching film, video, and media studies at the secondary and college level; methods for eliciting critical responses; analysis of film/video techniques; analysis of cultural representations and genre characteristics; connecting and comparing film/video and literature; studying documentary and television news; developing media studies units.

CI 5481. Current Developments in Teaching English and Speech. (2 cr; SP—English init lic; A-F only) Current theories of English and speech curriculum; theory and methods of teaching oral language; strategies for organizing curriculum; methods for linking different components of the English and speech curriculum; reflection on pre-student teaching experience.
CI 5482. Reading, Language Arts, and Literature: Internationale. (3 cr; SP–Elem ed init licensure only; A-F only)
Aids the preservice teacher in understanding theory and practice in the teaching of reading to students in the upper elementary grades.

CI 5496. Directed Experiences in Teaching English. (8 cr; SP–Med)init lic students in English ed only; S-N only)
Student teaching/clinical experience for English post-baccalaureate students only.

CI 5500. Special Topics: Outdoor Science Education. (1-8 cr (max 8 cr) SP–Elem tchg exper)
Classroom and field work activities aimed at increasing the knowledge and interest of students in teaching outdoor in all seasons. Topics include snow and ice ecology, the timber wolf and white-tailed deer, pond ecology, Twin Cities’ geology, trees and plants of Minnesota, and stargazing.

CI 5501. Teaching Science and Health in the Elementary School. (2 cr; SP–Elem ed init licensure only; A-F only)
Methods and materials for teaching science and health at the elementary school level.

CI 5504. Elementary School Science: Materials and Resources. (3 cr; SP–Elem tchg exper or #)
Examination of the teacher’s role in inquiry teaching; the current science curriculum; and resources for teaching science in the elementary school.

CI 5531. Teaching Middle School Science. (4 cr; SP–Init lic students in science only)
Experience in designing science lessons for middle school students and understanding the middle school environment.

CI 5532. Teaching Secondary School Science. (4 cr; SP–Addition to init lic program in science; A-F only)
Methods of planning and teaching science for secondary school students.

CI 5533. Current Developments in Science Teaching. (3 cr; SP–Med,init lic, grad student or #; A-F only)
Learn to use national and state standards and new curricula to design science courses.

CI 5534. Studies in Science Education. (4 cr; SP–M Ed, init lic or #; A-F only)
Improvement of science teaching through the application of research findings.

CI 5535. Foundations of Science Education. (3 cr; SP–Med, grad student or #; A-F only)
Analysis of present science teaching practices in light of the historical and philosophical foundation of science education.

CI 5536. Advanced Methods of Teaching and Assessment. (3 cr; SP–Med or grad student or #)
Development and teaching of extended science activities; structured controversies, field-based activities, service learning projects and computer-based investigations; development of authentic assessments and students’ portfolios based on national and state guidelines.

CI 5540. Special Topics: Science Education. (1-8 cr [max 8 cr])
Detailed examination and practice of the teaching of one area of science (e.g. geology, health, physical science) or science instruction (e.g. laboratories, demonstrations, Internet, simulations).

CI 5596. Clinical Experience in Middle School Science. (4 cr; SP–Init lic in science ed; A-F only)
Provides experience with planning and delivering science lessons for middle school students.

CI 5597. Clinical Experience in Secondary School Teaching. (4 cr; SP–Init lic or #; A-F only)
Supervised clinical experience in secondary school science teaching.

CI 5619. Teaching Second Languages and Cultures in Elementary Schools. (3 cr)
Methods and materials for ESL and foreign languages; development of oral and written communication in a second language; alternatives in second-language program format; global awareness and cross-cultural experience; and awareness of children’s language, children’s literature, games, and songs; planning and development of units and lessons.

CI 5631. Second Language Curriculum Development and Assessment. (3 cr; SP–SLC init lic only; A-F only)
Developing skills for selecting, organizing, providing, and assessing effective second language learning opportunities through study, practice, and reflection.

CI 5632. Communication and Comprehension in Second Language Classrooms. (3 cr; SP–SLC init lic only; A-F)
Comprehension and communication processes in a second language focus on listening, speaking, reading and writing; techniques for initial to advanced literacy instruction; fundamental principles of effective second language instruction; the relationship of culture to proficiency in the four modalities; traditional and alternative approaches to assessing language proficiency; use of technology to enhance instruction.

CI 5634. Content-Based Instruction in Second Language Settings. (3 cr; SP–SLC init lic only; A-F only)
Content-based language instruction: principles, models and methods; learning strategy instruction; developing content-based language curriculum; traditional and alternative approaches to assessing cognitive-academic language proficiency; use of technology to enhance content-based instruction.

CI 5635. Culture and Diversity in Second Language Classrooms. (3 cr; SP–Init lic program only)
Developing skills for teaching a diverse student population in both foreign language and English as a second language instructional settings through study, practice, and reflection.

CI 5642. The Assessment of Learners with Limited English Proficiency. (3 cr; A-F only)
Explores policies, procedures, and instruments in use in assessing the English language proficiency and academic readiness of limited English proficient students in American public schools; academic competence, bilingualism and special needs populations; alternative assessment; preparation of students for mainstream classrooms.

CI 5644. Working with Linguistically and Culturally Diverse Students in the Mainstream Classroom. (1 cr)
Benefits and challenges of working with linguistically and culturally diverse students; instructional practices and strategies; issues related to language learning, cultural considerations, and integration of culturally and linguistically diverse learners in the classroom.

CI 5651. Foundations of Second Languages and Cultures Education. (3 cr; A-F only)
Historical overview of second language teaching and learning in the U.S. Exploration of second language instructional settings across multiple contexts: elementary and secondary options for foreign language, bilingual education, immersion language programs, and English as a second language programs. Theoretical frameworks for language instruction are tied to practice.

CI 5652. Integrating Culture in the Second Language Classroom. (3 cr)
Exploration of culture in second language contexts. Rationale for and process of implementing cultural awareness, culture learning, and the integration of language and culture instruction as integral to effective second language development.

CI 5656. Reading and Writing in a Second Language. (3 cr; A-F only)
Reading comprehension and composing processes in a second language; relationship between first and second language; proportion and composing processes; relationship between reading and writing; relationship of culture to reading comprehension and writing; policies of literacy; assessment of second language reading comprehension and writing proficiency; using technology to enhance literacy instruction.

CI 5657. Speaking and Listening in a Second Language. (3 cr; A-F only)
Theories and methods in teaching language as communication in oral and aural modes; planning student interaction; classroom organization for oral language learning and a program using technology to enhance interaction; assessment of listening comprehension and oral communication.

CI 5658. Second Language Testing and Assessment. (3 cr; A-F only)
Aligning second language classroom instruction and assessment; fundamental concepts in language assessment; traditional and alternative approaches to assessing proficiency in speaking, listening, reading, writing; creation of formative and summative assessments; critique of common assessment instruments.

CI 5660. Special Topics in the Teaching of Second Languages and Cultures. (1-3 cr [max 3 cr])
Topics related specifically to the needs of the in-service teacher. Topics, location, credits, and duration are flexible.

CI 5662. Issues in Second Language Curriculum Design. (3 cr; A-F only)
Historical overview of curriculum development in second language education; contexts that influence curriculum development: models for curriculum development in second language settings; politics of curricular reform; national and state standards and implications for curriculum development; effects of technology on second language curriculum.

CI 5693. Directed Study in Secondary Languages and Cultures. (1-4 cr; SP–#)
Individual or group work on curricular, instructional, or assessment problems.

CI 5696. Practicum: Teaching World Languages and Cultures in Elementary Schools. (2 cr; SP–SLC 5619, adviser approval; credits cannot be counted on a graduate degree program)
Teaching and learning experiences in World 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 cr; SP–5619, adviser approval)
Teaching and learning experiences in an English as a Second Language setting at the elementary school level. Requires students to work in a public school setting.

CI 5698. Student Teaching in Second Languages and Cultures. (2 cr; SP–Adviser approval; credits cannot be counted on a graduate degree program)
Student teaching in Second Languages and Cultures at the secondary level for teachers already licensed in another field. Requires students to work in a public school setting.

CI 5699. Clinical Experiences in Second Languages. (6-8 cr; SP–SLC init lic program only; A-F only)
Teaching and learning experiences in elementary and secondary school instructional settings. Includes a seminar held concurrently to support the student teaching experience.

CI 5701. Teaching Social Studies in the Elementary School. (2 cr; SP–S-L 511 or equiv, elem ed init lic only; A-F only)
Content and organization of elementary social studies programs; programs of understanding, improving the learning situation, and effective use of materials.

CI 5731. Social Studies for the In-Service Elementary/ Middle School Teacher. (3 cr; SP–elem/middle school tchg exper or #; A-F only)
Content and organization of elementary and middle school social studies programs. Understanding and improving the teaching-learning situation through the analysis of current trends and issues in the field. Integration with other subject areas where appropriate.
CI 5741. Introduction to Social Studies Education. (3 cr; SP–Grad course or #) Broad issues and themes related to social studies education, including societal context, rationale, and scope and sequence. Analysis and evaluation of selected teaching strategies, methods, and resources.

CI 5742. Advanced Methods of Teaching the Social Studies. (3 cr; SP–Secondary social studies init lic student; A-F only) 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. (2 cr; SP–Secondary social studies init lic student; A-F only) 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. (1 cr; SP–Secondary social studies init lic student; A-F only) Emphasis on reflecting on the teaching experience, developing a professional identity, and refining teaching skills.

CI 5747. Global and Environmental Education: Content and Practice. (3 cr; A-F only) 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 5762. Developing Civic Discourse in the Social Studies. (3 cr; SP–Med ed or grad student; A-F only) Philosophies, strategies, and research on developing civic discourse in the secondary social studies classroom; selecting issues, developing a democratic classroom climate, relating to social and cultural contexts. Applicable to all of the social sciences.

CI 5765. Teaching About Newspapers in the Classroom. (3 cr) Use of daily newspapers in the classroom. Instructional strategies, curriculum development techniques, and teaching materials useful in teaching about the newspaper in the elementary and secondary classroom.

CI 5782. Clinical Experiences in Teaching Social Studies. (1-8 cr [max 16 cr]; SP–Social studies postbac student; S-N only)

CI 5821. Teaching Mathematics in the Elementary School. (2 cr; SP–Elem ed init lic only; A-F only) Principles of learning pertinent to the modern program of mathematics in elementary grades. Objectives, content, philosophy, instructional materials, and methods of instruction and evaluation.

CI 8075. Seminar: Art Education. (2 cr; SP–Ed grad student or #; A-F only) Reports, evaluation of problems, and review of recent literature.

CI 8079. Research in Art Education. (3 cr; SP–Ed grad student or #; A-F only) Current research agenda. Helps students identify research questions and choose appropriate methodologies.

CI 8095. Problems: Art Education. (1-12 cr [max 12 cr]; SP–Grad art ed major or #) Independent research under faculty guidance; may include advanced studio practice and educational issues requiring a research methodology.

CI 8111. Representations of Knowledge in Curriculum and Culture. (1-3 cr; SP–CI grad student or #) Overview of research and theory on sociology of knowledge and education. Conceptions of knowledge in curriculum; connections between cultural conditions and curriculum design and implementation; influence of national political agendas, population, the mass media, and textbooks on curriculum in diverse educational settings.

CI 8115. Curriculum and Achievement Outcomes in a Diverse Society. (3 cr; SP–Doctoral student; A-F only) 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 cr; SP–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 cr; SP–CI grad student or #) Traditions of inquiry, exemplary studies, and associated research methods; survey and assessment of topics and methods as applied to curriculum questions; and relationships between theory and research.

CI 8131. Curriculum and Instruction Core: Critical Examination of Curriculum in Context. (3 cr; SP–CI Ph.D student; A-F only) Central concepts, ideas, and debates in professional field of curriculum. Critical discussion about curriculum in general and the role to lay a foundation for student research and innovation in a particular social subject or related field.

CI 8132. Curriculum and Instruction Core: Teaching Theory and Research. (3 cr; SP–CI Ph.D student; A-F only) Overview of research on teaching: historical perspective, modern research and findings, and implications for practice and future research.

CI 8133. Research Methods in Curriculum and Instruction. (3 cr; SP–CI Ph.D student; A-F only) Survey of educational research methods and comparison of underlying assumptions and procedures.

CI 8148. Qualitative Studies of Children and Classrooms. (3 cr; SP–CI MA or Ph.D student or #) Introduction to the use of qualitative research methods, including ethnography, sociolinguistics, and symbolic interactionism; emphasizes observation.

CI 8161. Planning a Research Experience I, II, and III. (2 cr; SP–CI Ph.D student or #) Designing research questions, initiating literature reviews, and selecting a research methodology.

CI 8162. Planning a Research Experience I, II, and III. (2 cr; SP–CI Ph.D student or #) Development of research methodology, data collection devices, and processes for successful research.

CI 8181. Seminar in Teaching in Colleges of Education. (3 cr; SP–CI Ph.D student or #) Goals, instructional strategies, evaluation procedures, and professional considerations.

CI 8195. Problems: Improvement of Instruction. (1-6 cr [max 6 cr]; SP– #) Independent research in curriculum and instruction.

CI 8196. Practicum in Teaching in Colleges of Education. (1 cr; SP–8181) Supervised teaching in an education course at the University of Minnesota or other college or university.

CI 8197. Problems: Curriculum Studies. (1-4 cr [max 8 cr]; SP–MA student or #) Directs students to completing Plan B paper for M.A. degree.

CI 8198. Problems: Teacher Education. (1-6 cr [max 12 cr]; SP– #) Independent research.

CI 8361. Advanced Courseware and Design: Issues. (3 cr; A-F only) Examination and critique of existing research. Students identify a research topic, write a literature review, plan a study, and present a research proposal.

CI 8391. Instructional Systems Seminar. (1-3 cr [max 6 cr]; SP–CI grad student or #) Topics related to needs of the in-service teacher; topics, location, credits, and duration are highly flexible.

CI 8395. Problems: Instructional Systems. (1-6 cr [max 12 cr]; SP– #) Independent research.

CI 8400. Special Topics in Children's and Young Adult Literature. (1-6 cr [max 6 cr]; SP–Grad course in children's or young adult lit) Overview of research and issues. Study of original manuscripts and artwork for children's books; research in child and young adult response to literature. Topics vary.

CI 8410. Special Topics in Reading Research and Instruction. (1-6 cr [max 6 cr]; SP– #) Research at all levels; topics vary and may include research designs, trends, and specific studies.

CI 8412. Research in Reading. (3 cr; SP– #) Significant literacy research; critical analysis of methodology and findings, appraising research methods, population limitations, and educational implications.


CI 8470. Special Topics on Literacy. (1-6 cr [max 6 cr]; SP–CI PhD student or #) Current theories and research on literacy and literacy development; alternative methods of conducting literacy research; implications for literacy instruction.

CI 8492. Readings in English Education and Reading. (1-2 cr [max 10 cr]; SP– #) Individual research.

CI 8511. Seminar: Research in Science Education. (1 cr [max 6 cr]; SP–Grad student or #) Students and faculty present research projects for comment and critique. Special topics may also be considered.

CI 8570. Advanced Topics in Science Education. (1-4 cr [max 4 cr]; SP–CI grad student or #; A-F only) Current theories and research on science education: alternative methods of conducting research; implications for science education.

CI 8594. Conducting Research in Science Education. (3 cr; SP–sci ed research course) Application of research methodology to a specific science education issue.

CI 8595. Problems: Science Education. (1-6 cr [max 12 cr]; SP–CI grad student or #) Independent research.

CI 8631. Research Seminar I: Second Languages and Cultures Education. (3 cr; SP–8133; A-F only) Students explore a research topic through readings, seminar discussions, conducting an actual study, and peer critique of work.
Courses

CI 862. Research Seminar II: Second Languages and Cultures Education. (3 cr; SP–8631; A-F only) Students complete data analyses and prepare written report on an original study as well as offer peer critique of work.

CI 8650. Seminar: Special Topics in Second Languages and Cultures Research. (1-3 cr [max 3 cr]; SP–CI grad student or #) Research topics vary.

CI 8691. Readings in Second Languages and Cultures Education. (1-3 cr [max 3 cr]; SP–#) Independent reading.

CI 8695. Problems: Second Languages and Cultures Education. (1-6 cr [max 12 cr]; SP–#) Independent research.

CI 8742. Seminar: Research in Social Studies Education. (2 cr; SP–CI grad student or # A-F only) Critical review and analysis of seminal research studies; criteria for appraising research findings; educational implications.

CI 8795. Problems: Social Studies Education. (1-6 cr [max 12 cr]; SP–CI grad student or #) Independent research.

CI 8796. Research Internship in Social Studies Education. (1-6 cr [max 6 cr]; SP–CI grad student or #) Internship with social studies education faculty member; experience in collecting and analyzing data; drafting and presenting reports; writing for publication.

Dance (Dnce)

Department of Theatre Arts and Dance
College of Liberal Arts

Dnce 5010. Modern Dance Technique 7. (3 cr [max 6 cr]; SP–3020, A) Continuation of technical development. Performance range and style. Students study with various guest artists.

Dnce 5020. Modern Dance Technique 8. (3 cr [max 4 cr]; SP–3010, A) Continuation of technique. Performance range and style. Students study with various guest artists.


Dnce 5500. Topics in Dance. (1-2 cr [max 10 cr]; SP–A or #) Topics specified in Class Schedule.

Dnce 5500. Performance. (2 cr [max 18 cr]; SP–Technique course, A) Technique, improvisation, choreography, music, design, and technical production as they relate to dance performance.

Dnce 5585. Teaching Dance. (4 cr; SP–1020, A or #) Methods, principles, and techniques of teaching dance.

Dnce 5970. Directed Studies. (1-4 cr [max 10 cr]; SP–#, A or #) Guided individual study.

Dentistry (Dent)

School of Dentistry

Dent 8031. Topics and Problems in Dental Education. (1-3 cr) Independent study in student learning, instructional development, curriculum planning, student testing and evaluation, and academic administration, where these areas and their interfaces are applied directly to professional dental education. Provides opportunity for applying and extending concepts learned in Dent 7033.

Dent 8090. Evidence-based Clinical Pediatric Dentistry. (2 cr; A-F only) In-depth literature review and seminar discussion of selected pediatric dentistry topics.

Dent 8091. Interdisciplinary Care of the Cleft Palate Patient. (1 cr; N-S only) Comprehensive surgical, dental, and speech and hearing evaluation and management of patients with cleft lip and palate.

Dent 8100. Topics in Advanced Periodontology: Literature Review. (2 cr) State-of-the-art information on a variety of topics concerning risk factors and therapeutic modalities for periodontal disease.


Dent 8120. Advanced Principles and Techniques of TMJ and Orofacial Pain Disorders. (3 cr; SP–Participation in TMJ and Orofacial Pain advanced education program; A-F only) Interdisciplinary study of theory, principles, epidemiology, and mechanisms associated with TMJ and craniofacial pain disorders and a basis for scientific understanding of diagnostic and management strategies for them.

Dent 8121. Current Literature in TMJ and Craniofacial Pain. (1 cr; A-F only) Review of current literature and of how it relates to past literature, theories on pain, and philosophies of management.

Dent 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DDS consent)

Dent 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max 18 per semester or summer; 10 cr total required [Plan A only])

Design, Housing, and Apparel (DHA)

Department of Design, Housing, and Apparel
College of Human Ecology

DHA 5111. History of Decorative Arts. (4 cr; QP–General art history survey course or # SP–General art history survey course or # A-F only) In-depth study of textiles, ceramics, metal, and glass from selected historical periods. Focus on the Goldstein Gallery collections.

DHA 5170. Special Topics in Design, Housing, and Apparel. (1-4 cr [max 8 cr]; QP–Depends on topic, check with dept; SP–Depends on topic, check with dept; A or #)

In-depth investigation of a single specific topic, methods, principles, and techniques of teaching dance.

DHA 5193. Directed Study in Design, Housing, and Apparel. (1-4 cr; QP–# SP–# A-F only) Independent study in design, housing, and apparel under tutorial guidance.

DHA 5196. Field Study: National/International. (1-10 cr [max 10 cr]; QP–# SP–# A-F only) Faculty-directed field study in a national or international setting.

DHA 5216. Textile and Apparel Consumer. (3 cr; QP–3216 or SP–1201, 2213 or # A-F only) Consumer actions concerning textile/clothing products for home (and other physical interiors) and personal use as a part of daily living in different social, economic, and cultural settings, nationally and internationally.

DHA 5381. Digital Illustration. (3 cr; QP–5334; SP–4334; A-F only) Focuses on the integration of design knowledge with computer applications. Experience using raster- and vector-based programs for illustration.

DHA 5382. Digital Sound and Video. (3 cr; QP–5334 or #; SP–4334 or A-F only) Design solutions involving time-based media emphasizing sound and video. Explore these two components and their creative processes, and as well as electronic publishing via the internet. Focus on electronic publishing on the internet and the development of internet-based communication.

DHA 5388. Design Planning, Analysis, and Evaluation. (3 cr; QP–3333 or grad student or #; SP–4354 or grad student or # A-F only) Experience in design planning, research, and development. Emphasis on preliminary research including theoretical, applied, and legal aspects of design projects and processes. A variety of planning and developmental models will be used. Design prototyping, testing, and analysis is included.

DHA 5399. Theory of Electronic Design. (3 cr; QP–Sr or grad student or #; SP–Sr or grad student or # A-F only) Investigate electronic documentation, media, and methods, and their relationship to communication and design. Emphasis on the development of a new understanding of the communication of information in a visual, dynamic, hyper- and multimedia-based environment.

DHA 5463. Housing Policy. (3 cr; QP–3463; SP–2401, 2463 or # A-F only) Explore the institutional and environmental settings that make up housing policy in the United States. Examine competing ideas about solving the nation’s housing problems through public intervention in the market. Federal and local public sector responses to housing problems will be evaluated.

DHA 5467. Housing and the Social Environment. (3 cr; QP–1400 or SP–2401 or # A-F only) Housing choices are explored in the context of the social environment with an emphasis on the special needs of the elderly, disabled, minorities, large families, female-headed households, and low-income households.

DHA 5481. Housing for the Elderly and Special Populations. (3 cr; QP–1400 or SP–2401 or # A-F only) Introduction to the changing housing needs of individuals and families across the life span. Particular emphasis will be on housing needs of children, older adults, and persons with disabilities.
Courses

DHA 5484. Rural Housing Issues. (3 cr; QP–3463; SP–2401, 2463 or A-F only)

Housing issues in nonmetropolitan areas. The housing concerns of specific rural populations (e.g., low income, elderly persons, American Indians, migrant workers) are identified and compared with urban housing issues are made.

DHA 8101. Philosophical Foundations of Design, Housing, and Apparel. (4 cr; A-F only)
The nature of thought underlying and within professional areas of the field.

DHA 8103. Methodological Orientations: Qualitative Research. (3 cr; A-F only)
Assessment of field research methods relevant to research regarding material culture. Relationship of selected research problem (and its theoretical framework) to practical problems of fieldwork. Rationale and plan for appropriate field methods of data collection.

DHA 8111. Analysis of Design Literature. (3 cr; A-F only)
Classic and contemporary literature; visualization, creativity, and design methods literature.

DHA 8112. Design Theory and Criticism. (3 cr; A-F only)
Students establish a framework for criticism by examining various theories used in design disciplines. Study existing designed environments to explain the designer’s purpose, identify problem-solving processes, and describe interaction between humans and design. Field investigations.

DHA 8113. Education and Evaluation in Design Studies. (3 cr; A-F only)
Educational processes and methods used in design studio courses. Learning styles, team projects, criticism, evaluation, and curriculum development.

DHA 8164. Innovation Theory and Analysis. (3 cr; A-F only)
Theories and factors that influence adoption and diffusion of designed goods. Methodologies used in analysis of diffusion process.

DHA 8170. Topics in Design, Housing, and Apparel. (1-3 cr [max 6 cr]; SP–Varies with topic; A-F only)
In-depth investigation of a topic announced in advance.

DHA 8180. Professional Seminar in Design, Housing, and Apparel. (1-2 cr [max 4 cr]; A-F only)
Professional development issues and trends.

DHA 8192. Readings in Design, Housing, and Apparel. (1-3 cr [max 8 cr]; SP–A-F only)
Independent study and review of books and periodicals under tutorial guidance.

DHA 8193. Directed Study in Design, Housing, and Apparel. (1-3 cr [max 8 cr]; SP–A-F only)
Guided individual reading or study.

DHA 8267. Dress and Culture. (3 cr; SP–4212 or A-F only)
Cultural factors of identity expressed through dress. Focuses on issues of cultural diversity through analysis of design and textiles within a specific world region.

DHA 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

DHA 8361. Color, Design, and Human Perception. (3 cr; QP–Basic color theory course; SP–Basic color theory course or A-F only)
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.

DHA 8362. The Nature of Representation in Visual Communication. (3 cr; SP–Grad DHA major or A-F only)
Relationship of images to the design communication process. Aspects of representation and pictorial information modes. Human interaction with images and their role in increasing understanding, enhancing learning, and positively affecting human experience.

DHA 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

DHA 8463. Housing and Community Dynamics. (3 cr; A-F only)
Multi-disciplinary theoretical approaches to understanding housing and community.

DHA 8467. Housing Theory. (3 cr; SP–5467 or A-F only)
Investigation and evaluation of theories applied to the study of household behavior in relation to housing.

DHA 8555. Project Credits: Master of Fine Arts. (6 cr [max 12 cr]; SP– Completed coursework for M.F.A. with multimedia emphasis)
A two-semester studio sequence during which M.F.A. students develop and complete the M.F.A. project.

DHA 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

DHA 8671. Interior Design Studio. (4 cr; SP–A-F only)
Advanced problem analysis and design solution.

DHA 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

DHA 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

DSSC 8212. Doctoral Research Workshop in Development Studies and Social Change. (1 cr; SP–Grad DSSC minor or S-N only)
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. (2 cr [max 4 cr]; SP–Grad DSSC minor or S-N only)
Offered in conjunction with MacArthur Program on Peace and International Cooperation workshop series.

Dutch (Dtch)

Department of German, Scandinavian, and Dutch
College of Liberal Arts

Dtch 5490. Topics in Dutch Literature. (3 cr)
Topic may focus on a specific author, group of authors, genre, period, or subject matter. Topics specified in Class Schedule.

Dtch 5741. Medieval and Early Modern Dutch. (3 cr)
Introduction to the linguistic aspects of medieval and early modern Dutch. Reading and analysis of representative literary texts from the Dutch Middle Ages to 1700.

Dtch 5993. Directed Studies. (1-4 cr [max 12 cr]; SP–A, ∆)

East Asian Studies (EAS)

Institute of International Studies
College of Liberal Arts

EAS 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

EAS 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Ecology, Evolution, and Behavior (EEB)

Department of Ecology, Evolution, and Behavior
College of Biological Sciences

EEB 5008. Forest Response to Quaternary Climate Change. (2 cr; QP–Biol 5041 or 5841; SP–5407, EEB 4631 or Geo 4631, EEB 5009; A-F only)
Forest responses to past climate change at the population, community, and ecosystem level. Response to natural and human disturbance, range shifts and invasions. Limitations to the speed of response to rapid climate change.

EEB 5009. Quaternary Vegetation History and Climate. (2 cr; QP–5004 or Geo 5631 or A-F only)
Reconstructing and dating changes in vegetation and climate from Quaternary pollen stratigraphy of major world biomes; evidence from other indicators of past environments; comparison with climate models.

EEB 5011. Pollen Morphology. (2 cr; QP–Biol 3201 or A-F)
Morphology and nomenclature of pollen grains and pteridophyte spores, survey of pollen and spores of major plant families, lab techniques.
EEB 5013. Quaternary Plant Macrofossils. (2 cr; QP–PBio 3201 or GCB 3201 or 4511 or #) Morphology of seeds, fruits, and other macroscopic remnants likely to occur in Quaternary deposits; survey of fossils of major plant families, lab techniques.

EEB 5033. Population and Quantitative Genetics. (4 cr; QP–Biol 5003 or GCS 3022, course in biometry or statistics; SP–Biol 4003 or GCB 3022, introductory statistics or #; A-F only) Genetic basis of variation in populations and of evolutionary change: allelic frequency dynamics with emphasis on natural selection, additive genetic variance and heritability. Current topics related to the consequences of artificial selection and inbreeding.

EEB 5051. Analysis of Populations. (3 cr; QP–Intro biology, intro statistics or #; SP–Intro biology, intro statistics or #) Factors involved in the regulation, growth, and general dynamics of populations. Data needed to describe populations, population growth, population models, and regulatory mechanisms.

EEB 5053. Ecology: Theory and Concepts. (4 cr; QP–Biol 3008; SP–Biol 3407 or #) 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 5122. Plant Interactions with Animals and Microbes. (4 cr; QP–Biol 3008; Biol 1106 or 1806 or 3011; Biol 3103 or Biol 3102 or 3812, 10 cr of bio sci; SP–Biol 2012 or 3002, 3407 or 3409; A-F only) Ecological and environmental implications of mutualistic and antagonistic interactions between plants, animals and microbes at organismal, population, and community levels.

EEB 5321. Evolution of Social Behavior. (3 cr; QP–3111; SP–Biol 3411 or #; A-F only) Introduction to theories and concepts relating to behavior evolution, mating systems, and cooperative behavior in animals.

EEB 5323. Neural and Endocrine Mechanisms Underlying Vertebrate Behavior. (2 cr; QP–3111 or Biol 3011; SP–Biol 3411 or Biol 3101 or NSC 3101 or Phys 3101 or #; A-F only) 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 cr; QP–3111; SP–Biol 3411 or #) 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 5361. Visions of Nature: The Natural World and Political Thought. (4 cr; QP–Advanced studies in hist or phil or biol; SP–Advanced studies in hist or phil or biol) Theories about the organization of nature, human nature, and their significance for the development of ethics, religion, political and economic philosophy, civics, and environmentalism in Western and other civilizations. Graduate credit requires paper on conceptual topic on human ecology.

EEB 5371. Principles of Systematics. (3 cr; QP–# SP–#) Theoretical and practical procedures of biological systematics. Phylogeny reconstruction including computer-assisted analyses, morphological and molecular approaches, species concepts and speciation, comparative methods, classification, historical biogeography, nomenclature, and use and value of museums.

EEB 5961. Decision Analysis and Modeling in Conservation Biology. (3 cr; QP–Conservation biology grad; SP–Conservation biology grad or #; A-F only) Active learning class explores decision analysis techniques and modeling in conservation biology. Introduces techniques, concepts, and software.

EEB 8010. Seminar in Paleoecology. (1 cr [max 4 cr]; SP–#; S-N only) Reading and discussion of recent literature on Quaternary paleoecology.

EEB 8020. Community Ecology Seminar. (1 cr [max 5 cr]; SP–#; S-N only) Research topics in selected areas.

EEB 8050. Population Biology Seminar. (1 cr [max 5 cr]; SP–#; S-N only) Research topics in selected areas.

EEB 8051. Empirical Ecology. (4 cr; QP–Biol 3008; stat or biome course; SP–stat or biome course or #) Overview of analytical methods in interpreting data collected from observational and experimental studies in ecology and related fields of evolution, behavior, and conservation biology. Univariate, bivariate, and multivariate methods, including computationally intensive methods, ordination, and hypothesis testing.

EEB 8060. Evolutionary Genetics Seminar. (1 cr [max 5 cr]; SP–#; S-N only) Research topics in selected areas.

EEB 8162. Winter Ecology. (1-2 cr; SP–Physiology and ecol courses, #; S-N only) Survival options and mechanisms of plants and animals during seasonal cold periods.

EEB 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

EEB 8360. Behavioral Biology Seminar. (1 cr [max 5 cr]; SP–#; S-N only) Research topics in selected areas.

EEB 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

EEB 8620. Advanced Limnology. (2 cr; QP–max 6 cr; QP–5601 or Geol 5601 or equiv; SP–4601 or #; A-F only) Selected topics, using current and classical literature. Seminar format. Terra paper required.

EEB 8666. Doctoral Pre-Thesis Credits. (1-18 cr; #; S-N only) Doctoral Pre-Thesis Credits. (1-18 cr; SP–Doctoral student, adviser and DGS consent)

EEB 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max 12 cr per semester or summer; doctoral student who has not passed prelim oral)

EEB 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

EEB 8980. Seminar on Current Topics. (1 cr [max 3 cr]; SP–#; S-N only) Current research in ecology, evolution, and behavior. For first-year and third-semester graduate students.

EEB 8990. Graduate Seminar. (1 cr [max 5 cr]; SP–#; S-N only) Research topics in one or more selected areas.

EEB 8991. Independent Study: Ecology, Evolution, and Behavior. (1-10 cr [max 10 cr]; SP–#; S-N only) Individual research on a specialized topic.

EEB 8994. Directed Research. (1-5 cr [max 10 cr]; SP–#; S-N only)

EEB 8995. Independent Study. (1-10 cr; SP–#; A-F only) Research topics in areas of students’ interest.

EEB 8996. Independent Study. (1 cr; SP–#; A-F only) Independent study; may be repeated for up to 12 cr.

EEB 8997. Independent Study. (1 cr; SP–#; A-F only) Independent study; may be repeated for up to 12 cr.

EEB 8998. Independent Study. (1 cr; SP–#; A-F only) Independent study; may be repeated for up to 12 cr.

EEB 8999. Independent Study. (1 cr; SP–#; A-F only) Independent study; may be repeated for up to 12 cr.

EEB 9000. Seminar in Current Topics. (1 cr; SP–#; S-N only) Seminar in Current Topics. (1 cr; SP–#; S-N only)

EEB 9001. Microeconomic Analysis. (2 cr; QP–5151 or equiv, Math 3252, Math 3261 or equiv; SP–5151 or equiv, Math 2243, Math 2263 or equiv or #) 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.

EEB 9002. Microeconomic Analysis. (2 cr; QP–8001; SP–#; S-N only) 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.

EEB 9003. Microeconomic Analysis. (2 cr; QP–8002; SP–#; S-N only) 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.

EEB 9004. Microeconomic Analysis. (2 cr; QP–8003; SP–#; S-N only) 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.

EEB 8101. Microeconomic Theory. (2 cr; QP–5151 or equiv, Math 3261 or equiv; Math 5615, Math 5151 or equiv, Math 2243 or equiv, Math 5615 or Math 8601, grad econ major or #) Decision problems faced by the household and firm; theories of choice under conditions of certainty and uncertainty. Partial equilibrium analysis of competition and monopoly. General equilibrium analysis. Welfare economics: economic efficiency of alternative market structures, social welfare functions. Dynamics: stability of markets, capital theory. Seven-week course.
Courses

Econ 8102. Microeconomic Theory. (2 cr; QP–8101; Math 3261 or Math 5615 or #; Math 8601, grad econ major or #) Decision problems faced by the household and firm; theories of choice under conditions of certainty and uncertainty. Partial equilibrium analysis of competition and monopoly. General equilibrium analysis. Welfare economics: economic efficiency of alternative market structures, social welfare functions. Dynamics: stability of markets, capital theory. Seven-week course.

Econ 8103. Microeconomic Theory. (2 cr; QP–8101; Math 5616; SP–8102, Math 5616 or #Math 8602 or comparable abstract math course; grad econ major or #) Decision problems faced by the household and firm; theories of choice under conditions of certainty and uncertainty. Partial equilibrium analysis of competition and monopoly. General equilibrium analysis. Welfare economics: economic efficiency of alternative market structures, social welfare functions. Dynamics: stability of markets, capital theory. Seven-week course.

Econ 8104. Microeconomic Theory. (2 cr; QP–8102, Math 5616; SP–8103, Math 5616 or #Math 8602 or comparable comparable abstract math course; grad econ major or #) Decision problems faced by the household and firm; theories of choice under conditions of certainty and uncertainty. Partial equilibrium analysis of competition and dynasty models. Variational and indivisibilities, private information. Implications for recursive methods. This seven-week course meets with Econ 8108.

Econ 8105. Macroeconomic Theory. (2 cr; QP–5152 or equiv, Math 3252, Math 3261 or equiv; SP–5152 or equiv, Math 2243, Math 2263 or equiv or #) Dynamic general equilibrium models: solving for paths of interest rates, consumption, investment, prices. Models with uncertainty, search, matching, indivisibilities, private information. Implications for measurement and data reporting. Overlapping generations and dynasty models. Variational and recursive methods. This seven-week course meets with 4165.


Econ 8111. Introduction to Mathematical Economics. (2 cr; QP–8101; Math 2261 or equiv; Math 5612 or equiv or #Math 4242 recommended; Math 8601, grad econ major or #) Use of mathematical models in economic theory. Standard techniques.

Econ 8112. Introduction to Mathematical Economics. (2 cr; QP–8111; Math 5615 or comparable abstract math course; SP–8111, Math 5615 or comparable abstract math course) Use of mathematical models in economic theory. Standard techniques.

Econ 8113. Introduction to Mathematical Economics. (2 cr; QP–8111, Math 5614 or comparable abstract math course; SP–8112, Math 5616 or comparable abstract math course, #103) Use of mathematical models in economic theory. May include special topics.

Econ 8117. Noncooperative Game Theory. (2 cr; QP–Math 5614 or equiv; SP–Math 5616 or equiv or #) Solution concepts for noncooperative games in normal form, including Nash and perfect equilibrium and stable sets of equilibria. Extensive form games of perfect and incomplete information, sequential equilibrium, and consequences of stability for extensive form. Applications including bargaining and auctions. Seven-week course.

Econ 8118. Noncooperative Game Theory. (2 cr; QP–8117; SP–8117) Solution concepts for noncooperative games in normal form, including Nash and perfect equilibrium and stable sets of equilibria. Extensive form games of perfect and incomplete information, sequential equilibrium, and consequences of stability for extensive form. Applications including bargaining and auctions. Seven-week course.

Econ 8119. Cooperative Game Theory. (2 cr; QP–8103, Math 5614 or #Math 5616 or equiv or #) Basics of cooperative game theory, emphasizing concepts used in economics. Games with and without transferable utility; the core, the value, and other solution concepts. Recent results, including potential, reduced games, consistency, and noncooperative implementation of cooperative solution concepts. Seven-week course.

Econ 8120. History of Economic Thought. (2 cr; Econ 8103, Econ 8106, Econ 8104, # Econ 8103 or #; offered when feasible) Selected topics, emphasizing development of theoretical topics. Seven-week course.

Econ 8125. History of Economic Thought. (2 cr; Econ 8124; SP–8124 or #) Selected topics, emphasizing development of theoretical topics. Seven-week course.

Econ 8161. Advanced Topics in Microeconomics. (2 cr [max 4 cr]; QP–8103; SP–8104 or #; offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8185. Advanced Topics in Macroeconomics. (2 cr [max 4 cr]; QP–8106; SP–8106 or #; offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8186. Advanced Topics in Macroeconomics. (2 cr [max 4 cr]; QP–8106; SP–8106 or #) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8191. Workshop in Mathematical Economics. (1-3 cr [max 10 cr]; QP–8103; SP–8104 or #) Effective participation 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 8192. Workshop in Mathematical Economics. (1-3 cr [max 10 cr]; QP–8103; SP–8104 or #) Effective participation 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 8202. Econometric Analysis. (2 cr; QP–8201; Stat 5101 or #) Basic linear regression model and its variants; panel data, censored and truncated regression, discrete choice models; time series and simultaneous equation models. This seven-week course meets with 4242.

Econ 8203. Econometric Analysis. (2 cr; QP–8201; SP–8202) Basic linear regression model and its variants; panel data, censored and truncated regression, discrete choice models; time series and simultaneous equation models. This seven-week course meets with 4242.

Econ 8204. Econometric Analysis. (2 cr; QP–8202; SP–8203) Basic linear regression model and its variants; panel data, censored and truncated regression, discrete choice models; time series and simultaneous equation models. This seven-week course meets with 4246.

Econ 8205. Applied Econometrics. (2 cr; QP–Math 5242 or equiv, Econ 8101, Econ 8103, Stat 5101, Math 5242 or equiv, Econ 8101, Econ 8105, Stat 5101 or #) 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 cr; QP–8205, Stat 5101, Stat 5102, Stat 8103, Stat 8106, Stat 5101 or #) 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 cr; QP–8205, Stat 5101, Stat 5102, Stat 8103, Stat 8107, Stat 5101 or #) 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 cr; QP–8206, Stat 5104, Stat 5106, Stat 5108, Stat 5102 or #) 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 cr; QP–8105, 5151, Math 5242 or equiv, Stat 5133, Stat 5151, Math 4242 or equiv, Stat 5102 or #) 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 cr; QP–8211; Econ 8211) 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 cr; QP–8212; SP–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.
Courses

Econ 8281. Advanced Topics in Econometrics. (2 cr [max 4 cr]; QP–8123; SP–8213 or #) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8282. Advanced Topics in Econometrics. (2 cr [max 4 cr]; QP–8123; SP–8213 or #) offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8291. Workshop in Econometrics. (1-3 cr [max 10 cr]; QP–8213; SP–8213 or #) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8292. Workshop in Econometrics. (1-3 cr [max 10 cr]; QP–8213; SP–8213 or #) offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8311. Economic Growth and Development. (2 cr; QP–8103, 8105; SP–8104, 8106 or #) Methods of analyzing dynamical systems; applying methods to new models of growth and development; deriving and evaluating models' quantitative implications in light of growth and development in a number of countries. Seven-week course.

Econ 8312. Economic Growth and Development. (2 cr; QP–8103, 8105; SP–8104, 8106 or #) offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8313. Economic Growth and Development. (2 cr; QP–8103, 8105; SP–8104, 8106 or #) offered when feasible) 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 cr; SP–M Master's student, adviser and DGS consent)

Econ 8381. Advanced Topics in Economic Development. (2 cr [max 4 cr]; QP–8312; SP–8313 or #) offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8382. Advanced Topics in Economic Development. (2 cr [max 4 cr]; QP–8312; SP–8313 or #) offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8391. Workshop in Economic Growth and Development. (1-3 cr [max 10 cr]; SP–#) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8392. Workshop in Economic Growth and Development. (1-3 cr [max 10 cr]; SP–#) offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.


Econ 8402. International Trade and Payments Theory. (2 cr; QP–8401; SP–8401 or #) Tariffs, quotas, and other barriers to trade; gains from trade; trading blocs; increasing returns; growth. Seven-week course.

Econ 8403. International Trade and Payments Theory. (2 cr; QP–8402; SP–8402 or #) offered when feasible) International business cycles; exchange rates; capital movement; international liquidity. Seven-week course.

Econ 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

Econ 8481. Advanced Topics in International Trade. (2 cr [max 4 cr]; QP–8403; SP–8403 or # offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8482. Advanced Topics in International Trade. (2 cr [max 4 cr]; QP–8403; SP–8403 or # offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8491. Workshop in Trade and Development. (1-3 cr [max 10 cr]; SP–#) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8492. Workshop in Trade and Development. (1-3 cr [max 10 cr]; SP–#) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8501. Wages and Employment. (2 cr; QP–8101, 8104; SP–8102, 8105 or #) 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 cr; QP–8501; SP–8501 or #) offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8581. Advanced Topics in Labor Economics. (2 cr [max 4 cr]; QP–8502; SP–8502 or # offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8582. Advanced Topics in Labor Economics. (2 cr [max 4 cr]; QP–8502; SP–8502 or # offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8601. Industrial Organization and Government Regulation. (2 cr; QP–8102; SP–8102 or #) Behavior of businesses and industries: productivity, firm size distributions, exit-entry dynamics, etc. Theories of the firm, industry structure and performance, invention and innovation, and technology adoption. Positive and normative theories of regulation. Seven-week course.

Econ 8602. Industrial Organization and Government Regulation. (2 cr; QP–8601; SP–8601 or #) offered when feasible) Behavior of businesses and industries: productivity, firm size distributions, exit-entry dynamics, etc. Theories of the firm, industry structure and performance, invention and innovation, and technology adoption. Positive and normative theories of regulation. Seven-week course.

Econ 8603. Industrial Organization and Government Regulation. (2 cr; QP–8602; SP–8602 or #) offered when feasible) Behavior of businesses and industries: productivity, firm size distributions, exit-entry dynamics, etc. Theories of the firm, industry structure and performance, invention and innovation, and technology adoption. Positive and normative theories of regulation. Seven-week course.

Econ 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Econ 8681. Advanced Topics in Industrial Organization. (2 cr [max 4 cr]; QP–8803; SP–8803 or #; offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8682. Advanced Topics in Industrial Organization. (2 cr [max 4 cr]; QP–8803; SP–8803 or #; offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8691. Workshop in Applied Microeconomics. (1-3 cr [max 10 cr]; SP–#) offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8692. Workshop in Applied Microeconomics. (1-3 cr [max 10 cr]; SP–#) offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8701. Monetary Economics. (2 cr; QP–8102, 8105; SP–8103, 8106 or #) Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

Econ 8702. Monetary Economics. (2 cr; QP–8701; SP–8701 or #) Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

Econ 8703. Monetary Economics. (2 cr; QP–8702; SP–8702 or #) Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

Econ 8704. Financial Economics. (2 cr; QP–8102, 8105; SP–8103, 8106 or #) Role of financial institutions in efficient allocation of risk; multiperiod and continuous-time securities markets; theory of firm under uncertainty; financial intermediation; derivation of empirical asset-pricing relationships; tests concerning alternative market structures. Seven-week course.

Econ 8705. Financial Economics. (2 cr; QP–8704; SP–8704 or #) Role of financial institutions in efficient allocation of risk; multiperiod and continuous-time securities markets; theory of firm under uncertainty; financial intermediation; derivation of empirical asset-pricing relationships; tests concerning alternative market structures. Seven-week course.

Econ 8706. Financial Economics. (2 cr; QP–8705; SP–8705 or #) Role of financial institutions in efficient allocation of risk; multiperiod and continuous-time securities markets; theory of firm under uncertainty; financial intermediation; derivation of empirical asset-pricing relationships; tests concerning alternative market structures. Seven-week course.

Econ 8777. Thesis Credits: Masters. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Econ 8781. Advanced Topics in Monetary Economics. (2 cr [max 4 cr]; QP–8702; SP–8702 or # offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8782. Advanced Topics in Monetary Economics. (2 cr [max 4 cr]; QP–8702; SP–8702 or # offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8791. Workshop in Macroeconomics. (1-3 cr [max 10 cr]; SP–#)

For definitions of course numbers and symbols, see inside back cover.

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Courses

Econ 8803. Public Economics. (2 cr; QP–8802; SP–8802 or #) 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.

Econ 8881. Advanced Topics in Public Economics. (2 cr [max 4 cr]; QP–8883; SP–8883 or # offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8882. Advanced Topics in Public Economics. (2 cr [max 4 cr]; QP–8883; SP–8883 or # offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

Econ 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Econ 8991. Workshop in Public Economics and Policy. (1-3 cr [max 10 cr]; SP–#)

Econ 8992. Workshop in Public Economics and Policy. (1-3 cr [max 10 cr]; SP–#)

Econ 8990. Individual Graduate Research. (1-7 cr; SP–#)

Education (Ed)

College of Education and Human Development

Educ 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and DGS consent)

Educ 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

Educ 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Educ 8777. Thesis Credits: Master's. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Educ 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Education and Human Development (EdHD)

EdHD 5001. Learning, Cognition, and Assessment in the Schools. (3 cr; QP–MEd/init lic student or CLA music ed or preteaching major or #; EdPA 5090; SP–MEd/init lic student or CLA music ed or preteaching major or #; EdPA 5090/A-F only) Theories and principles of learning, cognition, and assessment; emphasis on a dynamic systems perspective; developmental transitions in childhood and adolescence; interactions between the student, environment, and task; and accommodations and adaptations for students in special education.

EdHD 5005. School and Society. (2 cr; QP–MEd/init lic student or CLA music ed or preteaching major or #; EdPA 5090; SP–MEd/init lic student or CLA music ed or preteaching major or #; EdPA 5090/A-F only) Theories and principles of learning, cognition, and assessment; emphasis on a dynamic systems perspective; developmental transitions in childhood and adolescence; interactions between the student, environment, and task; and accommodations and adaptations for students in special education.

EdHD 5007. Technology for Teaching and Learning. (1.5 cr; QP–SpS 5300; SP–MEd/init lic or CLA music ed or preteaching major or #; basic knowledge of Mac and a word processing program; SP–SpS 5300; SP–MEd/init lic or CLA music ed or preteaching major or #; basic knowledge of Mac and a word processing program; A-F only) Selects educational technology in K-12 classrooms and the issues associated with their effective use. Computer technologies are used to stimulate personal productivity, communicate with other users, and enhance learning and teaching processes.

EdHD 5009. Human Relations: Applied Skills for School and Society. (1 cr; QP–SpS 5000; SP–SpS 5000; A-F only) Addresses 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, and teaching in diverse educational settings.

Educational Policy and Administration (EdPA)

Department of Educational Policy and Administration

College of Education and Human Development

EdPA 5001. Formal Organizations in Education. (3 cr) Organizational theory, issues in educational organizations; and how general theories apply to schools, colleges and universities, and a variety of other organizations.

EdPA 5021. Historical Foundations of Modern Education. (2 cr) Analysis and interpretation of important elements in modern education derived from pre-classical sources: Greeks, Romans, Middle Ages, Renaissance, Reformation, Enlightenment, and Industrial Revolution.

EdPA 5023. History of Western Educational Thought. (3 cr) Great educational classics of Western civilization: Plato, Aristotle, Quintilian, Montaigne, Milton, Locke, Rousseau, and others.


EdPA 5028. Education Imagery in Europe and America. (3 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.

EdPA 5032. Comparative Philosophies of Education. (3 cr) Exploration of the principal philosophies in educational thought today, e.g., realism, idealism, pragmatism, and postmodernism. Practice in philosophical critique.

EdPA 5036. Ethics, Morality, and Values in Education. (3 cr) Application to key issues of professional practical reflection on moral education, virtues, and principles.

EdPA 5041. Sociology of Education. (3 cr) Structures and processes within educational institutions; linkages between educational organizations and their social contexts, particularly related to educational change.

EdPA 5044. Introduction to the Economics of Education. (3 cr) Costs and economic benefits of education, with a focus on K-12; educational markets, prices, and production relationships; investment and cost-benefit analysis.

EdPA 5048. Cross-Cultural Perspectives on Leadership. (2 cr; SP–#) Intensive weekend workshop introduces participants to cultural variables of leadership that influence functioning of cross-cultural groups. Methods include lectures, case studies, discussion, problem-solving exercises, and simulations. Enrollment is limited.


EdPA 5056. Case Studies for Policy Research. (3 cr; A-F only) 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.

EdPA 5061. Ethnographic Research Methods. (3 cr) 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.

EdPA 5064. Divergent Perspectives in Educational Policy and Practice. (3 cr) Examine the full range of policy issues. Emphasis on understanding differences in policy approach; comprehension of the context in which policies are created and how they are implemented.

EdPA 5080. Special Topics: Educational Policy and Administration. (1-3 cr [max 24 cr]) Issues of educational policy and administration.

EdPA 5087. Seminar: Educational Policy and Administration. (1-3 cr [max 24 cr]) Issues of educational policy and administration.

EdPA 5095. Problems: Educational Policy and Administration. (1-3 cr [max 24 cr]) Issues of educational policy and administration.

EdPA 5096. Internship: Educational Policy and Administration. (1-9 cr [max 24 cr]) Issues of educational policy and administration.

EdPA 5101. International Education and Development. (3 cr) Introduction to comparative and international development education, contemporary theories regarding the role of education in the economic, political, and sociocultural development of nations; examination of central topics and critical issues in the field.
Courses

EdPA 5102. Knowledge Formats and Applications: International Policy, Theory, and Education Contexts. (3 cr) Analyzes the interrelationships of "knowledge capital" (notic symbolic resources) and culture through intrinsic, cross-, and multicultural perspectives. Distinguishes knowledge from information and data, focusing on national and international developments occurring along basic and applied knowledge paths.

EdPA 5103. Comparative Education. (3 cr) 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.

EdPA 5121. Educational Reform in International Context. (3 cr) 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.

EdPA 5124. Critical Issues in International Education and Educational Exchange. (3 cr) Analysis of comprehensive policy-oriented frameworks for international education; practices of U.S. and other universities; conceptual development of international education and its practical application to programs, to employment choices, and to pedagogy.

EdPA 5128. Anthropology of Learning. (3 cr) Cross-cultural perspectives in examining educational patterns; the implicit and explicit cultural assumptions underlying them. Methods and approaches to cross-cultural studies in education.

EdPA 5132. Intercultural Education and Training: Theory and Application. (3 cr) 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.

EdPA 5301. Contexts of Learning: Historical, Contemporary, and Projected. (3 cr; A-F only) Contextual understanding of education as a social institution. Education is studied as one institution among the several that constitute its dynamic context.


EdPA 5303. Managing the Learning Organization. (3 cr; A-F only) Examines schools, colleges, and other human service organizations centered on learning. Focuses on skills needed to manage organizations effectively.

EdPA 5304. Educational Leadership for Equity, Opportunity, and Outcome. (3 cr; SP–Admission to EdPA doctoral program) Emphasizes importance of understanding the implications of the multiple contexts in which leadership occurs, the role of followers, and the complexities of collaborative structures and shared governance.

EdPA 5321. The Principalship. (3 cr) Role of the principal: qualifications, duties, and problems.

EdPA 5324. Financial Management for Elementary-Secondary Education. (3 cr) Provides an overview of state-local school finance systems, budgeting, governmental fund accounting, and interpretation of financial information. For graduate students pursing licensure as elementary-secondary principals and superintendents.

EdPA 5328. Introduction to Educational Planning. (3 cr) Principles, tools, comparative practices, and emerging issues in K-12 and higher education settings; decision making models; strategic and project planning; barriers to effectiveness; and change management processes.

EdPA 5332. Leadership Development Seminar. (3 cr) Assessment and development of skills required of the educator in planning, decision making, and human relations. Introduction to contemporary issues in educational administration.

EdPA 5336. Laboratory in Decision Making. (3 cr) Contributions of recent research and theory to effective administration. Analysis of administrative behavior in realistic settings; relations of administration to human behavior.

EdPA 5341. The American Middle School. (3 cr) Focus on the uniqueness of the early adolescent and appropriate learning situations. For educators working with middle-level students.

EdPA 5344. Law and Educational Policy. (3 cr) Reviews of the legal foundations of educational policy; statutory themes and case law; implications for educational organizations and administrative practice; case studies and emergent issues in recent court rulings.

EdPA 5346. Politics of Education. (3 cr; SP–Postbac or MEd or grad student; A-F only) Political dimensions of policy formulation and implementation in education. Emphasis on understanding the role of power and influence in shaping educational policies and resolving conflicts over educational issues. Analysis of consequences and cross-impacts.

EdPA 5348. Public School Personnel Programs. (3 cr) Management concepts, functions, and practices of the personnel subsystem in education; selection, assignment, evaluation, and development of school personnel; collective bargaining and the grievance process.

EdPA 5352. Projective Leadership for Strategic Learning Communities. (3 cr) Explores many trends and changes facing society, culture, and education from a strategic learning community perspective; helps students bring the future into the present.

EdPA 5356. Services Integration: Policy, Research, and Practice. (3 cr) Presents policy, research, and current practices related to integrating education, health, and social services to support children, youth, and families; federal, state, and local perspectives; realities, possibilities, and barriers for services integration.

EdPA 5361. Project in Teacher Leadership. (3-6 cr; SP–MEd student in Teacher Leadership Program) Create, implement, evaluate, and present a leadership project designed to initiate positive change in educational environments. Review of related literature, proposal development, project development, implementation and evaluation, critical reflection, sharing learning outcomes.

EdPA 5364. Context and Practice of Educational Leadership. (3 cr; SP–MEd or CEHD grad student; A-F only) Promotes an understanding of school culture and its impact on facilitating change and assuming leadership roles in education. Current research and practice about leadership and organizational learning in K-12 education.

EdPA 5368. Federal and State Policies Impacting Services, Families, and Children With Special Needs. (3 cr) Examines legislative, procedural, executive, and judicial actions impacting services, families, and children with special needs at all levels of government. For administrators, supervisors, and other professionals responsible for the management of general and alternative education programs.

EdPA 5372. Youth in Modern Society. (3 cr) Youth in advanced societies and as a social entity; functions and roles in industrial society, family, education, politics and government, economy and work, welfare and religion; organizations, social movements, and subcultures; empirical research and cross-cultural perspectives.

EdPA 5376. Organizational Approaches to Youth Development. (3 cr) Defining youth development within framework of formal and informal organizations; organizational systems responsible for youth development in the community; policy issues surrounding these systems.

EdPA 5378. Experiential Learning: Theory and Practice. (3 cr) Theory and practices of learning by doing. Focuses on the educator’s personal engagement in the actual process to understand the technical, motivational, and evaluative aspects of experiential learning.

EdPA 5381. The Search for Children and Youth Policy in the United States. (3 cr) Review of contemporary policy issues affecting children and youth in the United States and South Africa; identify national standards, norms and principles of youth development; conflicting expectations facing policy-makers; and search for the critical content of youth policy.

EdPA 5384. Inclusive and Collaborative Learning Communities. (3 cr; SP–Init lic; grad student; A-F only) Knowledge and practice base for addressing the wide range of abilities in classrooms and for creating collaborative learning communities for students and staff. Strategies for creating curricular, instructional, and social supports for learning general education classrooms.

EdPA 5396. Field Experiences in PK-12 Educational Administration. (2-6 cr; S-N only) Field experiences and/or internships arranged for students seeking licensure as PK-12 principals and superintendents. Content and credits dependent on licensure requirements and specified in individual field experience arrangements.

EdPA 5501. Principles and Methods of Evaluation. (3 cr) Introduction to program evaluation. Planning an evaluation study, collecting and analyzing information, reporting results; evaluation strategies; overview of the field of program evaluation.


EdPA 5524. Evaluation Colloquium. (1 cr; QP–5240 or 5285 or EPsy 5243; SP–5501 or EPsy 5243) Informal seminar of faculty and advanced students interested in the issues and programs of program evaluation.

EdPA 5701. American Higher Education. (3 cr; A-F only) American higher and postsecondary education in historical and contemporary perspective; special emphasis on societal and political demands on higher education system; consequent changes in various forms and functions.

EdPA 5704. Student and Faculty Issues in Higher Education. (3 cr; QP–EdPA 5201; SP–EdPA 5001) Broad range of issues involving students and faculty in colleges and universities, including: college student development, curricular and extracurricular activities, faculty work and development, and student-faculty interaction.

EdPA 5721. Racial and Ethnic Diversity in Higher Education. (3 cr) Review of research. Theoretical frameworks, methodological perspectives, and research strategies used to study students, staff, and faculty; historical perspectives.
Courses

EdPA 5724. Leadership and Administration of Student Affairs. (3 cr; A-F only)
Scope, administration, coordination, and evaluation of programs in college and university student affairs.

EdPA 5728. Two-Year Postsecondary Institutions. (3 cr; A-F only)
Present status, development, functions, organization, curriculum, and trends in postsecondary, but nonbaccalaureate, institutions.

EdPA 5732. The Law and Postsecondary Institutions. (3 cr; A-F only)
Analysis of court opinions and federal regulations affecting postsecondary educational institutions.

EdPA 6002. Critical Issues in Contemporary Education. (3 cr; SP, ED or PhD student)
Meanings of difference from sociological, psychological, historical and philosophical perspectives as related to current and emerging critical issues in education. Participants help design, facilitate, and present the course.

EdPA 8011. Doctoral Research Seminar I. (1 cr; SP, EdPA PhD student; S-N only)
Introduction and planning for individual program development, preliminary examinations, and dissertation prospects. Modes of inquiry used in current research in education, databases relating to education, recent writings on literature synthesis, and key contributions to education literature.

EdPA 8012. Doctoral Research Seminar II. (1 cr; SP, EdPA PhD student; S-N only)
Introduction to quantitative and qualitative research approaches and methods; nature of research, role of researcher, philosophical perspectives on research, and ethical issues in conducting research.

EdPA 8013. Doctoral Research Seminar III. (1 cr; SP, EdPA PhD student; S-N only)
Introduction to the most important quantitative and qualitative approaches employed in educational policy research.

EdPA 8014. Doctoral Research Seminar IV. (1 cr; SP, EdPA PhD student; S-N only)
Preparation of thesis prospectus.

EdPA 8087. Seminar: Educational Policy and Administration. (1-3 cr; max 24 cr)

EdPA 8095. Problems: Educational Policy and Administration. (1-3 cr; max 24 cr)

EdPA 8096. Internship: Educational Policy and Administration. (1-9 cr; max 24 cr)

EdPA 8104. General Systems Thinking for the Schools. (3 cr; SP, ED or PhD student)
The contemporary global organization must continually learn about its work, its clients, and its environment. Computer software and perspectives on the learning organization used to study the development of the education and human service organizations.

EdPA 8304. Leadership and Ethics. (3 cr; SP, 5304)
Review of major leadership theories and their application to problems of practice in educational organizations. Studies of leadership behavior illustrate major emerging issues in educational management.

EdPA 8321. Data Analysis for Educational Management. (3 cr)
Managers of educational organizations are faced with problems that require analysis of a wide range of information. Outlines a frame for data analysis and introduces a set of computer-based tools suited to the practice of educational administration.

EdPA 8333. FTE: Masters. (1 cr; SP, Master’s student, adviser and DGS consent)

EdPA 8444. FTE: Doctoral. (1 cr; SP, Doctoral student, adviser and DGS consent)

EdPA 8502. Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives. (3 cr; QP, 5240 or 5285 or EPsy 5243; SP, 5201 or EPsy 5243)
Concepts, approaches, models, and theoretical frameworks for program evaluation that have developed since the 1960s.

EdPA 8595. Evaluation Problems. (1-6 cr; QP, 5240 or 5285 or EPsy 5243; SP, 5501 or EPsy 5243)
Hand-on experience in conducting a program evaluation in a real-world setting under supervision of an evaluation professional.

EdPA 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP, Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

EdPA 8702. Administration and Leadership in Higher Education. (3 cr; QP, 5201, 5250; SP, 5001, 5701)
Leadership, governance, and administration in higher education through theoretical perspectives and practical analysis. Planning, change, decision making, organizational culture, budgets, conflict.

EdPA 8703. Public Policy and Practice in Higher Education. (3 cr; QP, 5201, 5250; SP, 5001, 5701; A-F only)
Developing and implementing higher education policy and practice as dynamic and interactive processes; effects of social, economic, political, and demographic environment on federal and state higher education policy; reciprocal effects of colleges and universities on their environments; public policy responses to finance and inequality in higher education.

EdPA 8721. Instruction and Learning in Higher Education. (3 cr)
Multiple forms and tasks. Conceptual perspectives on instruction and learning. Critique of effectiveness of standard and emerging approaches to faculty and student work.

EdPA 8724. Strategic Planning in Higher Education. (3 cr; QP, 8250 or 8256; SP, 8703)
Strategic planning principles, their application to higher education, and pitfalls encountered by planners in higher education. Selected tools of strategic planning, management, and strategic planning case studies.

EdPA 8728. Economics of Higher Education. (3 cr)
Institutional responses to changing external economic factors; economic effects resulting from higher education’s output in teaching, research, and service; research on institutional and governmental policies.

EdPA 8732. Financing Higher Education. (3 cr; S-N only)
The financial foundations of higher education have recently undergone major changes to increase institutional dependency on tuition, gifts, and entrepreneurial income. Computer models of educational systems and organizations used to assist students in acquiring essential skills of financial management.

EdPA 8777. Thesis Credits: Masters. (1-18 cr; SP, Max 16 cr per semester or summer; 10 cr total required [Plan A only])

EdPA 8888. Thesis Credits: Doctoral. (1-18 cr; SP, Max 18 cr per semester or summer; 24 cr required)

Educational Psychology (EPsy)

Department of Educational Psychology
College of Education and Human Development

EPsy 5101. Intelligence and Creativity. (3 cr; A-F only)
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. (3 cr; A-F only)
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 cr)
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 cr; A-F only)
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 cr)
Survey of adult learning and instruction. Emphasis on instructional design, learning theories, experience, individual differences, evaluation, tests and measurement, and technology. Implications for curricular and instructional design in higher education, continuing education, and professional and business related training.

EPsy 5117. Problem Solving and Decision Making. (3 cr; A-F only)
Strategies, rules, methods, and other cognitive components involved in problem solving and decision making, implications for educational practices, and applied domains.

EPsy 5125. Psychology of Building Character, Values, and Behavior. (3 cr; A-F only)
New approaches to motivation, building prosocial values and behavior; how to alter values and behavior of anti-social individuals; strengths and weaknesses of traditional approaches to character education, instilling prosocial values as a way to alter negative behaviors.

EPsy 5135. Human Relations Workshop. (4 cr; S-N only)
Experiential course addressing issues of prejudice and discrimination in terms of history, power, and social perception. Includes knowledge and skills acquisition.
Courses

EPsy 5151. Cooperative Learning. (3 cr) Participants learn how to use cooperative learning in their setting. Topics include theory and research, teacher's role, essential components that make cooperation work, teaching social skills, assessment procedures, and collegial teaching teams.

EPsy 5152. Psychology of Conflict Resolution. (3 cr) Overview of the field of conflict resolution. Major theories, research, major figures in the field, factors influencing quality of conflict resolution are covered. The nature of conflict, the history of field, and interpersonal, interprofessional, intergroup conflict, negotiation, mediation are discussed.

EPsy 5154. Organization Development and Change. (3 cr) Overview of organizational development and change. Normative models of effective organizations, entry and contracting skills, diagnosis procedures and intervention procedures (data feedback, skills training, continuous improvement, mediation).

EPsy 5155. Group Dynamics and Social Influence. (3 cr) Overview of the field of group dynamics with emphasis on social psychology. Major theories, research, and figures in the field are covered. Group goals, communication, leadership, decision making, problem solving, conflicts, power, uniqueness theory, deindividuation, and minority influence will be covered.

EPsy 5156. Social and Personality Influences on Education. (4 cr; A-F only) Survey of social psychology and personality applied to education. Application of major theories and research to classroom and school practices and educational issues are emphasized. Class sessions include lectures, discussions, simulations, experiential exercises. Intrapersonal, interpersonal, and group dynamics are discussed.

EPsy 5157. Social Psychology of Education. (3 cr; A-F only) Overview of social psychology and its application to education. Participants study the major theories, research, and major figures in field. Class sessions include lectures, discussions, simulations, role-plays, and experiential exercises.

EPsy 5191. Education of the Gifted and Talented. (3 cr) Theories of giftedness, talent development, instructional strategies, diversity and technological issues, implications for educational practices and psychological inquiry, and international considerations.

EPsy 5200. Special Topics: Psychological Foundations. (1-4 cr; max 30 cr) Focus on special topics in psychological and methodological concepts relevant to advanced educational theory, research, and practice not covered in other courses.

EPsy 5216. Introduction to Research in Educational Psychology. (3 cr; QP – 5260 or other intro statistics course; SP – 5261 or other intro statistics course; A-F only) Introduction to educational research, leading students through the basic steps involved in designing and conducting a research study. Topics include reviewing literature, formulating research problem, using different approaches to gather data, managing and analyzing data, and reporting results.

EPsy 5217. Proseminar in Educational Psychology. (3 cr; QP – 5216 or SP – 5217 or A-F only) Survey and examination of the types of research proposed or done by faculty and students in educational psychology.

EPsy 5211. Basic Principles of Educational Measurement. (3 cr; QP – 5260 or equiv; SP – 5261 or equiv) Concepts, principles, and methods in educational and psychological measurement. Specifically, the course will cover reliability, validity, item analysis, scores, grades, scales, test construction, and test evaluation.

EPsy 5231. Introductory Statistics and Measurement in Education. (4 cr) Students develop an understanding of basic statistics and measurement concepts and tools and apply them to the collection, interpretation, and explanation of data.

EPsy 5233. Principles and Methods of Evaluation. (3 cr) Introductory course in program evaluation; planning an evaluation study, collecting and analyzing information, interpreting results; overview of the field of program evaluation.

EPsy 5246. Evaluation Colloquium: Psychological Foundations. (1 cr; max 6 cr; QP – 5240/EdPA 5285; SP – 5243/EdPA 5501; S-N only) Informal seminar of faculty and advanced students interested in the issues and problems of program evaluation.

EPsy 5261. Introductory Statistical Methods. (3 cr) Introduction to statistics with emphasis on understanding and applying statistical concepts and procedures. Data analysis using statistical software to present and interpret data, and analysis of variance.

EPsy 5281. Introduction to Computer Operations and Data Analysis in Education and Related Fields. (3 cr; S-N only) Introductory computer literacy course to familiarize students with personal computers and computing resources at the University. Applications include electronic communications, spreadsheets, graphical presentation, and data analysis.

EPsy 5400. Special Topics in Counseling Psychology. (1-4 cr; max 8 cr) Theory, research, and practice in counseling and student personnel psychology. Topics vary.

EPsy 5401. Counseling Procedures. (3 cr; QP – Upper div student; SP – Upper div student) Emphasis on the counseling relationship and principles of interviewing. Case studies, role playing, and demonstration. For individuals whose professional work includes counseling and interviewing.

EPsy 5412. Introduction to Developmental Counseling and Guidance. (3 cr; QP – SP – #) Contemporary models of counselors as advocates for all students. Emphasizes prevention and systems intervention with counselors involved in the developmental guidance curriculum, school change, staff and community collaboration, individual student planning, and learning success with diverse populations.

EPsy 5421. Leadership and Administration of Student Affairs. (3 cr; QP – EdPA 5420; SP – EdPA 5724; A-F only) Theoretical approaches, administrative structure, and evaluation methods used in college and university student affairs.

EPsy 5422. Principles of Group Work: Theory and Procedures. (3 cr; QP – Advanced undergrad or grad student in the helping professions; SP – Advanced undergrad or grad student in the helping professions) Principles and procedures for group work with educators and the helping professions. Discussion of various types of groups (e.g., counseling support, task, psychoeducational). Applications to various settings and populations (e.g., schools and community agencies).

EPsy 5431. Career Development: Theory, Skills, and Counseling Applications. (3 cr; QP – CSPP major; SP – CSPP major; A-F only) Introduction to career development theory and practice over the life span. Emphasis on career counseling for individuals and organizational approaches to career programs in education and business. Topics cover both traditional and contemporary theories and practices.

EPsy 5432. Foundations of Individual/Organizational Career Development. (3 cr; A-F only) Introduction to individual and organizational career development theory and practice. Examines critical issues in work patterns, work values, and workplaces in a changing global society, with implications for career planning, development, and transitions, emphasizing personal and organizational change. For nonmajors: serves students in adult ed, HRD, IR, college student advising, and other related fields.

EPsy 5433. Counseling Women Over the Life Span. (3 cr; QP – One course in counseling or career development; SP – Counseling or career development course) Counseling skills and interventions to facilitate career development of girls and women of different life stages and backgrounds (school girls to older women); developmental issues from a systematic integrative life planning framework; facts, myths, and trends regarding women’s changing roles.

EPsy 5434. Counseling Adults in Transition. (3 cr) QP – Advanced undergrad or grad student in the helping professions; SP – Advanced undergrad or grad student in the helping professions) Psychological, physical, and social dimensions of adult transitions (e.g., family and personal relationships, career). Adult development theories, stress and coping, and helping skills and strategies as they relate to adult transition.

EPsy 5451. The College Student. (3 cr) The psychology and sociology of college students, including research concerning diversity of populations, vocational development of students, student society, culture, mental health, underachievement, dropout, values and attitudes, and relevant research methods.

EPsy 5461. Cross-Cultural Counseling. (2 cr; A-F only) Emphasis on the effect of cross-cultural and cross-national psychological differences in human traits and characteristics. These theoretical differences provide a framework for the development and women and implementation of effective cross-cultural counseling interventions.

EPsy 5601. Survey of Special Education. (2 cr) Introduction to programs and services provided to people with disabilities in school and community settings. Emphasis on the needs of families, the roles and responsibilities of service providers, and related service providers.

EPsy 5602. Computer Technology in Special Education. (2 cr; A-F only) Develop skills, understand processes, and identify resources needed to utilize technology to benefit persons with disabilities. Emphasis on learning theory, principles of effective instruction, instructional and assistive technology integration.

EPsy 5603. Childhood Language Development: Classroom Implications. (3 cr) Recent trends and findings in the study of language acquisition and communication; classroom implications, including education of exceptional children and implications of diversity on instruction.

Courses


EPsy 5612. Understanding of Academic Disabilities. (3 cr; A-F only) Introduction to issues related to the education of students with academic disabilities (learning disabilities, mild mental intellectual disabilities, and emotional/behavioral disabilities) including history, definition, assessment, classification, legislation, and intervention approaches.

EPsy 5613. Foundations of Special Education I. (3 cr; QP – Child development course, 5601 or equiv; SP – Child development course, 5601 or equiv; A-F only) Emphasis on the organization of educational programs and services for people with disabilities and their families. First course for students seeking to become licensed teachers in special education.

EPsy 5614. Foundations of Special Education II. (3 cr; QP – 5601, 5608 or 5609; SP – 5613; A-F only) Emphasis on assessment, planning, and implementing educational programs for people with disabilities. Second course for students seeking to become licensed teachers in special education.

EPsy 5615. Advanced Academic Interventions. (3 cr; QP – 5612; SP – 5612; A-F only) Develop knowledge and skills in designing, implementing, and evaluating Individual Educational Plans (IEPs) for students eligible for special education service in learning disabilities, emotional/behavioral disorders, and mild mental intellectual disabilities.


EPsy 5621. Functional/Basic Academic Interventions in Mental Retardation. (3 cr; QP – 5601; SP – 5613; 5614; A-F only) Methods and materials course emphasizing functional approaches to promoting academic learning in students with mild to moderate mental retardation and moderate to severe mental retardation.

EPsy 5622. Programs and Curricula for Learners With Severe Disabilities. (3 cr; QP – 5611; SP – 5616) Emphasis on developing programs and curricula for students with moderate, severe, and profound development delays, as well as severe multihandicapping conditions. Special consideration given to preparing children and youth for integrated community environments.

EPsy 5624. Biomedical and Physical Aspects of Developmental Disabilities. (3 cr; A-F only) Selected information in genetics; anatomy, physiology, and kinesiology; central and peripheral nervous system; prenatal, perinatal, and postnatal development; physically disabling conditions; management and educational procedures.


EPsy 5626. Seminar: Developmental Disabilities and Instructional Management. (3 cr; QP – 5616, 5622; SP – 5612, 5622) Data-based strategies for school and nonschool instruction of learners with developmental disabilities including assessment, design, implementation, and evaluation of curriculum and instruction: curriculum content, concept and task analysis, classroom arrangements, manipulation of instructional cues, corrections, and consequences.

EPsy 5635. Education of Students With Physical and Health Disabilities. (3 cr; QP – 5601 or #; SP – 5601 or #; A-F only) Introduction to students with physical and health disabilities and their characteristics; the educational implications of physical disabilities; assessment procedures and appropriate educational interventions for learners with physical and health disabilities.

EPsy 5636. Education of Multihandicapped Learners With Sensory Impairments. (3 cr; QP – 5613; 5614) Characteristics of learners with visual and auditory impairments; design of instructional programs to remediate or circumvent disabilities, including use of prosthetic devices; related areas of performance affected by sensory impairments.

EPsy 5641. Foundations of Education for Individuals Who Are Deaf/Hard of Hearing. (3 cr) Historical and current issues related to education of individuals who are deaf or hard of hearing. Implications of causes of hearing loss, social and cultural relationships, philosophies of education, characteristics and legislative guidelines and their applicability to education of individuals who are deaf or hard of hearing.


EPsy 5646. Reading and Writing Practices With Deaf/Hard of Hearing Children. (3 cr; QP – 5643; 5644 or #; SP – 5644 or general ed methods in tchg reading and writing skills or #) Gain knowledge and skills to assess, plan, and implement instruction for children and youth with hearing loss. Emphasis is placed on research, theoretical, and programmatic issues in developing reading and writing skills, curricular adaptations, and effective instructional approaches.

EPsy 5647. Aural and Speech Programming for Persons Who Are Deaf/Hard of Hearing. (3 cr) 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/Hard of Hearing Students. (3 cr; QP – 5644 or #; SP – 5640, 5644 or #) Design and development of portfolios for various models of educational service delivery systems for individuals with hearing loss, emphasizing consultation skills, curriculum management and modifications, material and technology applications, and support service adaptations.

EPsy 5656. Social and Interpersonal Characteristics of Students With Disabilities. (3 cr; A-F only) Emphasis on children and youth of school age and on the ways in which their emotional, social, and behavioral disorders affect their functioning in school and on ways in which their behaviors disturb others.

EPsy 5657. Interventions for Social and Emotional Disabilities. (3 cr; QP – 5611; 5656; SP – 5616, 5656; A-F only) Developing comprehensive behavioral programs for students with social and emotional disabilities. Instructing students with social and emotional disabilities.

EPsy 5671. Literary Braille. (3 cr; A-F only) Mastery of literary braille code including all contractions and short-form words used in Grade 2 English Braille: American Usage. Use of specialized braille writing equipment, including braille writer, slate and stylus, and computer programs with six-key input.

EPsy 5672. Advanced Braille Codes. (2 cr; QP – 5671 or #; SP – 5671 or #; A-F only) Mastery of the Nemeth code for braille mathematics transcription including elementary math computation, algebra, geometry, trigonometry, and symbolic logic notation. Introduction to foreign languages, computer notation, music, and raised line drawing techniques.

EPsy 5673. Reading and Writing for Children With Visual Disabilities. (2 cr; QP – 5671; CI 5414 or equiv, or #; SP – 5671, CI 5414 or equiv, or #; A-F only) Principles of preparation, selection, and use of instructional materials and adaptive technology for children with visual disabilities, including use of braille, large print, auditory tapes, and computer files to access and electronically convert information between these different media.

EPsy 5674. Techniques of Orientation, Mobility, and Independence for Students With Visual Disabilities. (3 cr; QP – 5673, 5675 or #; SP – 5675 or #; A-F only) Introduction to basic techniques to gain skills in pre-cane techniques, orientation to learning environments, and adaptations for activities of daily living and independence. Introduction to mobility maps, consideration of cane, guide dog, and telescopic aids to mobility.


EPsy 5676. Case Management for Children With Visual Disabilities. (3 cr; QP – 5671, 5673, 5675; SP – 5671, 5673, 5675; A-F only) Advanced course evaluating and managing cognitive, psychosocial, physical, and academic needs of students. Consideration of parent, teacher, and student in counseling and educational program management.

EPsy 5681. Education of Infants, Toddlers, and Preschool Children With Disabilities: Methods and Materials. (3 cr; QP – 5625; SP – 5625; A-F only) Overview of the methods and materials available to maximize the developmental and educational outcomes for young children, birth to age 5, with disabilities and their families in home, community, and school-based settings.

EPsy 5720. Special Topics: Special Education. (1-4 cr [max 12 cr]; SP – #) Lab and fieldwork approach, often assuming a product orientation, e.g., generation of action plan, creating set of observation field/not field data in some form. Provides opportunities for educational personnel to study specific problems and possibilities related to special education.

EPsy 5740. Special Topics: Interventions and Practices in Educational and Human Service Programs. (1-4 cr [max 8 cr]; SP – #) Concepts, issues, and practices related to the community inclusion of children, youth, and adults with developmental disabilities through weekly seminar and extensive supervised experience working with individuals within the community.
Courses

EPsy 5751. Student Teaching: Deaf/Hard of Hearing. (1-6 cr; max 10 cr) QP.—# SP.—S-N only. Supervised learning experiences for students with severe/profound hearing impairments in educational settings, including preparation for initial school personnel role. Classroom teaching and supervision roles under the direction of clinical or general teaching personnel.

EPsy 5572. Student Teaching: Learning Disabilities. (1-6 cr [max 10 cr]; QP.—# SP.—S-N only) Supervised experience in teaching or related work in schools or other agencies serving children and adolescents with learning disabilities.

EPsy 5573. Student Teaching: Early Childhood Special Education. (1-6 cr [max 8 cr]; QP.—# SP.—A-F only) Supervised experience in teaching or other work in schools, agencies, or home settings with infants, toddlers, and preschoolers with disabilities and their families.

EPsy 5574. Student Teaching: Social and Emotional Disabilities. (1-6 cr [max 8 cr]; QP.—Completion of lic courses for social and emotional disorders; # SP.—Completion of lic courses for social and emotional disorders; # A-F only) Teach students with social and emotional disorders at public schools and other appropriate sites. Attend a weekly seminar on student teaching competencies.

EPsy 5575. Student Teaching: Developmental Disabilities—Secondary. (1-6 cr [max 6 cr]; QP.—Completion of all lic coursework; # SP.—Completion of all lic coursework; # A-F only) Supervised student teaching, or special practicum project, in schools, or other agencies serving individuals at the secondary level who have mild to moderate as well as moderate to severe disabilities.

EPsy 5576. Student Teaching: Developmental Disabilities—Elementary. (1-6 cr [max 6 cr]; QP.—Completion of all lic coursework; # SP.—Completion of all lic coursework; # S-N only) Supervised student teaching, or special practicum project, in schools or other agencies serving children at the elementary level who have mild to moderate as well as moderate to severe disabilities.

EPsy 5577. Student Teaching: Physical and Health Related Disabilities. (1-6 cr [max 8 cr]; QP.—# SP.—# A-F only) Supervised teaching and related work (direct instruction and consultation) in schools or other agencies serving children and adolescents who have physical disabilities.

EPsy 5578. Student Teaching: Visual Impairments. (1-6 cr [max 8 cr]; QP.—# SP.—# A-F only) Supervised student teaching or special practicum project, in schools or other agencies serving children and adolescents who have visual impairments.

EPsy 5801. Assessment and Decision Making in School and Community Settings. (3 cr; A-F only) Introduction to psychological and educational assessment for individuals who work with children, especially those experiencing academic and behavior problems. Study of standardized group and individual tests of intelligence, achievement, socio-emotional functioning, perception, reading, mathematics, adaptive behavior, and language.

EPsy 5849. Observation and Assessment of the Preschool Child. (4 cr) 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. Collaborative Family-School Relationships. (2-3 cr; QP—Honors senior class or grad student; SP—Honors senior class or grad student) Theoretical and empirical bases for creating collaborative family-school relationships for students’ development and educational success in school.

Emphasis on model programs for K-12 and practical strategies for school personnel to address National Educational Goal 8.

EPsy 5852. Early Intervention and Prevention. (3 cr) Theory and research base for school-based primary and secondary prevention programs to promote academic and social competence of children and youth. Emphasis on program designs and approaches promoting healthy development of children (birth to 5) for increased school success.

EPsy 5871. Interdisciplinary Practice and Interagency Coordination in Education and Human Services. (3 cr) Principles and procedures of interdisciplinary practice and interagency coordination. Examine the relative strengths of interdisciplinary approaches, develop skills for collaborating with others, and examine different approaches to interagency coordination.

EPsy 5991. Independent Study in Educational Psychology. (1-3 cr [max 20 cr]; QP.—# SP.—# A-F only) Self-directed study in areas not covered by regular courses. Specific program of study is jointly determined by student and advising faculty member.

EPsy 6111. Seminar: Knowledge and Skill. (3 cr; SP—Learning and research; A-F only) Analysis of expertise in human problem solving; representation of knowledge and skill; issues in human and artificial intelligence; semantic memory; processes of acquisition. Research in cognitive science useful for educational practice and design of educational environments.


EPsy 6115. Psychology of Instruction and Technology. (3 cr) Seminar including, but not limited to, learning and instructional theories, advanced and emerging technologies, and measurement and evaluation.

EPsy 8131. Development of Moro-Political Judgment. (3 cr; A-F only) Current research topics in socio-political moral judgment and moral development.

EPsy 8132. Personality Development and Socialization. (3 cr; SP—Personality or child psychology course) Major research and theoretical work. Developmental and educational influences on personality.

EPsy 8221. Psychological Scaling. (3 cr; SP—PSY 5221 or equiv; PSY 8262 or equiv) Elementary and advanced topics in unidimensional and multi-dimensional scaling; measurement theory and statistics, rating scales and other category scaling methods, magnitude estimation, paired comparisons, multi-attribute scaling, and multidimensional scaling.

EPsy 8222. Advanced Measurement: Theory and Application. (3 cr; SP—PSY 5221 or equiv; PSY 8262 or equiv) Educational and psychological measurement, their applications, and their interrelationships: classical reliability and validity theory, item response theory, generalizability theory, differential item functioning, matrix sampling, and test equating.

EPsy 8261. Statistical Methods I: Probability and Inference. (3 cr; QP—PSY 5260 or equiv; PSY 5261 or equiv) Inferential methods commonly used in social and behavioral sciences. Probability, hypothesis testing and estimation for means and variances of normal populations, one-way analysis of variance, and contingency table analysis.

EPsy 8262. Statistical Methods II: Regression and the General Linear Model. (3 cr; QP—PSY 8260, 8261 or equiv; PSY—PSY 8261 or equiv) Higher order analysis of variance designs, including those with repeated measures, simple and multiple regression methods, and non-parametric procedures.

EPsy 8263. Design and Analysis of Experiments. (3 cr; QP—PSY 8260, 8261, 8262 or equiv; SP—PSY 8261, 8262 or equiv) Advanced treatment of various experimental designs, including completely randomized factorial, randomized block, hierarchical, repeated measures, and Latin square designs. Major computer packages used for data analyses. Univariate and multivariate approaches to these designs.

EPsy 8264. Advanced Multiple Regression Analysis. (3 cr; QP—PSY 8260, 8262, regression and ANOVA course, familiarity with a statistical analysis package; PSY—PSY 8261, 8262, regression and ANOVA course; familiarity with a statistical analysis package) General linear model used as a context for regression. Matrix algebra, multiple regression, path analysis, polynomial regression, standardized regression, stepwise solutions, analysis of variance, weighted least squares, and logistic regression.

EPsy 8265. Factor Analysis. (3 cr; QP—PSY 8262, familiarity with a statistical analysis package; PSY—PSY 8262, familiarity with a statistical analysis package) Factor analytic techniques and applications. Component, common factor, and image analysis; general discussion of factor extraction. Estimating number of dimensions, rotation, and factor score estimation.

EPsy 8266. Statistical Analysis Using Structural Equation Methods. (3 cr; QP—PSY 8263 or 8264; PSY—PSY 8263 or 8264) Quantitative techniques using manifest and latent variable approaches for analysis of educational and social science data. Introduction to structural equation modeling approaches to multiple regression, factor analysis, and path modeling. Developing, estimating, and interpreting structural equation models.

EPsy 8281. Advanced Statistical Computing and Data Analysis. (3 cr; QP—PSY 5260 or equiv, PSY 5261 or 5262 or equiv; SP—PSY 5261 or equiv, PSY 5281 or equiv) Cross-disciplinary course. Students learn to use SAS statistical package to perform data management, data analysis, and report writing.

EPsy 8290. Special Topics: Seminar in Psychological Foundations. (1-6 cr [max 15 cr]; SP.—#) Students formulate research designs. Learning and cognition, social psychology, measurement, and statistics.

EPsy 8295. Problems: Evaluation. (1-6 cr [max 6 cr]; QP—PSY 5240 or EDPS 5285; SP—PSY 5243 or EDPS 5501; SP) Individually directed study of an issue in the theory or practice of program evaluation.

EPsy 8296. Internship: Evaluation. (1-9 cr [max 9 cr]; QP—PSY 5240 or EDPS 5285, SP—PSY 5243 or EDPS 5501; SP#) Hands-on experience in conducting a program evaluation in a real-world setting under supervision of an evaluation professional.

EPsy 8333. FTE: Master’s. (1 cr; SP—Master’s student, adviser and DGS consent)

EPsy 8402. Individual Counseling: Theory and Applications. (3 cr; SP—Grad ed psy major with CSPP subprog or # A-F only) Traditional and contemporary theories of counseling and psychotherapy. Applications to various settings and populations.

EPsy 8403. Social/Cultural Contexts: Counseling and Skills. (3 cr; SP—Grad ed psy major with CSPP subprog or # A-F only) Broad personal dimensions of race, ethnicity, gender, class, beliefs, disability, age, sexual orientation, and geographic origin. Societal and personal biases and stereotypes; multicultural concepts and culturally appropriate counseling procedures.

EPsy 8404. Group Counseling: Theory, Applications, and Skills. (3 cr; SP—Ed psy MA or PhD student with CSPP subprog or # A-F only) Theories, research, and procedures of group counseling and of groups such as psychoeducational groups. Applications to various settings and...
Courses

populations. Ethical issues in group work. Practice of group skills, including group participation and observation.

Epsy 8411. Advanced Counseling Research. (4 cr; SP-
Ed psy PhD student with CSPP subprog or #; A-F only) Focus on critically reviewing counseling research, qualitatively and quantitatively integrating research, and designing valid research.

Epsy 8412. Seminar: Advanced Counseling Theory and Ethics. (4 cr; SP-Ed psy PhD student with CSPP subprog or #; A-F only)

Comparative analysis of theoretical models and methods used in contemporary counseling and psychotherapy; ethical standards and models of ethical decision making for professional roles.

Epsy 8413. Personality Assessment of Adolescents and Adults. (3 cr; SP-Grad ed psy major or #; A-F only) Students develop or increase expertise in psychological assessment of adolescents and adults through assessment interviews, MMPI-2, MMPI-A, DSM4, and integration of this content in written assessment reports.

Epsy 8431. Master's Research Seminar: CSPP. (4 cr; QP-Grad ed psy major or #; SP-
S-N only)

Survey of research methods, data-based decision making, and research design skills, and research simulation.

Epsy 8435. Integrative Seminar: School Counseling. (3-6 cr [max 6 cr]; SP-Grad ed Psy PhD student with CSPP subprog or #)

Theories, review of relevant research, demonstration, and in-class practice of supervision skills.

Epsy 8501. Counseling Pre-Practicum. (2 cr; QP- CSPP or genetic counseling grad student; SP- CSPP or genetic counseling grad student; A-F only)

Overview of basic helping skills through demonstration and in-class practice of individual helping skills.

Epsy 8502. Field Placement in Counseling and Student Personnel Psychology. (2 cr; QP-8501; SP-8501 or #; S-N only)

Students participate under supervision in practitioner activities within a counseling work environment.

Epsy 8503. Counseling Practicum I. (1-4 cr; SP-8502 or #; A-F only)

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. (1-4 cr; SP-8503 or #; A-F only)

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. (1-2 cr [max 2 cr]; SP-Ed psy PhD student with CSPP subprog or #; A-F only) Students involved in counseling supervision of beginning courses.

Epsy 8512. Internship: CSPP. (1-6 cr [max 12 cr]; SP-Ed psy MA or PhD student with CSPP subprog; A-F only)

Supervised internship in counseling, counseling psychology, or student personnel psychology at sites approved by CSPP program.

Epsy 8513. University Counseling Practicum I. (4 cr; SP-Ed psy MA or PhD student with CSPP subprog or #; S-N only)

Integrates science of counseling psychology with supervised practice in University Counseling and Consulting Services with career, academic, and personal clients.

Epsy 8514. University Counseling Practicum II. (4 cr; QP-8513, #; SP-8513, S-N only)

Integrates science of counseling psychology with supervised practice in University Counseling and Consulting Services with career, academic, and personal clients.

Epsy 8521. Practicum in Student Affairs and Student Development. (1-4 cr [max 8 cr]; SP-Ed psy MA or PhD student with CSPP subprog or #; A-F only)

Supervised practice in university and college student development offices.

Epsy 8522. Counseling Practicum: Advanced. (1-2 cr [max 6 cr]; SP-Grad ed psy major with CSPP subprog or #)

Advanced skills practicum in counseling, counseling psychology, or student development.

Epsy 8600. Special Topics: Special Education Issues. (1-3 cr; SP #; A-F only)

Current trends (e.g., schoolwide discipline, models of collaboration, and diversity) investigated by formulating research projects. Students write a media piece development an issue and its impact on the community.

Epsy 8612. Seminar: Students with Academic Difficulties. (3 cr; A-F only)

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 8621. Seminar on Intellectual Impairments. (3 cr; SP-Grad students interested in mental retardation and related intellectual impairments)

Review of research and theories in context of relevant developmental theories; important contributions in primary sources concerning principles of cognition and behavior and applied problems. Procedures for deriving appropriate field applications; generalizing and implementing researchable questions.

Epsy 8651. Seminar on Social and Emotional Disabilities. (3 cr; A-F only)

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. (1-18 cr; SP-MA or PhD student who has not passed prelim oral)

Epsy 8677. Seminar: Information Acquisition for Persons With Disabilities. (3 cr [max 6 cr]; A-F only)

Research findings from diverse disciplines on impact of hearing and visual disabilities on ability to acquire and/or access information.

Epsy 8694. Research in Special Education. (3 cr)

Design and implementation of research related to the unique developmental characteristics of exceptional learners.

Epsy 8701. Doctoral Core Seminar: Special Education. (1-5 cr [max 6 cr]; SP-Ed psy PhD student with spec ed subprog or #; A-F only)

Required for students with a family/life span focus on social development, behavioral interaction, and cultural interactions.

Epsy 8702. Doctoral Core Seminar: Special Education. (1-5 cr [max 6 cr]; SP-8701 or #; A-F only)

Required for students focusing on communication/language/academics.

Epsy 8706. Single Case Designs in Intervention Research. (3 cr)

Design and analysis of single-case experiments to examine effects of interventions on individual behavior in school, home, and community.

Epsy 8772. Seminar in Early Intervention. (2 cr)

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: Masters. (1-18 cr; SP- Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Epsy 8811. Assessment in School Psychology I: Foundations of Academic Assessment. (3 cr; Grad psy ed major with school psy subprog or #; A-F only)

Theories and models of psychodiagnostic assessment and test scores with children with disabilities. 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 cr; SP-Grad psy ed major with school psy subprog or #; A-F only)

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 cr [max 4 cr]; QP-8811 or #; SP-8821, grad ed psy major with school psy subprog or #; SP-8811 or #8812; A-F only)

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. Program Development and Social-Emotional Consultation. (3 cr; A-F only)

In-depth study and analysis of instructional interventions and procedures necessary to work with school personnel in developing school wide, classroom, and individual instructional interventions. Practice in developing and applying interventions with individual students.

Epsy 8818. Intervention Practicum in School Psychology. (1 cr [max 2 cr]; QP-8815 or #; SP-Grad ed psy major with school psy subprog, #8815 or #8816; A-F only)

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. Seminar: School Psychology. (2 cr [max 4 cr]; SP-Grad ed psy major with school psy subprog; A-F only)

Introduction to school psychology as a professional field of specialization. Students learn about how school systems work and common roles and functions of school psychologists. Ethical and professional standards and future employment options.

Epsy 8822. Seminar on Research in School Psychology. (1 cr [max 2 cr]; SP-Grad ed psy major with school psy subprog or #; S-N only)

Integrative, developmental series of discussions and activities related to research in school psychology and related disciplines; assists students preparing written research and scholarly works. Students from other programs are welcome.
EEPSY 8831. Practicum: School Psychological Services. (1-3 cr; max 6 cr; SP–Grad ed psy major with school psy subprog)
Field placements in schools. Experiences may include consultation, assessment, direct service to individuals or groups, supervision, and site supervision. Supervised off-site as well as by University through required participation in seminar.

EEPSY 8832. Clinical/Community Practice in School Psychology. (1-3 cr [max 6 cr]; SP–Grad ed psy major with school psy subprog)
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.

EEPSY 8841. Practicum: Instruction and Supervision in School Psychology. (2 cr [max 4 cr]; SP–Grad ed psy major with school psy subprog or #A-F only)
Review of best practice literature and strategies for evaluating supervision skills. Students give lectures to and supervise school psychology students in order to learn firsthand the issues related to providing supervision and to understand responsibilities related to academic careers.

EEPSY 8842. Internship: School Psychological Services. (1-5 cr [max 10 cr]; SP–Grad ed psy major with school psy subprog, #S-N only)
Advanced field placement. Full-time supervised experience for one year or part-time for no more than two years.

EPSY 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

EPSY 8905. History and Systems of Psychology: Landmark Issues in Educational Psychology. (3 cr; SP–Ed psy PhD student)
Critical issues in learning and cognition, statistics and measurement, counseling, school psychology, social psychology of education, and special education.

EPSY 8993. Directed Study: Educational Psychology. (1-10 cr [max 20 cr]; SP–A-F only)

EPSY 8994. Research Problems: Educational Psychology. (1-6 cr [max 18 cr]; SP–A-F only)
Research methodology and techniques; examination of literature; participation in formulating and executing research proposal.

Electrical Engineering (EE)

Department of Electrical and Computer Engineering

Institute of Technology

EE 5114. Integrated Sensors and Transducers. (4 cr; QP–3063, 3111; SP–3161, 3601)
Microelectromechanical systems composed of microsensors, microactuators, and electronics integrated onto common substrate. Design, fabrication, and operation of sensors, instruments, and integrated systems for controlling, analyzing, and actuating processes.

EE 5163. Semiconductor Properties and Devices I. (3 cr; QP–3063, 3111 or #SP–3161, 3601 or #)
Principles and properties of semiconductor devices. Selected topics in semiconductor materials, devices, and technology. Aspects of transport in p-n junctions, heterojunctions.

EE 5164. Semiconductor Properties and Devices II. (3 cr; QP–3661 or #SP–5163 or #)
Principles and 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 cr; QP–IT or cr or grad student)
Fabrication of microelectronic devices; silicon integrated circuits, GaAs devices; lithography, oxidation, diffusion; process integration of various technologies, including CMOS, double poly bipolar, and GaAs MBE.

EE 5173. Basic Microelectronics Laboratory. (1 cr; QP–55670; SP–5171 or #5171)
Students fabricate a polysilicon gate, single-layer metal, NMOS chip, performing 80 percent of processing, including photolithography, diffusion, oxidation, and etching. Photolithography and etching processes are compared with final electrical test results. Simple circuits are used to estimate technology performance.

EE 5231. Linear Systems and Optimal Control. (3 cr; QP–IT grad student, Math 5242, Math 5243 or #SP–IT grad student, 3015 or #)
Properties and modeling of linear systems; linear quadratic and linear-quadratic-Gaussian regulators; maximum principle.

EE 5235. Robust Control System Design. (3 cr; QP–IT grad student, Math 5243 or #SP–5161 or SP–IT grad student, 3015, 5231 or #)
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 5301. Logic Level CAD. (3 cr; QP–5358B; SP–4301)
Theory and practice of synthesis, simulation, and test generation algorithms in digital design.

EE 5323. VLSI Design I. (3 cr; QP–3351, 3062 or #; SP–2301, 3115 or #)
Combination and sequential static CMOS circuits; transmission gate networks; clocking strategies and sequential circuits; CMOS process flows, design rules, structured layout techniques; dynamic CMOS, domino, DCVS, CMOS arithmetic logic units, high-speed carry chains, fast CMOS multipliers.

EE 5324. VLSI Design II. (3 cr; QP–5571 or #5232 or #; SP–4321 or #)
Performance analysis and design optimization, including parasitic effects and device sizing techniques; low-power high-performance circuits; CMOS memory cells, array structures and read/write circuits; self-timed circuit design; design for testability, including scan design and built-in self test; VLSI case studies.

EE 5327. VLSI Design Laboratory. (3 cr; QP–5358, 5572 or #SP–4301, 5322 or #)
Lab to accompany 5323. Complete design of integrated circuits. Designs evaluated by computer simulation. Selected designs fabricated and tested in succeeding semester.

EE 5329. VLSI Digital Signal Processing Systems. (3 cr; QP–5572 or #SP–5323 or #5322 or #)
Programmable architectures for signal and media processing; data-flow representation; transformations architecture; low-power design; architectures for two’s complement and redundant representation, carry-save, and canonical signed digit; scheduling and allocation for high-level synthesis.

EE 5333. Analog Integrated Circuit Design. (3 cr; QP–3062, grad student or #SP–3115, grad student or #, Analog integrated circuit design; fundamental circuits for analog signal processing; design issues associated MOS and BJT devices; design and testing of circuits; selected topics (e.g., modeling of basic IC components, design of operational amplifier, comparator, analog sampled-data circuit filter).

EE 5361. Computer Architecture and Machine Organization. (3 cr; QP–3351, 3352; SP–2301, 2361; §CSci 5201)
Introduction to computer architecture. Aspects of computer systems, such as pipelining, memory hierarchy, and input/output systems. Performance metrics. Examination of each component of a complicated computer system.

EE 5334. Computer Systems Performance Measurement and Evaluation. (3 cr; QP–5582 or #, SP–5563 or #)
Tools and techniques for analyzing computer hardware, software, and system performance. Benchmark programs, microcomputer and computer systems, performance metrics. Deterministic and probabilistic simulation techniques, random number generation and testing. Bottleneck analysis.

EE 5381. Advanced Computer Networks. (3 cr; QP–3301, 5838, CSci 5211 or #SP–3025, 4361 or #)

EE 5391. Computing with Neural Networks. (3 cr; QP–3021 or Stat 3091 or #SP–3025 or Stat 3091 or #)
Neural networks as a computational model; connections to AI, statistics and model-based computation; associative memory and matrix computation; Hopfield networks; supervised networks for classification and pattern recognition; unsupervised learning; networks for data reduction; associative recognition and retrieval, optimization, time series prediction and knowledge extraction.

EE 5501. Digital Communication. (3 cr; QP–5203, 3021, sr or grad student in IT major or #SP–4301, 3025, sr or grad student in IT major or #)
Theory and techniques of modern digital communications. Communication limits; modulation and detection; data transmission over channels with intersymbol interference; optimal and suboptimal sequence detection; equalization. Error correction coding; trellis-coded modulation; multiple access.

EE 5531. Probability and Stochastic Processes. (3 cr; QP–3021, grad student in IT major or #SP–3025; grad student in IT major or #)

EE 5542. Adaptive Digital Signal Processing. (3 cr; QP–5511, 5702 or #SP–4541, 5531 or #)
Design, application, and implementation of adaptive and suboptimal algorithms; FIR and IIR filters; Wiener, Kalman and Least-Squares; linear prediction and lattice structure; LMS, RLS and Levinson-Durbin algorithms; channel equalization, system identification, biomedical, sensor array processing, spectrum estimation, noise cancellation.

EE 5545. Real-Time Digital Signal Processing Laboratory. (2 cr; QP–3352, 5511, EE sr or grad student in IT major or #SP–4541)
Real-time computation of digital signal processing (DSP) functions, including filtering, sample-rate change, and differential pulse code modulation; implementation on a current DSP chip. DSP chip architecture, assembly language, arithmetic; real-time processing issues; processor limitations; O/R handling.

EE 5549. Digital Signal Processing Structures for VLSI. (3 cr; QP–5511, 5541)
Pipe-lining; parallel processing; fast convolution; FIR, rank-order, IIR, lattice, adaptive digital filters; scaling and roundoff noise; DCT, Viterbi coders, lossless coders, video compression.

EE 5551. Multiscale and Multirate Signal Processing. (3 cr; QP–5511, 5570, grad student in IT major or #SP–4541)
Multirate discrete-time systems. Bases, frames; continuous wavelet transform; scaling equations; discrete wavelet transform; applications in signal and image processing.
Courses

EE 5581. Information Theory and Coding. (3 cr; QP—5702 or SP—5950). Source and channel models, codes for sources and channels. Entropy, mutual information, capacity, rate-distortion functions. Coding theorems.

EE 5585. Data Compression. (3 cr; QP—IT 5r or grad student or IT 3111 or SP—IT 5r or grad student or SP). Source coding in digital communications and recording; codes for lossless compression; universal lossless codes; lossless image compression; scalar and vector quantizer design; loss source coding theory; differential coding; trellis codes; transform and subband coding; analysis/synthesis schemes.

EE 5601. Introduction to RF and Microwave Engineering. (3 cr; QP—Sr or grad student in IT major, 3111; SP—IT 5r or grad student, 3601) Fundamentals of RF Microwave engineering, including circuits and antennas. Introduction to RF Microwave waveguides, including planar guides, microwave circuit analysis, and synthesis using passive elements; fundamentals of antennas, dipole antennas, arrays, wire and aperture antennas.

EE 5602. RF and Microwave Analog Circuit Chip Design. (3 cr; IT 3111, 3604; SP—5601, 5601) Fundamentals of RF/Microwave circuit design; chip design methodology, including topology, analysis, layout, and testing.

EE 5611. Plasma-Aided Manufacturing. (4 cr; QP—Upper div IT or grad student, ME 3301, ME 3303; SP—Upper div IT or grad student, ME 3321, ME 3322 or equiv; JME 5361) Manufacturing using plasma processes; plasma properties as a processing medium; plasma spraying, welding and microelectronics processing; process control and system design; industrial speakers; a cross-disciplinary experience between heat transfer design issues and manufacturing technology.

EE 5621. Physical Optics. (3 cr; QP—3011 or SP—3015 or #) Physical optics principles, including Fourier analysis of optical systems and images, scalar diffraction theory, interferometry, and coherence theory. Applications discussed include diffractive optical elements, holography, astronomical imaging, optical information processing, and micronotics.


EE 5624. Optical Electronics. (4 cr; QP—3111; SP—3601 or Phys 3002 or #) Fundamentals of lasers, including propagation of Gaussian beams, optical resonators, and theory of laser oscillation. Polarization optics, electro-optic, acousto-optic modulation, nonlinear optics, and phase conjugation.


EE 5629. Optical System Design. (2 cr; QP—IT 5r or grad student; SP—IT 5r or grad student) Elementary or paraxial optics. Non-paraxial, exact ray tracing. Energy considerations in instrument design. Fourier optics and image quality. Design examples: telescopes, microscopes, diffraction-limited lenses, projectors, and scientific instruments.

EE 5653. Physical Principles of Magnetic Materials. (3 cr; QP—IT grad student or SP—IT grad student or #) Physics of diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, ferrimagnetism; ferromagnetic phenomena; static and dynamic theory of micromagnetics; magnetic recording and magnetization dynamics; magnetic material applications.

EE 5655. Physical Principles of Magnetic Recording. (4 cr; QP—IT grad student or SP—IT grad student or #) Review of magnetics; analytical models magnetic head; models of longitudinal and perpendicular magnetic magnetic recording and reproduction; magnetic head, noise properties recording performance, high-speed switching and high frequency impedance; digital recording systems. Lab and demonstration experiments.

EE 5657. Physical Principles of Thin Film Technology. (4 cr; QP—IT grad student or SP—IT grad student or #) Physical principles of deposition, characterization, and processing of thin film materials; materials science, vacuum science, and technology; physical vapor deposition techniques; properties of thin films and metallurgical/protective coatings; modification of surfaces films; emerging thin film materials and applications. Lab and demonstration experiments.

EE 5705. Advanced Electric Drives. (3 cr; QP—5300, 5322 or SP—4701) D-q axis analysis of salient-pole synchronous motor drives; vector-controlled induction motor drives, sensor-less drives, voltage space-vector modulation techniques, current-source inverter drives, reluctance drives, power quality issues. Integrated software lab.

EE 5721. Power Generation Operation and Control. (3 cr; QP—5800 or SP—4721) Engineering aspects of power system operation; economic analysis of generation plants and scheduling to minimize total cost of operation; scheduling of hydro resources and thermal plants with limited fuel supplies; loss analysis and secure operation; state estimation and optimal power flow; power system organizations.

EE 5725. Power Systems Engineering. (3 cr; QP—3010, 5300, 5310 or SP—4721) Reliability analysis of large power generation and transmission systems; writing programs for state-by-state analysis and Monte Carlo analysis; power system protection systems, circuit current calculations, short circuit detection, isolating failed components; characteristics of protection components.

EE 5741. Advanced Power Electronics. (4 cr; QP—5814 or SP—4741) Physics of solid-state power devices, passive components, magnetic components, advanced topologies; unity power factor correction circuits, EMI issues, snubbers, soft switching in dc and ac converters; practical considerations; very low voltage output converters. Integrated hardware laboratory and computer simulations.

EE 5811. Biomedical Instrumentation. (3 cr; QP—IT 5r or life science sr or grad student; SP—IT 5r or life science sr or grad student) Biophysical signal sources. Electromagnets, microelectrodes, other transducers. Characteristics of amplifiers. Noise in biological signals. Filtering, recording, display, Protection of patients from electrical hazards. Experiments in neural and muscle stimulation, EKG and EMG recording, neuron simulation, filtering, and low-noise amplifiers.

EE 5821. Biological System Modeling and Analysis. (3 cr; QP—IT 5r or IT life science sr or grad student; SP—IT 5r or life science sr or grad student) Purpose of biological system modeling; advantages, limitations, special problems. Models of nerve excitation and propagation. Biological control systems; respiratory and cardiovascular systems. Sensory organs and theories of perception. Limbs and locomotion.

EE 5940. Special Topics in Electrical Engineering I. (1-4 cr; QP—2 or SP—#) Special topics in electrical and computer engineering. Topics vary.

EE 5950. Special Topics in Electrical Engineering II. (1-4 cr; QP—2 or SP—#) Special topics in electrical and computer engineering. Topics vary.

EE 8141. Advanced Heterojunction Transistors. (3 cr; QP—5600 or 5661; SP—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. Properties of Semiconductors I. (3 cr; SP—#) Modern solid-state theory applied to specific semiconductor materials; influence of band structure and scattering mechanisms upon semiconductor properties; plasma effects in semiconductors; mathematical treatments of generation-recombination kinetics, carrier injection, drift, and diffusion; use of semiconductor properties in devices of current importance.

EE 8162. Properties of Semiconductors II. (3 cr; SP—8161 or #) Modern solid-state theory applied to specific semiconductor materials; influence of band structure and scattering mechanisms upon semiconductor properties; plasma effects in semiconductors; mathematical treatments of generation-recombination kinetics, carrier injection, drift and diffusion; use of semiconductor properties in devices of current importance.

EE 8190. Electronics Seminar. (1-3 cr; SP—#) Current literature; individual assignments.

EE 8210. System Theory Seminar. (1-3 cr; max 9 cr; SP—#) Current literature; individual assignments.

EE 8213. Advanced System Theory. (3 cr; SP—IT grad student) Generalized linear systems; applications, structural properties, computational approaches, classification, functional behavior, and synthesis.

EE 8215. Nonlinear Systems. (3 cr; SP—#) 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. (3 cr; max 9 cr; SP—#) Current literature; individual assignments.

EE 8231. Optimization Theory. (3 cr; SP—#) Introduction to optimization engineering; approximation theory. Least squares estimation, optimal control theory, and computational approaches.

EE 8235. Advanced Control Topics. (3 cr; SP—#) Adaptive and learning systems, optimal and robust control and stabilization, and stability of dynamic systems.

EE 8331. Advanced Analog Integrated Circuit Design. (3 cr; QP—5506; SP—5333 or #) Data converters and low power low voltage analog circuits; basic background in design of CMOS analog-to-digital and digital-to-analog converters and special circuit design techniques needed for low power design; students design and test several design problems.

EE 8333. FTE: Master's. (1 cr; SP—Master's student, adviser and DGS consent).

EE 8360. Computer Systems Seminar. (1-3 cr; SP—#) Current literature; individual assignments.

EE 8365. Advanced Computer Architecture. (3 cr; QP—5833 or CSci 5201; SP—5KSCi 6203, 5361 or CSci 5201 or #) Instruction set architecture, processor microarchitecture, and memory and I/O systems. Interactions between computer software and hardware; methodologies of computer design.
EE 8367. Parallel Machine Organization. (3 cr; QP-EE 8062 orSCI 8002) Design and implementation of multiprocessor systems. Issues of compiler and system software related to multiprocessor systems.

EE 8444. FTE: Doctoral. (1 cr; SP-Doctoral student, adviser and DGS consent)

EE 8500. Seminar: Communications. (1-3 cr; SP-# may be repeated for cr; Current literature; individual assignments.

EE 8541. Image Processing and Applications. (3 cr; SP-4541, 5581 or #) Two-dimensional digital filtering and transforms; application to image enhancement, restoration, compression, and segmentation.

EE 8581. Detection and Estimation Theory. (3 cr; SP-5702; SP-5533 or #) 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-sensor signal design and processing.

EE 8591. Predictive Learning from Data. (3 cr; SP-IT grad student or #) 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 8610. Seminar: Quantum Electronics. (1-3 cr; SP-#; may be repeated for cr) Current literature; individual assignments.

EE 8611. Plasma Physics. (3 cr; SP-#) Plasma theory and charged particle transport phenomena; collision processes, orbit theory, kinetic theory, Boltzmann transport equation, moment (continuity) equations, magnetohydrodynamics, transport properties. Applications of plasma theory to modeling of dc, rf, and microwave discharges.

EE 8660. Seminar: Magnetics. (1-3 cr; SP-#; may be repeated for cr) Current literature; individual assignments.

EE 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP-Max 18 cr per semester or summer; doctoral student who has not passed preliminary)

EE 8725. Advanced Power System Analysis and Economics. (3 cr; QP-5802; SP-4721; IT grad student or #) 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 8741. Power Electronics in Power Systems. (3 cr; QP-5814; SP-4741; IT grad student or #) Impact of power electronics loads on power quality. Passive and active filters. Active input current wave shaping, HVDC transmission. Static VAR control, energy storage systems. Interconnecting photovoltaic and wind generators. Static phase shifters and circuit breakers for flexible AC transmission (FACTS).

EE 8777. Thesis Credits: Masters. (1-18 cr; SP-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

EE 8888. Thesis Credits: Doctoral. (1-18 cr; SP-Max 18 cr per semester or summer; 24 cr required)

EE 8940. Special Investigations. (1-3 cr; SP-IT grad student or #; may be repeated for cr) Studies of approved theoretical or experimental topics.

EE 8950. Advanced Topics in Electrical and Computer Engineering. (1-3 cr; SP-#; may be repeated for cr) Topics vary according to needs and staff availability.

EE 8961. Plan B Project I. (3 cr; SP-Grad EE major; may be taken to satisfy requirement for Plan B master's degree, may appear on master's program but may not be applied toward minimum cr in major field; no cr toward PhD) Project topic(s) arranged between student and adviser. Written report(s).

EE 8963. Plan B Project II. (1 cr; SP-EE grad student; may be taken to satisfy requirement for Plan B master's degree, may appear on master's program but may not be applied toward minimum cr in major field; no cr toward PhD) Project topic(s) arranged between student and adviser. Written report(s).

EE 8970. Graduate Seminar I. (1 cr; SP-Grad student or #; may be repeated for cr) Recent developments in electrical engineering and related disciplines.

EE 8980. Graduate Seminar II. (1 cr; SP-Grad student or #; may be repeated for cr) Recent developments in electrical engineering and related disciplines.

EE 8990. MFA Creative Thesis. (4 cr [max 16 cr]; SP—English creative writing major grad student or #) Advanced workshop for students with experience in creative writing and an interest in writing for stage. Contact creative writing program for specific description.

EngW 5102. Advanced Fiction Writing. (4 cr [max 16 cr]; SP—English grad student, MFA creative writing student, Δ) Special topics in writing fiction, literary nonfiction and poetry. Topics specified in Class Schedule.

EngW 5130. Reading as Writers. (3 cr [max 12 cr]; SP—English creative writing major grad student or Δ) Special topics in reading fiction, literary nonfiction and poetry. Topics specified in Class Schedule.

EngW 5401. Introduction to Editing for Publication. (3 cr) Beginning editing, from the nature of the editor-writer relationship to manuscript reading, author querying, rewriting, and style. Some discussion of copy editing. Students develop editing skills by working on varied writing samples.

EngW 5402. Advanced Editing. (3 cr; SP—5401, #, Δ) For students with advanced editing competence to further advance their skills. Workshop/seminar; editing long text and fiction, children’s literature, translations and indexes.

EngW 5993. Directed Study in Writing. (1-3 cr; SP—, Δ) Projects in writing poetry, fiction, drama, and nonfiction, or study of ways to improve writing.

EngW 8101. Reading Across Genres. (4 cr; SP—Creative writing MFA student, Δ) Contemporary writing in fiction, poetry, and creative nonfiction. Primarily a reading course rather than a writing course.

EngW 8110. Seminar: Writing of Fiction. (4 cr [max 16 cr]; SP—Δ) Focuses on full-length book, e.g., a novel or short story collection. Assignments in common and individual project.

EngW 8120. Seminar: Writing of Poetry. (4 cr; SP—Δ) Focuses on exploration and practice of various styles. Assignments in common and individual project.


EngW 8140. Fiction: Manuscript Preparation. (4 cr [max 8 cr]; SP—110 creative writing MFA student, Δ) For students working on their creative project.

EngW 8150. Poetry: Manuscript Preparation. (4 cr [max 8 cr]; SP—120 creative writing MFA student, #) For students working on their creative project.

EngW 8160. Literary Nonfiction: Manuscript Preparation. (4 cr [max 8 cr]; SP—130, creative writing MFA student, #) For students working on their creative project.

EngW 8333. FTE: Masters. (1 cr; SP—Master's student, adviser and DGS consent)

EngW 8990. MFA Creative Thesis. (2 cr [max 48 cr]; QP-8140, 8150, 8160, #; SP—8140, 8150, 8160, creative writing MFA student, #) For students working on their creative project.
Courses

**English: Literature** *(EngL)*

**Department of English Language and Literature**

**College of Liberal Arts**

EngL 5001. Introduction to Methods in Literary Studies. *(3 cr)*
- Ends and methods of literary research, including professional literary criticism, analytical bibliography, and textual criticism.

EngL 5002. Introduction to Literary and Cultural Theory. *(3 cr)*
- Approaches to practical and theoretical problems of literary history and genre.

EngL 5120. Reading Course in American Literature. *(3 cr)*
- For graduate students who seek a general background or preparation for advanced study. Readings typically cover a wide historical range (e.g., the 19th century, a genre such as the novel, or a major literary movement such as Modernism).

EngL 5130. Readings in American Minority Literature. *(3 cr [max 9 cr]*)
- Contextual readings of 19th- and 20th-century American minority writers. Topics specified in Class Schedule.

EngL 5140. Post-Colonial Literatures. *(3 cr [max 9 cr]*)
- Selected readings in post-colonial literatures. Topics specified in Class Schedule.

EngL 5150. Readings in Criticism and Theory. *(3 cr [max 9 cr]*)
- Major works of classical criticism, the English critical tradition from the Renaissance to 1920. Leading theories of criticism from 1920 to the present. Theories of fiction; narratology; Feminist criticisms. Marxist criticisms. Psychoanalytic criticisms. Theories of postmodernism.

EngL 5210. Middle English Literature and Culture. *(3 cr [max 9 cr]*)
- Wide reading in the literature of the time period designed to prepare graduate students for work in other graduate courses or seminars. Attention to relevant scholarship or criticism. Topics specified in Class Schedule.

EngL 5230. Early Modern Literature and Culture. *(3 cr [max 9 cr]*)
- Topical readings in early modern poetry, prose, fiction, and drama designed to prepare graduate students for work in other courses or seminars. Attention to relevant scholarship or criticism.

EngL 5250. 19th-Century Literature and Culture. *(3 cr [max 9 cr]*)
- Readings cover topics in 19th-century British, American, and post-Colonial literatures. May include British Romantic or Victorian literatures; or 19th-century American literature; or a few important writers from a particular literary school, or one genre such as the novel.

EngL 5270. 20th-Century Literature and Culture. *(3 cr [max 9 cr]*)
- Readings cover 20th-century British, Irish, or American literatures, or topics involving the literatures of two nations. May focus on a few important writers from a particular literary school, or may focus on one genre such as drama. Topics specified in Class Schedule.

EngL 5291. Contemporary Literature and Culture. *(3 cr)*
- Wide, multi-genre reading in contemporary American, British, and Anglophone literature; designed to prepare graduate students for work in other courses or seminars. Attention to relevant scholarship or criticism. Topics specified in Class Schedule.

EngL 5330. Topics in Drama. *(3 cr [max 9 cr]*)
- Wide reading in the literature of a given period or subject designed to prepare graduate students for work in other courses or seminars. Attention to relevant scholarship or criticism. Topics specified in Class Schedule.

EngL 5581. Folklore I. *(1 cr)*
- Folklore genres such as proverbs, oral prose narratives (tales and legends), foodways and games. Manner in which folklore is transmitted and changed with concentration on how folklore functions in literature, the mass media, and everyday life.

EngL 5582. Folklore II. *(3 cr SP- 5581)*
- Training in collection of folklore materials.

EngL 5580. Practicum in the Teaching of English. *(1-3 cr [max 9 cr]*)
- Discussion of and practice in recitation, lecture, small-groups, tutoring, individual conferences, and evaluation of writing and reading. Emphasis on the theory informing effective course design and teaching for different disciplinary goals. Topics (e.g., teaching of literature, or expository or creative writing) specified in Class Schedule.

EngL 8110. Studies in Medieval Literature and Culture. *(3 cr [max 12 cr]; SP- # for grad non-major)*
- Sample topics: Chaucer; “Piers Plowman”; Middle English literature, 1300-1475; medeval literary theory; literature and class in the 14th-century; and texts and heresies in the late Middle Ages.

EngL 8120. English Early Modern Studies. *(3 cr [max 12 cr]; SP- # for grad non-major; A-F only)*
- British writers and topics from the Reformation to the French Revolution. In the first half of this period (which divides at 1640), a typical topic is Spenser and the epic tradition; in the second half, women historians before Wollstonecraft.

EngL 8150. Shakespeare. *(3 cr [max 9 cr]; SP- # for grad non-major)*
- Perspectives and works vary with offering and instructor’s emphases, characteristically on 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. 19th-Century British Studies. *(3 cr [max 12 cr]; SP- # for grad non-major)*

EngL 8190. 20th-Century Anglophone Literatures and Cultures. *(3 cr [max 12 cr]; SP- # for grad non-major)*
- 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 cr [max 12 cr]; SP-Course in seminar topic or #)*

EngL 8290. Topics, Figures, and Themes in American Literature. *(3 cr [max 12 cr]; SP-Course in seminar topic or #)*
- Recent topics: Dickinson, 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 cr [max 12 cr]; SP-Course in seminar topic or #)*
- Recent topics: Harlem Renaissance, ethnic autobiographies, Black Arts movement. Topics specified in Class Schedule.

EngL 8333. FTE: Master’s. *(1 cr; SP-Master’s student, adviser and DGS consent)*

EngL 8400. Advanced Studies in Post-Colonial Literature, Culture, and Theory. *(3 cr [max 12 cr]; SP- # for grad non-major)*
- Sample topics: Marxism and nationalism, modern India, feminism and decolonization, “The Empire Writes Back,” and Islam in the West. Topics specified in Class Schedule.

EngL 8444. FTE: Doctoral. *(1 cr; SP-Doctoral student, adviser and DGS consent)*

EngL 8510. Studies in Criticism and Theory. *(3 cr [max 12 cr]; SP- # for grad non-major)*
- Sustained consideration of developments within critical theory that have affected the practice of literary criticism, either by altering our conception of its object (“literature”) or by challenging our conception of critical practice. Topics specified in Class Schedule.

EngL 8520. Advanced Studies in Cultural Theory and Practice. *(3 cr [max 12 cr]; SP- # for grad non-major)*
- Contact varies and might focus on a body of theory and use. Sample topics: semiotics applied to perspective paintings, numbers, and money; in-depth analysis of a particular set of cultural practices by applying various theories to them.

EngL 8530. Advanced Studies in Feminist Criticism. *(3 cr [max 12 cr]; SP- # for grad non-major)*
- Brief history of feminist criticism and in-depth treatment of contemporary perspectives and issues. Topics specified in Class Schedule.

EngL 8621. Seminar on Writing for Publication. *(3 cr; SP- # for grad non-major)*
- Conference presentations, book reviews, revision of seminar papers for journal publication, and preparation of a scholarly monograph. Style, goals, and politics of journal and university press editors and readers, electronic publication, and other professional concerns.

EngL 8666. Doctoral Pre-Thesis Credits. *(1-18 cr; SP-Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)*

EngL 8780. Folklore. *(3 cr [max 12 cr]; SP- # for grad non-major)*
- Folklore methodology and application to specific topics. Sample topics: fieldwork in folklore; horror in oral tradition, writing, and film; liminality and tradition; folklore and/or literatures; folklore of the uncanny; tradition, alterity, and liminality.

EngL 8888. Thesis Credits: Doctoral. *(1-18 cr; SP-Max 18 cr per semester or summer; 24 cr required)*

EngL 8910. Studies in Special Subjects. *(3 cr [max 12 cr]; SP- # for grad non-major)*
- Sample topics: literature of World War II, writings of the Holocaust, literature of the English Civil War, and advanced seminar in versification.

EngL 8992. Directed Reading in Language, Literature, Culture, Rhetoric, Composition, or Creative Writing. *(1-9 cr [max 15 cr]; SP- #)*

**English: Writing, Rhetoric, and Language** *(EngC)*

**Department of English Language and Literature**

**College of Liberal Arts**

EngC 5602. Gender and the English Language. *(3 cr)*
- Introduction to features of English that are gender-marked or gender-biased; connections between language theory and social structures, including class and ethnicity, patterns of women’s and men’s speech in specific social contexts, gender and writing, sociolinguistics and sexual orientation.
Studies. EngC 5690. Minnesota Writing Project: Directed Language. EngC 5650. Topics in Rhetoric, Composition, and Language. etc.). Emphasis on reading and analyzing existing used in the field (ethnographic, case-study, historical, research paradigms, methodologies, and procedures in development of local standards and vernaculars. Sociolinguistic methods of analysis.

EngC 5605. Social Variation in American English. (3 cr) Description and analysis of English language variation from a sociohistorical perspective in the United States and the Caribbean. Social history of migrations (voluntary and enforced) leading to the development of regional and rural dialects, pidgins, creoles, and urban varieties.

EngC 5611. History of the English Language. (3 cr) Development of English language from Old English (mid-5th century) to Middle English (around 1100) to Early Modern English (about 1500).

EngC 5612. Old English I. (3 cr; SP-§ 3612) Introduction to the language to A.D. 1150. Selected readings in prose and poetry. Some attention to the culture of the Anglo-Saxons.

EngC 5613. Old English II. (3 cr; SP-§ 3613; 3612 or 5612) Critical reading of texts; introduction to versification. Reading of Beowulf.

EngC 5621. Irish Language I. (4 cr; QP-Grad or English undergrad major or #; SP-Grad or English undergrad major or #) Grammatical structures of modern Irish dialect of Connemara, Co. Galway; development of skills in both oral and written language; vocabulary, manipulation of grammatical structures, speaking, listening, reading, and writing practice; modern Gaelic culture.

EngC 5622. Irish Language II. (4 cr; SP-§ 5621, #) Grammatical structures of modern Irish dialect; development of skills in both oral and written language; vocabulary; manipulation of grammatical structures; speaking, listening, reading, and writing practice; modern Gaelic culture.

EngC 5630. Theories of Writing and Instruction. (3 cr) Introduction to major theories that inform teaching of writing in college and upper-level high school curriculums. Topics specified in Class Schedule.

EngC 5631. History of Rhetoric and Writing. (3 cr) Surveys, compares, and contrasts the assumptions of classical and contemporary rhetorical theory, especially as they influence the interdisciplinary field of composition studies. Rhetoric is one of the chief contributors to this field.

EngC 5632. Electronic Text. (3 cr; SP-§ 3632) Widespread electronic networking has renewed some perplexing questions about the status and function of text. Investigates many of these and related questions as reframed by the phenomenon of electronic text.

EngC 5640. Research Methods in Rhetoric, Composition, and Language. (3 cr) Research paradigms, methodologies, and procedures used in the field (ethnographic, case-study, historical, critical, quantitative, text-analytical, survey-based, etc.). Emphasis on reading and analyzing existing research studies, and on preparing original research. Topics specified in Class Schedule.

EngC 5650. Topics in Rhetoric, Composition, and Language. (3 cr) Topics specified in Class Schedule.

EngC 5690. Minnesota Writing Project: Directed Studies. (1-3 cr; max 30 cr) Workshops in which writing teachers investigate current theories of writing and writing pedagogy, write for publication, and explore research topics in applied literacy.

EngC 5860. Seminar in Rhetoric, Composition, and Literary Studies. (3 cr; max 9 cr; SP-# for grad nonmajor) Students read and conduct research on theories and literature relevant to cross-disciplinary fields committed to writing and teaching of writing.

EngC 5861. Seminar in Language and Discourse Studies. (3 cr; max 12 cr; SP-# for grad nonmajor) Current theoretical and methodological issues in discourse analysis. Social and psychological determinants of language choice (class, ethnicity, gender) in various English-speaking societies. Application to case studies; review of scholarship.

Entomology (Ent)

Department of Entomology College of Agricultural, Food, and Environmental Sciences

Ent 5011. Insect Morphology. (4 cr; QP-3005 or #; offered alt yrs; SP-# or # offered alt yrs; A-F only) Comparative study of insect structure with an evolutionary perspective.

Ent 5021. Insect Taxonomy and Phylogeny. (4 cr; QP- Biol 1009 or #; SP-# or #; offered alt yrs; A-F only) Identification of families of adult insects; evolution and classification of insects; techniques of collecting and curating insects; principles of phylogeny reconstruction.

Ent 5031. Insect Physiology. (2 cr; QP-5010, biochem course or #; SP-5011, biochem course or # A-F only) Essential processes of insects. Nerve and muscle mechanisms, energy metabolism, respiration, nutrition, digestion and excretion, regulation and interactions of processes, sensory mechanisms, and behavior. Reproductive behavior, embryology, and postembryonic development of insects.

Ent 5041. Insect Ecology. (3 cr; QP- Biol 5041 or EBB 5122 or offered fall 1998 and alt yrs; SP-Biol 5041 or EBB 5122 or offered fall 1998 and alt yrs) 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 5211. Insect Pest Management. (3 cr; QP-3005 or #; SP-3005 or #) Prevention or suppression of injurious insects by integrating multiple pest control tactics, e.g., chemical, biological, cultural, social strategies. Emphases on the dynamic integration of control methodologies in context of their economic, environmental, and social consequences.

Ent 5275. Medical Entomology. (3 cr; QP-3005 or #; offered 1998 and alt yrs; SP-3005 or # offered 1998 and alt yrs) Biology of arthropod vectors of human disease. Emphasis on disease transmission and host, vector, and pathogen interactions.

Ent 5311. Sampling Biological Populations. (3 cr; QP-Stat 5021 or equiv; SP-Stat 5021 or equiv) Sampling plans for study of field and laboratory populations of living organisms. Sampling distributions and techniques for detecting and coping with aggregation. Randomization, required sample size, and optimal allocation with designs for probability sampling. Sequential plans for making decisions.

Ent 5321. Ecology of Agriculture. (3 cr; QP- Agro or Hort or AmSc course, Ent or PiPa or Soil course or #; SP- Agro or Hort or AmSc course, Ent or PiPa or Soil course or # A-F only) Ecological perspective on post-industrial agriculture; origins of agriculture, social functions, and ecology of contemporary and extinct agricultural systems. Soils, plant development, pest ecology, forage quality, animal production, and food quality as an interactive network of factors.

Ent 5341. Biological Control of Insects and Weeds. (3 cr; QP- Biol 1009 EBB 3001 grad student or #; SP-3001, Biol 1009, EBB 3001 or grad student; A-F only) 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 5351. Insect Pathology. (2 cr; QP- 5030; SP-5031) Major pathogenic microorganisms that cause diseases in insects; routes of infection of insects; lab propagation of disease agents; factors in application of disease to pest insect control with safety considerations.

Ent 5361. Aquatic Insects. (3 cr; QP-1005 or #; SP-3001 or # A-F only) Taxonomy and natural history of aquatic insects including their importance in aquatic ecology, water resource management, recreation, and conservation. Emphasis on family-level identification of immatures and adults. Field trips scheduled to local aquatic habitats. A collection is required.

Ent 5371. Principles of Systematics. (3 cr; QP- # offered 1998 and alt yrs; SP- # offered 1998 and alt yrs) Theoretical and practical procedures of biological systematics. Phylogeny reconstruction including computer assisted analyses, morphological and molecular approaches, species concepts and speculation, comparative methods, classification, historical biogeography, nomenclature, use and value of museums, etc.

Ent 5381. Lepidopterology. (2-3 cr; QP-Ent course or #; course each in ecology and genetics recommended; SP-Ent course or #; course each in ecology and genetics recommended) Overview of Lepidoptera with emphasis on processes and phenomena such as polymorphism, mimicry, and individual quality that are well demonstrated by this insect order.

Ent 5481. Invertebrate Neurobiology. (3 cr; 3-4 cr-§ NSc 5480) Fundamental principles and concepts underlying cellular bases of behavior and “systems” neuroscience. Particular invertebrate preparations discussed.

Ent 5900. Basic Entomology. (1-6 cr; QP- #; SP-#) For graduate students who need to make up certain deficiencies in their biological science background.

Ent 5910. Special Problems in Entomology. (1-6 cr [max 10 cr]; QP- #; SP- #) Individual field, lab, or library studies in various aspects of entomology.

Ent 5920. Special Lectures in Entomology. (1-3 cr) Lectures or labs in special fields of entomological research given by a visiting scholar or regular staff member.

Ent 8041. Advanced Insect Genetics. (2 cr; QP- Basic genetics course, 5031 or #; offered alt yrs) Molecular genetic techniques and their applications, emphasizing insect species other than Drosophila. Application of genetic techniques to physiological processes.

Ent 8051. Toxicology. (2 cr; QP-5031, and inorganic chem course, biochem course or #) Chemistry and mode of action of conventional insecticides; insect growth regulators and microbial pesticides; transgenic viruses and genetically modified plants.

Ent 8200. Colloquium in Social Insects. (1-3 cr; SP- 3020 or 3200) Current research on bees, wasps, ants, and termites. Student critiques and research reports.

Ent 8210. Colloquium in Insect Evolution. (1-3 cr; QP- 5370; SP- 5317) Research issues in systematics and evolution. Comparative biology, biogeography, and molecular evolution. Students may re-enroll as topics alternate. Student critiques papers from primary literature.
Courses

Ent 8240. Colloquium in Insect Ecology. (1-2 cr; QP—SP. Also, S-N only) [A-F only]

Ent 8300. Graduate Seminar. (1 cr; SP—A)

Oral and written reports on and discussion by students of selected topics from current literature.

Ent 8333. FTE: Master's. (1 cr; SP—Master's student, adviser and DGS consent)

Ent 8444. FTE: Doctoral. (1 cr; SP—Doctoral student, adviser and DGS consent)

Ent 8500. Research in Entomology. (1-8 cr; S-N only)

Ent 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP—Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Ent 8777. Thesis Credits: Master's. (1-18 cr—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Ent 8888. Thesis Credits: Doctoral. (1-18 cr—Max 18 cr per semester or summer; 24 cr required)

Family Education (FE)

Department of Work, Community, and Family Education

College of Education and Human Development

FE 5001. Family Education Perspectives. (3 cr; A-F only)

Origins, evolution, and critique of alternative perspectives on family education. Implications for clients, programs, and educators.

FE 5003. Contemporary Family Education. (3 cr; A-F only)

Transitions in family life examined, with emphasis on preparing educators and educational programs.

FE 5200. Special Topics in Family Education. (1-4 cr—Max 4 cr)

Study of a topic in family education that is either not covered in available courses or that is not covered in a sufficient breadth and depth to meet student needs and interests. Topics vary.

FE 5201. Family and Work Relationships. (3 cr; A-F only)

Examination of the interactions of work and family to prepare professionals for improving work and family relationships. Preparing to deliver, evaluate, and sexuality education. Strategies to help children and adolescents acquire information, form values, develop interpersonal skills, and exercise personal responsibility in the sexual dimensions of individual and family life.

FE 5203. Communication Education (3 cr; A-F only)

Knowledge and skills needed to develop, deliver, and evaluate educational programs about family communications. Examination of family communications principles and issues. Development of appropriate teaching methods and materials.

FE 5301. Program Planning in Family Education. (3 cr; A-F only)

Exploration of curriculum research and theory; examination and critique of alternative perspectives and their concomitant implications for families; development and evaluation of family education curriculum and programs.

FE 5302. Family Education Curriculum in Secondary Schools. (3 cr; A-F only)

Examination, development, and implementation of family and consumer science curriculum in secondary schools. Emphasis on curricular perspectives from social reconstruction and cognitive processes.

FE 5303. Instructional Strategies in Family Education. (3 cr; A-F only)

Theory and research relevant to methods of teaching; development of skill in using methods; emphasis on methods that support families taking technical, communicative, and emancipatory action.

FE 5701. Practice of Parent Education I. (3 cr; A-F only)

Examination of parent education in community settings; consideration of parents as adult learners with diverse backgrounds; development of group facilitation skills; observation and interviewing in community settings; reflection on and critique of the practice of parent education.

FE 5702. Practice of Parent Education II. (3 cr; SP—5701 or A-F only)

Development of curriculum for parent education; consideration of teaching groups and individuals; consideration: of ethics in parent education; evaluation of parent education programs; development of curriculum and teaching portfolio; reflection on and critique of the practice of parent education.

FE 5703. Advanced Practice of Parent Education. (3 cr; SP—5702 cr)

Evolving perspectives of parent education. Emphasis on psycho-dynamic, conceptual-change approaches. Reflective and dialogic approaches for working with parents in understanding beliefs and examining their origins and consequences. Examination of issues related to diversity, self-awareness, ethics, and evaluation.

FE 5796. Parent Education Practicum. (1-4 cr—Max 4 cr; QP—SP. Also, A-F only)

Supervised parent education field assignments designed according to licensure requirements and individual student needs, interests, and prior competencies.

FE 5993. Directed Study in Family Education. (1-3 cr—Max 4 cr)

Self-directed study in areas not covered by regular courses. Specific program of study is jointly determined by student and advising faculty member.

FE 5996. Internship in Family Education. (1-6 cr—Max 6 cr; SP—A)

Planned work experience focusing on educational competencies in family education settings. Nature and extent of responsibilities are defined by the position student assumes.

FE 8900. Family Education Colloquium. (1-4 cr—Max 4 cr; SP—A-F only)

In-depth discussion about current issues not covered or covered as thoroughly in available courses. For family education graduate students, faculty, and community professionals.

FE 8994. Directed Research in Family Education. (1-6 cr—Max 6 cr; SP—Family ed student doing Plan B research, A-F only)

Family Practice and Community Health (FPCH)

Department of Family Practice and Community Health

Medical School

FPCH 5251. Cross-Cultural Medicine and International Health. (2 cr; SP—Family practice residency or #)

Concepts of illness and healing within different cultural contexts; interaction of cultural and biological factors in disease and illness; population-based health illness, disease.

FPCH 5345. Curriculum Design and Teaching Strategies for Medical Education I. (3 cr; SP—A)

Curriculum design: identifying and developing course goals; developing course, teacher, or learner evaluations.

FPCH 5346. Curriculum Design and Teaching Strategies for Medical Education II. (1 cr; SP—A)

Teaching strategies: lecture, demonstration, small-group discussion, clinical teaching, computer-assisted instruction.

FPCH 5555. Sexual Counseling for Family Physicians. (1-2 cr; SP—Medical school completion)

Assessment of and therapy for sexual dysfunction problems that arise in clinical practice of primary care physicians.

FPCH 5563. Clinical Neuropsychopharmacology. (1 cr; SP—FPCH residency)

Identification, diagnosis, treatment, and follow-up of major psychiatric disorders. Emphasis on neuropsychopharmacological approach, identification of psychoactive drugs, contraindications, side effects, and long-term management of patients.

FPCH 5564. Family Practice Seminar. (1 cr; Max 9 cr)

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.

FPCH 5570. Practicum in Counseling. (1 cr; SP—First-yr residency completion)

Short-term counseling techniques. Lectures, classroom exercises, and actual counseling contact.

FPCH 5582. Practice Management Workshop. (1 cr; SP—First-yr residency completion or #)

Practical counsel and information on day-to-day management of medical clinics (including economic and legal aspects, community and hospital relations, human relations, types of practice opportunities. Workshop with department faculty and community specialists.

FPCH 5598. Introduction to Physician's Role in Nursing Homes. (1 cr; Max 5 cr; SP—Medical School or dental school or GNP school graduate; S-N only)

Practicum in caring for frail elderly nursing home residents. Students participate in in-depth, multidisciplinary case discussion of geriatric patients and then attend bedside rounds of residents at two nursing homes in the Twin Cities area.

FPCH 5650. Principles of Geriatrics I. (1 cr; Max 5 cr; SP—Medical School or dental school or GNP school graduate; S-N only)

First in two-course sequence. Survey of major topics in geriatric medicine. Epidemiology, etiology, diagnosis, and treatment of major geriatric syndromes and illnesses.

FPCH 5651. Principles of Geriatrics II. (1 cr; Max 5 cr; SP—Medical School or dental school or GNP school graduate; S-N only)

Second in two-course sequence. Survey of major topics in geriatric medicine. Epidemiology, etiology, diagnosis, and treatment of major geriatric syndromes and illnesses.

FPCH 5653. Future Health Interventions for Older Populations. (2 cr; SP—Health science grad student or health science grad degree)

Practitioners and academicians lead discussions about promising new approaches to health care for older adults.

FPCH 5904. Community Health. (1 cr; SP—Second- or third-yr residency status or #)

Tools and techniques for studying contemporary health problems. Strategies to meet community health needs. In-depth look at community health activities in Minnesota.
FPCH 5950. Clinical Issues in Human Sexuality. (2 cr; SP–Enrollment in health sciences grad programs in CSPP, psychology, PubH, SW or FSOS or #) Assessment and treatment techniques pertaining to common sexual problems.

FPCH 5952. Practicum in Sexual Counseling I. (2-4 cr; SP–#) Developmental aspects of sexuality throughout the life cycle examined using such theories as psychodynamics and social role theory, with emphasis on significance of psychosocial aspects of sexuality for the patient.

FPCH 5958. Small Group Process. (2 cr; SP–#) Group dynamics; current schools of group process and therapy. Experiential and cognitive methods.

FPCH 5960. Basic Research Methods in Family Practice. (3 cr; SP–#) New applications from the behavioral science area of clinical practice. Lectures, workshops, conferences.

FPCH 5972. Research Methods in Family Medicine I. (2 cr; SP–FPCH grad student or #) First in two-course sequence. Research design and methodology, biostatistics, epidemiology, and demography. Steps necessary to formulate a question, determine its significance, develop an appropriate methodology, implement and complete a study, analyze data, and report findings in peer-reviewed literature.

FPCH 5973. Research Methods in Family Medicine II. (2 cr; SP–FPCH grad student or #) Second in two-course sequence. Research design and methodology, biostatistics, epidemiology, and demography. Steps necessary to formulate a question, determine its significance, develop an appropriate methodology, implement and complete a study, analyze data, and report findings in peer-reviewed literature.

FPCH 8201. Clinical Family Medicine. (12 cr [max 108 cr]; SP–Fam practice resident or #) Supervised care for patients of all ages on a continuous, primary, preventive, and general diagnostic basis. Diagnosis, methods of treatment, and problem-solving devices for benefit of patient and family, emphasizing health hazard appraisal. New and refined methods of recording, documentation, and retrieval of clinical data.

FPCH 8208. Family Medicine Conferences. (1 cr [max 9 cr]; SP–Fam practice resident or #) Problem cases from family practice service. Diagnosis, treatment, and consideration of current literature.

FPCH 8210. Family Medicine Grand Rounds. (1 cr [max 9 cr]; SP–Fam practice resident or #) Monthly conference on medical topics.

FPCH 8212. Clinical Psychiatry Rounds. (1 cr [max 9 cr]; SP–First-yr Fam practice resident or #) Medical fellows meet with a teaching psychiatrist to review cases, preferably from among patients. Topics of high clinical relevance.

FPCH 8215. Seminar: Psychosomatic Medicine. (1-2 cr; SP–Completion of first-yr fam practice residency or #) Multicausality of disease, including biologic, psychologic, and social factors that may predispose, precipitate, or aggravate disease. Theoretical models of psychosomatic disease; concept of “symptom choice” by patients. Methods of recognition, quantification, and treatment, including pharmacotherapy and psychotherapy.

FPCH 8217. Seminar in Counseling. (1-2 cr; SP–8215 or #) Skills and strategies for performing short-term, supportive counseling in family practice setting. Patient selection. Skills applicable to beginning, middle, and end of counseling. Strategies for working with patients presenting different types of problems seen by the family physician.


FPCH 8253. Research Problems. (1-6 cr [max 20 cr]; SP–#) Students complete research projects under faculty direction.

FPCH 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

Family Social Science (FSOS)

Department of Family Social Science

College of Human Ecology

FSOS 5101. Family Systems. (3 cr; SP–#) Students or #) 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 parenting, health care, and age are covered. Family strengths and family problems are integrated.

FSOS 5193. Directed Study in Family Social Science. (1-6 cr [max 6 cr]; QP–#; SP–FSOS or related field grad student)

FSOS 5426. Alcohol and Drugs: Families and Culture. (3 cr; SP–#) Overview of psychology and sociology of drug use and abuse. Life-span, epidemiological, familial, and cultural data regarding use; fundamentals of licit and illicit drug use behavior; gender, ethnicity, social class, sexuality, sexual orientation, and disability.

FSOS 5427. Alcohol, Drugs, and the Brain. (1 cr; SP–#) The psychopharmacology of alcohol and drug use. Topics include licit and illicit drugs; mechanisms of drug action in the brain; alcohol and drug taking practices, and the influence of alcohol and drugs on behavior.

FSOS 5428. Assessment and Treatment of Alcohol and Drug Use Issues. (3 cr; SP–#) Assessment and treatment of alcohol and other drug use problems. Theoretical and practical approaches to diagnosis, screening, and treatment; issues of loss, trauma, family, and culture; diversity issues of gender, ethnicity, social class, sexuality, and disability.

FSOS 5429. Counseling Skills Practicum I. (3 cr; SP–#) Develop competency in basic counseling skills. Counselor needs/motivations, non-verbal communication, basic and advanced empathy, identifying strengths, maintaining focus, challenging discrepancies, use of self. Emphasis on building from client strengths and learning through role-playing.

FSOS 5431. Counseling Skills Practicum II. (3 cr; QP–5029, 5030 or #; SP–5431; 5429) Exposure to advanced therapeutic methods and understanding the processes of change. Identifying and reinforcing or challenging core beliefs; reframing; paradox; trance and guided imagery; cognitive-behavioral, solution-focused, and narrative therapies. Non-pathologizing models of therapy emphasized.

FSOS 5432. Chemical Abuse and Families: An Overview. (3 cr; SP–#) Relationships and family systems with particular application to families in which alcohol or drug use is a problem. Family types, family of origin, models of family therapy, family systems theory, and alcoholism. Review of literature.

FSOS 5433. Group Therapy: Theory and Practice. (3 cr; SP–#) Lecture and small group experience designed to introduce group therapy concepts. Group dynamics, group structure, attitudinal development, group communication; education, support, and group processes, leadership roles and functions, critical incidents, therapeutic factors, and group processes.


FSOS 5435. Internship in Alcohol and Other Drug Use Problems. (2-18 cr [max 18 cr]; QP–Admission to ADCEP certificate program, #; SP–#) Admission to ADCEP certificate program, #) An 800-hour rotating clinical internship designed to strengthen student competencies. Students are placed in 3 to 4 different community agencies/treatment centers. A separate registration is required for each placement.

FSOS 5436. Ethical Issues in Addiction Counseling. (1 cr; QP–Admission to ADCEP certificate program, #; SP–#) Admission to ADCEP certificate program, #) Exploration/discussion of ethical issues and challenges in alcohol and drug counseling and therapy. Decision-making; values conflicts; boundary violations; client rights; professional responsibilities; issues in relationship/family therapy, group work, cross-cultural counseling; issues working with special populations.

FSOS 5437. Supervision Group. (2 cr [max 6 cr]; QP–Admission to ADCEP certificate program, #; SP–#) Supervision of alcohol and drug use counseling in group format. Each student presents at least one tape of a client counseling session. Role-playing and extensive discussion of clinical issues. Focus on non-pathologizing models of therapy. Some training tapes viewed, selected readings.

FSOS 5450. Special Topics: Addictions. (1-6 cr [max 9 cr]) Selected readings and/or projects in alcohol and drug use and problems. Evaluation of students’ mastery of the assigned study.

FSOS 8001. Conceptual Frameworks in the Family. (3 cr; SP–Family course or #) Major theoretical models about families, emphasizing sociohistorical context.

FSOS 8013. Qualitative Family Research Methods. (3 cr; SP–#) Approaches to qualitative family research evaluation, including phenomenological, feminist, grounded theory, content analytic, ethnomet hodological, ethnographic, and program evaluation. Theory, research examples, student projects.

FSOS 8014. Quantitative Family Research Methods. (3 cr; SP–#) Builds on basic understanding of quantitative research in behavioral sciences by focusing on special issues associated with conducting research on the family as the unit of analysis. Proposal writing and analysis of secondary data.

FSOS 8031. Family of Origin. (3 cr; SP–#) Preference given to marriage and family therapy students; S-N only) In-depth study of each student’s family of origin in a group of other students and a clinical faculty therapy supervisor.
Courses

FSoS 8032. Theories of Marital and Family Therapy. (3 cr)
General systems theory and cybernetics: influence of, application to family systems, historical roots, and theoretical and clinical models they have influenced. How change processes affect interactional patterns, information processing, family structure, family belief systems, and family life cycle transitions.

FSoS 8033. Clinical Issues in Marriage and Family Therapy. (3 cr; SP–8032 or equiv; A-F only)
Family therapy assessment and treatment approaches to problems such as depression, alcoholism, and sexual abuse, and to challenges of varying family structures, such as single-parent and remarried families.

FSoS 8034. Marriage and Family Therapy Supervision. (3 cr–6 cr; SP–FSoS 8032 or #)
For marriage and family therapists who want to become supervisors, this course is designed to meet didactic and interactive course requirements for the Approved Supervisor designation as stipulated by the American Marriage and Family Therapy Association (AAMFT). Topics included are theories of supervision, structures for supervision, methods of supervision, the evaluation process, and legal/ethical issues. Also covered are the therapist-client-supervisor relationships, potential problems, and contextual issues.

FSoS 8035. Assessment of Couples and Families. (3 cr; SP–8014 or equiv or A-F only)

FSoS 8036. Couple and Family Therapy Research. (3 cr; SP–8013, 8014; A-F only)
Strengths and limitations of current couple and family outcome research; methodological approaches, including quantitative and qualitative.

FSoS 8037. Ethical, Legal, and Professional Issues in Mental Health Practice: Issues with Couples and Families. (2-10 cr; max 10 cr; SP–8032, practicum or internship exper, or #; grad student in cooperating mental health practice prog who has completed 1 course on therapy with children or couples or families, practicum or internship exper, or #; A-F only)
Boundaries and triangles, gender inequalities, family law, confidentiality and reporting requirements, dual roles, client distress, and value clashes.

FSoS 8039. Clinical Interventions for Couples. (3 cr; SP–8032 or equiv or A-F only)
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 cr; SP–8001 or equiv or #, FSoS PhD student beyond 1st yr)
Concepts and principles of systems and ecosystems and their applications in family science; emphasizes theoretical integration and development of research models with system and family methodologies.

FSoS 8047. Integrative Research Seminar. (3 cr; SP–8001 or equiv, 8013 or equiv; 8014 or equiv)
For advanced doctoral students primarily in family social science who are working on independent research projects 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 cr; SP–8001 or equiv; #, marriage and family therapy course)
Helping families become more resilient to stress by decreasing vulnerability to crises and traumatic stress disorders. Students develop research or intervention proposals on family stress, coping, adaptation, crisis, trauma, or resilience.

FSoS 8102. Seminar in Gender Roles. (3 cr; SP–Two grad family courses or #)
Theory and research on gender roles in families. Gender issues in roles of mothers, fathers, marital partners, and same-sex partners. Issues of race, ethnicity, and social class as they intersect with gender.

FSoS 8103. Family Decision Making. (3 cr; SP–Two grad family courses or #)
Analysis and assessment of methodological and theoretical approaches to studying problem-solving and decision-making processes of individuals and family groups.

FSoS 8104. Family Policy Research. (3 cr; SP–4003 or equiv or #)
Seminar identifies characteristics distinguishing family policy research from other family research; conceptual frameworks, methods, and roles family policy research can play in policy-making and knowledge-building processes.

FSoS 8105. Family Gerontology. (3 cr; SP–4154 or equiv or #)
Integrates gerontology and family studies; new lines of inquiry, qualitative and quantitative, into aging families. Family gerontological research, family relationships, family and long-term care institutions, theoretical frameworks and research methods, and research and interventions.

FSoS 8106. Family Research from Economic Perspectives. (3 cr; SP–8013 or equiv, 8014 or equiv or #, WCFE 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 8107. Family Values Research: Theories and Critical Methods. (3 cr; SP–8013 or equiv, 8014 or equiv or #, WCFE 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 8109. Topics in Family Social Science. (1-6 cr; max 6 cr; SP–Grad student or #; SP–Grad student or #)
Special seminars on timely topics suited to the needs of students.

FSoS 8193. Directed Study in Family Social Science. (1-6 cr; max 6 cr; SP–Grad FSoS major; S-N only)
Required of all first-year family social science students (orientation to graduate program); not open to other students.

FSoS 8201. Family Research in Economic Areas. (3 cr; SP–Grad student or #)
Theory, theory of the term structure, measures of risk, Discounted cash flow valuation.

FSoS 8202. Teaching Family Courses in Higher Education I. (3 cr; SP–12 FSoS grad cr; teaching assistant exper recommended; S-N only)
Students cooperatively plan, administer, and evaluate (with a graduate faculty supervisor) an undergraduate course in family social science for other students.

FSoS 8203. Teaching Family Courses in Higher Education II. (1 cr; SP–8201 or equiv; S-N only)
Under faculty supervision, students teach an undergraduate course in family social science for which they have appropriate academic preparation and professional experience.

FSoS 8275. Clinical Consultation with Couples and Families. (3 cr; SP–# required for grad FSoS majors in marriage and family therapy prog; S-N only)
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. Family Therapy Practicum. (1-12 cr; max 12 cr; SP–Marriage and family therapy student; S-N only)
Clinical placement doing marriage and family therapy in a community setting.

FSoS 8296. Family Therapy Internship. (1-21 cr; SP–8295, marriage and family therapy student; S-N only)
Full-time clinical placement doing marriage and family therapy in a community setting.

FSoS 8333. PTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

FSoS 8444. PTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

FSoS 8550. Advanced Topics in Family Social Science. (1-6 cr; max 6 cr; SP–FSoS PhD student; S-N only)
Special seminars on topics suited to student needs.

FSoS 8666. Doctoral Pre-Thesis Credits. (1-16 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)
Graduate faculty work with students on research for Plan B paper.

FSoS 8777. Thesis Credits: Masters. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

FSoS 8794. Directed Research in Family Social Science. (1-6 cr; max 6 cr; SP–Grad FSoS major; S-N only)

FSoS 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Finance (Fina)

Department of Finance
Curtis L. Carlson School of Management

Fina 8801. Theory of Capital Markets. (4 cr; QP–Econ 8101, Econ 8101, Econ 8102, business admin PhD student or #)
Expected utility theory, discrete theory, continuous theory, theory of the term structure, measures of risk, portfolio choice, aggregation and separation, linear pricing.

Fina 8811. Corporate Finance. (4 cr; QP–8801, Econ 8103, Econ 8104, business admin PhD student or #)
Theoretical and empirical works in five major areas of corporate finance: capital structure, payout policy, mergers and corporate control, capital acquisition process, and corporate risk management. Theoretical frameworks are used to understand empirical evidence.

Fina 8821. Empirical Methods in Finance. (4 cr; QP–8801, Stat 5121, Stat 5122) or (Stat 5131, Stat 5132; Stat 8801, business admin PhD student or #)
Introduction to commonly used econometric methods in the empirical financial markets area. Econometric tests of linear pricing models, tests of market efficiency, event studies.

Fina 8892. Independent Study in Finance. (1-8 cr; max 16 cr; SP–Business admin PhD student or #)
Problems or developments of special interest to the student.

Fina 8894. Directed Research in Finance. (1-8 cr; max 16 cr; SP–Business admin PhD student specializing in finance or #)
Individualized directed research on a project of interest to the student, approved and advised by faculty.
Fisheries and Wildlife (FW)

Department of Fisheries and Wildlife
College of Natural Resources

FW 5051. Analysis of Populations. (3-4 cr; QP–Biol 1009 or Biol 1201, Stat 3011 or Stat 5021 or #; SP–Biol 1001 or Biol 1009, FW 4001 or Stat 3011 or Stat 5021 or #) Factors involved in the regulation, growth, and general dynamics of populations. Data needed to describe populations, population growth, population models, and regulatory mechanisms. (FW)

FW 5411. Aquatic Toxicology. (3 cr; QP–Biol 3008 or EEB 3401; SP–Biol 3407 or EEB 4601) Pollutant assessment approaches, biological effects, fate and flow of contaminants in aquatic systems, and major types of pollutants.


FW 5571. Avian Conservation and Management. (3 cr; QP–EEB 5134 or grad student or #; SP–EEB 4134 or grad student or #) Current problems in avian conservation and management with equal emphasis, biological effects, wetland, and game birds.


FW 5603. Habitats and Regulation of Wildlife. (3 cr; QP–Biol 3008; SP–Biol 3407; A-F only) Environmental interactions of wildlife at both population and community levels; environmental threats from human activities; habitat management practices; objectives, polices, and regulations in population management.


FW 5621. Geographic Information Systems for Fisheries, Wildlife and Biology Conservation. (3 cr) Hands-on experience with GIS as a tool for understanding, analyzing, and managing ecological systems. ARC-INFO and how to apply it to problems in fisheries, wildlife, and biological conservation.

FW 8200. Seminar. (1-4 cr) Oral and written student reports on selected topics from current literature in fisheries biology and management and wildlife. Lectures by and discussions with faculty and visiting specialists.

FW 8333. FTE: Master’s. (1 cr; SP–Master's student, adviser and DGS consent)

FW 8394. Research in Fisheries. (1-4 cr; S-N only) Directed research.

FW 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

FW 8448. Fishery Science. (3 cr; SP–Grad student in fisheries or wildlife conserv or conserv biol or ecology or #; S-N only) Applying ecological theory to the study and manipulation of fish populations; dynamics of growth, reproduction, 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 8452. Conservation Biology. (3 cr; A-F only) Seminar examining population- to system-level ecological issues (genetics; demographic processes; community, ecosystem, and landscape scale interaction; restoration ecology; ex situ strategies for restoration and recovery) and societal issues (social, economic, cultural perspectives; sustainable development strategies; roles of institutions; international and U.S. policies).

FW 8459. Stream and River Ecology. (3 cr; QP–Limnology course; SP–Limnology course or #) Structure and dynamics of running waters from an ecosystem perspective. Historical perspective, basic hydrology and fluvial geomorphology, terrestrial-aquatic interactions, detrital dynamics, metabolism, drift, trophic relations, biotic and abiotic interactions, ecosystem experiments and natural alterations, stability and succession, ecosystem dynamics in a watershed.

FW 8461. Advanced Topics in Fish Physiology. (1 cr; QP–Vertebrate physiology course; SP–Vertebrate physiology course or #) Lectures, discussion, current literature. Complements 5459.

FW 8462. Advanced Topics in Fish Behavior. (1 cr; QP–Behavior course; SP–5459 or behavior course or #) Current literature. Complements 5459.

FW 8465. Fish Habitats and Restoration. (3 cr; QP–Intro ecology course; SP–Intro ecology course or #) Mechanisms underlying physiology and behavior that shape fish community structure in specific north temperate habitats; techniques and planning procedures for restoring lakes and streams.

FW 8494. Research in Wildlife. (1-4 cr; SP–#; S-N only) Directed research.


FW 8666. Doctoral Pre-Thesis Credits. (1-18 cr per semester or summer; doctoral student who has not passed prelim oral)

FW 8777. Thesis Credits: Master’s. (1-18 cr per semester or summer; doctoral student who has not passed prelim oral)

FW 8888. Thesis Credits: Doctoral. (1-18 cr per semester or summer; 24 cr required)

For definitions of course numbers and symbols, see inside back cover.

Food Science and Nutrition (FScN)

Department of Food Science and Nutrition
College of Agricultural, Food, and Environmental Sciences

FScN 5411. Food Biotechnology. (2 cr; QP–5120; SP–4121; A-F only) Genetic tools as applied to food biotechnology. Improvement of microbes used in food production by modern biotechnological approaches. Discusses need for stringent regulation of modern biotechnology as well as ethical and legal issues.

FScN 5421. Introduction to Food Law. (3 cr; QP–1102; SP–1102) Analysis of the federal legal requirements affecting the production processing, packaging, marketing, and distribution of food and food products using case law studies and regulatory history.

FScN 5431. Physiochemistry of Food. (2 cr; QP–5110; SP–4111) Surface phenomena, colloidal interactions, liquid dispersions, gels, emulsions and foams, and functionality of food macromolecules in these systems.

FScN 5441. Introduction to New Product Development. (2 cr; QP–5110, 5135; SP–4111, 4331) 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 cr; QP–1102, 3102, Phys 1042; SP–1102, 3102, Phys 1102 or Phys 1302) 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 cr; QP–5110; SP–4111) Flavor and off-flavor development in foods. Industrial production of food flavorings and their proper application to food systems.

FScN 5531. Grains: Introduction to Cereal Chemistry and Technology. (2 cr; QP–Biol 1009, Chem 1052; SP–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 5621. Nutrition and Metabolism. (4 cr; QP–3612, BioC 3021, Phsl 3051; SP–3612, BioC 3021, Phsl 3051) Facilitates understanding of carbohydrate, lipid, and protein metabolism using a “systems” or “holistic” approach to emphasize how metabolic pathways interrelate.

Courses

FScN 5623. Regulation of Energy Balance. (2 cr; SP–5620; SP–5624) Regulation of energy balance in humans including regulation of food intake and energy expenditure.

FScN 8211. Risk Analysis in Food Science and Nutrition. (2 cr) Risks and benefits in various areas of the field (e.g., food preservatives and supplements).


FScN 8213. Food Lipids: Biological and Toxicological Aspects. (2 cr; QP–5110; SP–1112, 4111) Lipids, including chemical reactions of nutritional and toxicological significance, lipid stability in foods, antioxidants, health aspects, and lipid oxidation products, including oxysterols, cytobiology, atherogeneity, membrane effects, and biological properties.

FScN 8310. General Seminar. (1 cr [max 2 cr]; S–N Only) Presentations by faculty, graduate students, and outside speakers.

FScN 8311. Chemical Reactions in Food. (1 cr; QP–5110; SP–4111) Chemical reactions, stability, and degradation of important food constituents. Examples of food components and food reactions are used to develop an understanding of major chemical changes occurring in food systems.

FScN 8312. Issues in Food Microbiology. (1 cr; QP–5120; SP–4121) Current issues in food microbiology, dairy starter cultures, food fermentations, or selected aspects of food biotechnology.

FScN 8313. Food Process Engineering. (1 cr; QP–5110, 5135; SP–4111, 4121) Basic concepts of engineering in a food processing system. Current advances in food processing technology.

FScN 8314. Physical Chemistry of Food Systems. (1 cr; QP–5110; SP–4111) Critical scientific paradigms involved in rheological, interfacial, diffusion, and kinetic behavior of components in food systems that form liquid, solid, and gaseous phases. Problem solving in both product development and shelf stability.

FScN 8315. Quality Management: Concepts, Tools, and Implementation. (1 cr; QP–5110, 5120; SP–4111, 4121) Quality assurance of foods, including basic concepts and terminology management strategies and interacting factors, and management tools such as GMP, HACCP, and ISO9000.


FScN 8317. Instrumental Research Techniques in Food Science. (1 cr; QP–5110; SP–4111) How to apply instrumental research techniques to problem solving in food science.

FScN 8318. Current Issues in Food Science. (1 cr; QP–5110, 5120; SP–4111, 4121) How to approach current issues in food science.

FScN 8320. Advanced Topics in Food Science. (1-3 cr [max 6 cr]) Recent research or special topics.

FScN 8330. Research Topics. (1 cr [max 6 cr]) Seminar in which a faculty member or group of faculty and graduate students discuss research progress within the group or review and discuss current research literature.

FScN 8331. Dairy Chemistry and Physics. (2 cr; QP–5110; SP–4111) How basic processing operations, such as heating, cooling, homogenization, evaporation, drying, crystallization, and freezing, alter physical properties of milk.

FScN 8332. Microbial Starter Cultures. (2 cr; QP–5120, BioC 3021, 3022; SP–4121, BioC 3021) Microbiology, physiology, and genetics of lactic acid bacteria used in food fermentations.

FScN 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent) Seminar in which a faculty member or group of faculty and graduate students discuss research progress within the group or review and discuss current research literature.

FScN 8334. Reaction Kinetics of Food Deterioration. (2 cr; QP–Chem 5520; SP–Chem 5501) 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 cr; QP–5110; SP–4111) Current methods of carbohydrate and polysaccharide analysis, including structural and chemical characterization methods, polymer reactions, and modifications.

FScN 8336. Lipid Chemistry and Rancidity of Foods. (2 cr; QP–5110; SP–4111) Chemistry of food lipid oxidation and rancidification, and protective functions of antioxidants.

FScN 8337. Flavor Chemistry. (2 cr; QP–5110; SP–4111) Chemistry involved in formation, analysis, and release of flavoring materials in foods.

FScN 8391. Independent Study: Food Science. (1-4 cr [max 6 cr]) Independent study. Includes written reports.

FScN 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent) Seminar in which a faculty member or group of faculty and graduate students discuss research progress within the group or review and discuss current research literature.

FScN 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer, 10 cr total required [Plan A only])

Forest Resources (FR)

Department of Forest Resources

College of Natural Resources

FR 5104. Forest Ecology. (4 cr; QP–Bio course, chem course, grad student or #; SP–5104; bioI course, chem course, grad student or # A-F only) The form and function of forests as ecological systems. Characteristics and dynamics of species, populations, communities, landscapes, and ecosystem processes. Examples apply ecology to forest management. Emphasis on fire ecology. One field trip and weekly recitations.

FR 5142. Tropical Forest Ecology. (3-4 cr; QP–3xxx or above ecology course; SP–3xxx or above ecology course) Ecological principles related to form, function, and development of wet and dry tropical forests at organismal, community, and ecosystem scales. Succession, productivity, biodiversity, sustainability, agroforestry, and management alternatives. Natural distribution of forest types; causes, consequences, and extent of deforestation.

FR 5146. Dynamics of Global Change. (3-4 cr; QP–3xxx or above ecology course; SP–3xxx or above ecology course) Implications of global change upon wild and cultivated vegetation including forests, grasslands, and agricultural ecosystems. Responses to ecosystem, community, organismal, and physiological scales. Potential climate change; elevated atmospheric concentrations of carbon dioxide, ozone, and other trace gases; acid deposition; and other pollutants.

FR 5153. Forest and Wetland Hydrology. (3 cr; QP–5110 or #; SP–Basic Hydrology course or #) Current topics, problems, and methods associated with forest and wetland hydrology. The hydrologic role of forest vegetation in snow and rainfall regimes. Analytical methods and models to evaluate effects of vegetation management in uplands and wetlands on the amount and timing of water flow.


FR 5228. Advanced Topics in Assessment and Modeling of Forests. (3 cr; QP–5218 or equiv; NES 5210 or equiv; Stat 5021 or equiv; SP–4218; Math 1272, Stat 5021, A–F only) Recently developed mathematics, computer science, and statistics methodologies applied to forest resource function, management, and use problems.

FR 5251. Role of Renewable Natural Resources in Developing Countries. (1 cr; SP–OP or grad student or #; SP–5251; or grad student or # A–F only) International perspectives on important resource issues, including integration of natural resource, social, and economic considerations. Overviews of issues and case studies.

FR 5264. Advanced Forest Management Planning. (2 cr; QP–5270 or #; SP–4471 or #) Strengths and weaknesses of modeling tools used in forest planning. Emphasis on problem sets and applications ranging from stand-level management to regional timber supply analyses and landscape-level planning. Review of recent literature and practical problems with implementation.

FR 5404. Fundamentals of Natural Resource Education. (1-2 cr) For elementary teachers and others with instructor permission. Focus on understanding the forest community, the tools used by foresters, and awareness of effective forest management practices. Forestry-related indoor and outdoor activities which can be translated for classroom use.

FR 5412. Advanced Remote Sensing. (3 cr; QP–5262 or #; SP–4262) Provides fundamental and working knowledge of biophysical-quantitative remote sensing and its applications to monitoring environmental and natural resources. Includes experience working with digital remote sensing data, models, and image processing.

FR 5700. Colloquium in Natural Resources. (1-3 cr; QP–Varies with topic; SP–Varies with topic) Colloquium in specialized topics in natural resources.


FR 8107. Seminar: Forest Resources. (1 cr) Assigned topics, problem analyses, and research reports.

FR 8201. Research Problems: Forest Economics. (1-5 cr) 
Independent research under faculty guidance.

FR 8202. Research Problems: Forest Measurements. (1-5 cr) 
Independent research under faculty guidance.

FR 8203. Research Problems: Forest Recreation. (1-5 cr) 
Independent research under faculty guidance.

FR 8204. Research Problems: Forest Policy. (1-5 cr) 
Independent research under faculty guidance.

Independent research under faculty guidance.

FR 8206. Research Problems: Forest Management. (1-5 cr) 
Independent research under faculty guidance.

FR 8207. Economic Analysis of Forestry Projects. (2 cr; A-F only) 
Economics of public and private forestry and watershed management projects; analysis of commercial profitability and benefit-cost analysis; preparation of feasibility studies; case studies presented and developed.

FR 8208. Research Problems: Environmental Learning and Leadership. (1-5 cr; SP-#) 
Independent research under faculty guidance.

Forestry (Fors)

Department of Forest Resources
College of Natural Resources

Fors 8333. FTE: Master’s. (1 cr; SP-Master’s student, adviser and DGS consent)

Fors 8444. FTE: Doctoral. (1 cr; SP-Doctoral student, adviser and DGS consent)

Fors 8566. Doctoral Pre-Thesis Credits. (1-18 cr; SP-Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Fors 8777. Thesis Credits: Master’s. (1-18 cr; SP-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Fors 8888. Thesis Credits: Doctoral. (1-18 cr; SP-Max 18 cr per semester or summer; 24 cr required)

French (Fren)

Department of French and Italian
College of Liberal Arts

Fren 5251. Promenades Poétiques: The Subject in Motion. (3 cr; SP-3111 or above) 
The search for the subject in poetry and poetic prose as revealed through the motif of the “promenade” and experimentation with literary forms.

Fren 5261. The Returns of Tragedy. (3 cr; SP-3111 or above) 
Tragedy as dramatic form in relation to social order, myth and history, and theatre.

Fren 5271. “To Change or Not to Change?: Speculations on (Post) Modern French Texts. (3 cr; SP-3111) 
The meaning and purpose of the notion of “change” in French novels. Explore how a multiplicity of causes produces major changes in an individual’s personal and public life. The notion of change as it relates to financial and intellectual speculation.

Fren 5301. Critical Issues in French Studies. (3 cr; SP-# for undergrads) 
Introduces the methods of interpretation and critical debates that have shaped and continue to define the discipline of French studies. Provides a practical introduction to graduate-level literary research.

Fren 5479. Post/Colonial Francophone Literatures. (3 cr; SP-3111 or above) 
Francophone literature from North Africa, Africa, and the Caribbean of the colonial and/or post-colonial eras in the light of relevant literary and cultural theories.

Fren 5501. Structure of French: Phonology. (3 cr; SP-§3501; Ling 3001 or 5001, grad student, #) 
Advanced study of the sound system of contemporary French.

Fren 5502. Structure of French: Morphology and Syntax. (3 cr; SP-§3502; 5501 or #) 
Linguistic study of contemporary French word forms (inflectional and derivational morphology); introduction to French syntax (linguistic study of grammar) and characteristic syntactic constructions.

Fren 5531. Sociolinguistics of French. (3 cr; SP-§3531; Ling 3001 or 5001, grad student) 
Explores variation in the use of French associated with factors such as medium (oral/written), style (formal/informal), region, social and economic groups.

Fren 8111. Introduction to Old French. (3 cr) 
Studies in medieval French: instruction in reading Old French, sources of bibliography, and topics in medieval studies (language and literature). Taught in French.

Fren 8112. Early Medieval French Literature. (3 cr; SP-8111) 
Introduction to epic, romance, allegory, and theater in Old French readings (12th-13th centuries). Taught in French.

Fren 8113. Later Medieval French Literature. (3 cr; SP-8111 or #) 
Study of a problem presented by texts written in France ca. 1300-1500. Evolution of Middle French language.

Fren 8114. Old Provençal Language and Literature. (3 cr) 
Language and literature of Old Occitan (Old Provençal), chiefly troubadours’ poems. Some language instruction, reading of poems and other works, and consideration of nature and origins of “courty love.” Knowledge of French, Spanish, or Italian desirable. Taught in English.

Fren 8201. Narrative, History, and Memory. (3 cr) 
Significance of the narrative paradigm in literature, history, and cultural memory.

Developments in 20th-century drama and performance in relation to French theatrical tradition, post-1945 avant-garde innovation, and interculturalism in contemporary theater.

Fren 8250. Critical Issues: Poetry. (3 cr [max 12 cr]) 
Significant critical issues relating to poetic writing of selected authors or periods.

Fren 8260. Critical Issues: Theatre. (3 cr [max 12 cr]) 
Significant critical issues relating to dramatic writing of selected authors or periods.

Fren 8270. Critical Issues: Prose. (3 cr [max 12 cr]) 
Significant critical issues relating to prose writing of selected authors or periods.

Fren 8271. The Novel of the Ancient Regime. (3 cr) 
Considers major novels of the 17th and 18th centuries in connection with developments in such areas as esthetic theory, intellectual currents, social transformations, and reading practices.

Fren 8290. Critical Issues: Perspectives on an Author. (3 cr [max 12 cr]) 
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 8291L. Jean Genet’s Writings and French Institutions. (3 cr) 
Jean Genet’s writings at the crossroads of several disciplines (politics, psychoanalysis, religion, and law). Genet’s novels, dramas, and political essays explore the power of institutional settings and strategies imagined by individuals to short-circuit their impact.

Fren 8333. FTE: Master’s. (1 cr; SP-Master’s student, adviser and DGS consent)

Fren 8371. The Rule of Reason, The Reign of Madness: Readings in Early Modern France. (3 cr) 
Relationship between construction of reason and madness in philosophy, legitimation of political rule, and the institution of literature in early modern France.

Fren 8401. Seminar in Quebecois Literature. (3 cr) 
Quebecois writing as a literature of its own, not simply as part of Canadian literature. It is studied in relation to other North American literatures and to Francophone literature produced elsewhere in the world.

Fren 8444. FTE: Doctoral. (1 cr; SP-Doctoral student, adviser and DGS consent)

Fren 8521. History of the French Language. (3 cr) 
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. (1-18 cr; SP-Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Fren 8777. Thesis Credits: Master’s. (1-18 cr; SP-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Fren 8888. Thesis Credits: Doctoral. (1-18 cr; SP-Max 18 cr per semester or summer; 24 cr required)

French and Italian (FrIt)

Department of French and Italian
College of Liberal Arts

FrIt 5257. Passionate Beings: Literary and Medical Problematics in Italy and France from 1800 to the Present. (4 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 subjectivity, responsibility, order. Taught in English.

FrIt 5999. Teaching of French and Italian: Theory and Practice. (3 cr) 
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.

Genetics and Cell Biology (GCB)

Department of Genetics and Cell Biology
College of Biological Sciences

GCB 5034. Intermediate Molecular Genetics. (3 cr; QP-Biol 5003, Biol 5004; SP-Biol 4003, Biol 4004) 
Molecular genetics of prokaryotes and eukaryotes concentrating on characterization and regulation of expression of genes, and techniques used to study gene expression. For advanced bioscience undergraduates and for graduate students not majoring in molecular genetics.
Courses

GCB 5036. Intermediate Cell Biology. (3 cr; QP- Biol 5004 or SP–Grad MCDG major or #) Current literature in cell biology with overview of discussed topics. Selected scientific papers illustrate new concepts in, and experimental approaches to cell organization and function. Topics vary but include regulation of gene expression in procaroytes, regulation of gene expression in eucaryotes, chromatin structure and transcription, organellar gene expression. Current scientific research.

GCB 8910. Journal Club. (1 cr [max 4 cr]; SP–Grad MCDG major or #) Critical evaluation of selected current literature.

GCB 8912. Genetic Counseling in Practice. (4 cr; SP–MCDG MS student with genetic counseling specialization or #; A-F only) Practical genetic counseling, communicating genetics and medical information to the family, helping families with decision making.

GCB 8913. Psychosocial Issues in Genetic Counseling. (3 cr; SP–MCDG MS student with genetic counseling specialization or #; A-F only) Interviewing skills, supportive counseling, and case-study analysis specific to genetic counseling.

GCB 8914. Ethical and Legal Issues in Genetic Counseling. (3 cr; SP–MCDG MS student with genetic counseling specialization or #; A-F only) Professional ethics; ethical and legal concerns with new genome technologies.

GCB 8920. Special Topics. (1-4 cr [max 8 cr]; SP–Grad MCDG major or #) Independent research determined by student’s interests, in consultation with faculty mentor.

GCB 8933. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

Geography (Geog)

Department of Geography

Geog 5143. Geography of West Africa. (3 cr) West Africa from Senegal to Cameroon; social geography of resource use, population, settlement, economic development, and international relations.

Geog 5145. Development in Africa. (3 cr; SP–Afro 5145) Economic, political, and social development in Africa from independence to the present. Emphasis on reordering colonial landscapes, bases for North-South relations, big power intervention, and participation in the world economy.


Geog 5211. East Asia. (3 cr; SP–3211, 6EAS 3211) Open to graduate students in East Asian Studies and other disciplines who wish to study the region from a geographical perspective. Research paper. Meets with Geog 3211.

Geog 5215. Geography of China. (3 cr; SP–3215) Open to graduate students in East Asian Studies and other disciplines who wish to study the region from a geographical perspective. Research paper. Meets with Geog 3211.


Geog 5371. American Cities: Population and Housing. (4 cr; SP–3MA 5201, A-F only) Emergence of North American cities; residential building cycles, density patterns; metropolitan housing stocks, supply of housing services; population and household types; neighborhood-level patterns of housing use; housing prices; intraurban migration; housing submarkets inside metro areas; emphasis on linking theory, method, case studies.

Geog 5372. American Cities II: Economy, Land Use and Transportation. (4 cr; SP–3PA 5202, A-F only) Urban economy and its locational requirements; central place theory; transportation and urban land use, patterns and conflicts; industrial and commercial land blight; real estate redevelopment; historic preservation; emphasis on links between land use, transportation policy, economic development, and local fiscal issues; U.S.–Canadian contrasts.
Geog 5374. The City in Film. (4 cr; SP–5374) Meets with Geog 5724 (5th-9th San Francisco description). Open to graduate students and undergraduates wishing Honors credit. Course includes one additional weekly meeting to discuss films and readings, and a project on a topic selected in consultation with the instructor.

Geog 5385. Political Economy of Development. (3 cr; SP–5385) Nature and scope of the modern world system (capitalism) and its impact on regional development processes; roles of the state and international financial institutions.

Geog 5393. The Rural Landscape. (3 cr) Analysis of the three principal components of the rural landscape (the form of the land surface, the plant life that cloaks it, and the structures that people have placed upon it). Emphasis on structures associated with agriculture including some discussion on mining, forestry, resort areas, and small towns.

Geog 5401. Introduction to Atmospheric Science. (3 cr; SP–5401) 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 5411. Geography of Health and Health Care. (3 cr; SP–5411) 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 5423. Climate Models and Modeling. (3 cr; SP–5423) Survey of development and research with simple and complex (three-dimensional) climate models. Environmental processes and their numerical representation in climate models; evaluation of model sensitivity and accuracy; coupling between atmosphere, biosphere, hydrosphere, and cryosphere; assessment of model predictions for climate change.

Geog 5426. Climatic Variations. (3 cr; SP–5426) 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 5441. Quaternary Landscape Evolution. (3 cr; SP–5441) Roles of climate change, geomorphic history, vegetation change, and soil development in the evolution of landscape patterns during the Quaternary Period, with emphasis on North America.

Geog 5444. Water Resources, Individuals and Institutions. (3 cr; SP–5444) How water resources are controlled by natural system functions, user actions, and the influence of social and political institutions. Explore how these three levels of control vary in space and time, paying particular attention to the complexities of each of these controls and the feedbacks among them.

Geog 5511. Advanced Cartography. (3 cr; SP–5511) Advanced topics on data sources for mapping; history of thematic cartography (focused on 19th-century European activity); multivariate classification and symbolization; models for cartographic generalization, spatial interpolation, and surface representation; principles of animated and multimedia cartography.

Geog 5512. Cartography: Topics. (3 cr; SP–5512) Selected topics include the system of cartographic communication, map design, map reading, map analysis, history of cartography.

Geog 5530. Cartography Internship. (2–7 cr; max 10 cr) Provides intensive hands-on experience in contemporary map production and design, ranging from GIS applications to digital prepress. Strong computer skills essential.

Geog 5561. Principles of Geographic Information Science. (4 cr; SP–5561) 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 5562. Geographic Information Science and Analytical Cartography. (3 cr; SP–5562) Topics include algorithms and data structures for digital cartographic data, topological relationships, surface modeling and interpolation, map projections and geometric transformations, numerical generalization, and raster and vector processing. Hands-on experience using a variety of software packages.


Geog 5564. Urban Geographic Information Science and Analysis. (3 cr; SP–5564) 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 Environmental Systems and Global Change. (3 cr; SP–5565) Applications of geographic information systems and other spatial analysis tools to the analysis of environmental systems patterns, dynamics, and interactions. Focus on global to landscape databases developed to analyze atmospheric, hydropheric, geomorphic, pedologic, biologic, and human land use systems.

Geog 5588. Multimedia Cartography. (3 cr; SP–5588) Minimum of 3 geog courses including one cartography course or advanced standing in an allied field such as landscape architecture or.

Conceptualizing geographic topics in animatable form, selecting appropriate animation metaphors for specific ideas, using standard graphic software to prepare images for computer display and animation.

Geog 5605. Geopolitical Perspectives on Planning. (4 cr; SP–5605) Open to graduate students and undergraduates wishing Honors credits. Includes one additional weekly seminar-style meeting and a bibliography project on a topic selected in consultation with the instructor. Meets with 3605.

Geog 5701. Field Research. (3 cr; SP–5701) Field investigation in physical, cultural, and economic geography; techniques of analysis and presentation; reconstruction of environments.

Geog 5724. Meanings of Place. (3 cr; SP–5724) Analysis of the messages and meanings of our natural and built surroundings. Considers place-based responses to urban and rural settings based on aesthetic, historic, social, personal, and design perspectives. Uses extensive project and field work components and involves significant writing.

Geog 5775. Geographic Education. (3 cr; SP–5775) Three courses in geography or history or social sciences or education or Teaching geography from middle school up; pedagogical use of geographical themes; methods for effective teaching of multiple cognitive domains— facts, theories, analytical skills, and evaluations; designing audio-visual aids, independent projects, simulations, etc. to meet National Standards in geography.

Geog 5900. Topics in Geography. (3 cr; max 9 cr) Sr or grad student or #) Special topics and regions. Course offered by visiting professors in their research fields.


Geog 8002. Proseminar: The State, the Economy, and Spatial Development. (3 cr; SP–8002) Introduction to research in economic, political, and urban geography; conceptual research addressing interrelationship between political and economic processes and spatial dynamics of urban and regional development; empirical research documenting nature and extent of this interrelationship at different spatial scales.

Geog 8003. Proseminar: Historical Geography. (3 cr; SP–8003) Introduction to conceptual research and empirical studies.

Geog 8004. Proseminar: Physical Geography. (3 cr; SP–8004) Historical development of research in physical geography, current research trends, and transfer of current research to undergraduate education.

Geog 8005. Proseminar: Population Geography. (3 cr; SP–8005) Conceptual literature and empirical studies on fertility, mortality, and migrations in different parts of the world.

Geog 8006. Proseminar: Research Methods in Geography. (3 cr; SP–8006) Introduction to research design, strategies, methods of data collection, analysis, interpretation, and representation in contemporary geographic research.

Geog 8007. Proseminar: Theories of Development and Change. (3 cr; SP–8007) 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 8010. Research Seminar: Theoretical Geography. (3 cr; SP–8010) Advanced topics, which vary with interests of faculty offering course; contemporary theoretical and philosophical themes transcending subdisciplines of human and physical geography.

Geog 8020. Research Seminar: Economic Geography. (3 cr; SP–8020) Advanced topics, which vary with interests of faculty offering course.

Geog 8120. Seminar: Historical Geography. (3 cr; SP–8120) Contemporary research. Advanced topics, which vary with interests of faculty offering course.

Geog 8140. Seminar: Africa. (3 cr; SP–8140) Advanced topics, which vary with interests of faculty offering course.

For definitions of course numbers and symbols, see inside back cover.
Courses

Geog 8200. Seminar: East Asia/China. (3 cr; SP–#) Contemporary research. Advanced topics, which vary with interests of faculty offering course.

Geog 8210. Seminar: South Asia. (3 cr) Advanced topics, which vary with interests of faculty offering course.

Geog 8300. Geographic Writing. (3 cr; SP–#) N only) Analysis of organization and presentation of geographic research. Critiques of selected examples of geographic writing.

Geog 8302. Research Development. (3 cr; SP–#) N only) Students in geography and related social sciences are guided in key steps to effective research proposal writing.

Geog 8310. Seminar: Social and Cultural Geography. (3 cr; SP–#) Role of space and place in constitution of social and cultural life, social relations, and social identities; class, space, and place; geography of race and racism; environmental racism; geography of gender and sexuality; nationalism, national identity, and territory.

Geog 8320. Seminar: Considering Space and Place. (3 cr; SP–#) Aspects of place analysis/place description from variety of analytical and perceptual perspectives.

Geog 8330. Seminar: Rural Geography. (3 cr; SP–#) N only) Sources of data and other information necessary for an understanding of rural areas in the United States.

Geog 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

Geog 8335. Agrarian Change and Rural Development. (3 cr; A-F only) Contours of agricultural and rural development in the Third World; theories of agrarian transformation and rural development; role of agriculture in economic development; peasant economy; the nature and role of state intervention in rural sector.

Geog 8340. Seminar: Land Use Planning. (3 cr; SP–#) Topics of contemporary research, which vary with interests of faculty offering course.

Geog 8344. Environmental Policy. (3 cr; SP–#) U.S. environmental policies at the federal and state level; policy formulation, implementation, and evaluation.

Geog 8350. Seminar: World Population. (3 cr; SP–#) Contemporary research in world population development and problems. Topics vary with interests of faculty offering course.

Geog 8380. Seminar: Medical Geography. (3 cr; SP–#) N only) Geographic inquiry concerning selected problems of health and health care.

Geog 8400. Seminar: Physical Geography. (3 cr; SP–#) Topics of contemporary research, which vary with interests of faculty offering course.

Geog 8420. Seminar: Climatology. (3 cr; SP–# A-F only) Sample topics: climate modeling, climatic variability, climate change and predictability, severe local storms, drought, energy balance, urban climate, statistical climatology.

Geog 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

Geog 8510. Seminar: Geographic Information Systems (GIS) and Cartography. (3 cr; SP–#) Selected concepts and 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 and animated cartography; incorporation of uncertainty.

Geog 8520. Seminar: Geographic Information Systems (GIS) and Society. (3 cr; SP–#) Relationships between practice of GIS and political, economic, legal, and institutional structures of society; effects of GIS on society; nontraditional spaces in GIS; GIS and local decision making; privacy issues.

Geog 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Geog 8777. Thesis Credits: Masters. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Geog 8800. Seminar: Development of Geographic Thought. (3 cr; SP–#) Topics vary with interests of faculty offering course.

Geog 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Geog 8970. Directed Readings. (1-5 cr)

Geog 8980. Topics in Geography. (1-3 cr; SP–#) Seminar offered by visiting or regular faculty. Topics vary with interests of faculty.

Geog 8990. Research Problems in Geography. (1-5 cr) Individual research projects.

Geological Engineering (GeoE)

Department of Civil Engineering
Institute of Technology

GeoE 5311. Experimental Geo mechanics. (3 cr; QP–IT upper div or grad student, 5503; SP–IT upper division or grad student; 4301, CE 4301, or # A-F only) Machine stiffness; closed-loop testing. Small-strain theory. Measurement of deformation, strain gages, LVDTs, accelerometers, and associated circuits. Direct and indirect measurement. Material behavior: experiments on anisotropic, damaged, and fluid-filled solids.

GeoE 5321. Geomechanics. (3 cr; QP–CE 3300, CE 5301; SP–IT upper division or grad student; 4301, CE 4301 or # A-F only) Review of elasticity theory and solution of some elastic boundary value problems relevant to geomechanics. Wave propagation in unbounded elastic media. Elements of fracture mechanics and applications. Elements of poroelasticity and applications.

GeoE 5331. Geomechanics Modeling. (3 cr; QP–CE 5301; SP–IT upper division or grad student; 4301, CE 4301 or # A-F only) Soil and rock response in triaxial testing: drained and undrained behavior; elastic and plastic properties. Modeling stresses, strains, and failure in geomechanics problems.

GeoE 8300. Seminar: Geomechanics. (1 cr [max 4 cr]; SP–#) Presentations on various topics.


GeoE 8311. Advanced Rock Mechanics. (3 cr; QP–5302; SP–5331, CE 5331 or # IT grad student; A-F only) 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.


GeoE 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

GeoE 8336. Boundary Element Methods I. (3 cr; QP–AEM 3016; SP–IT grad student or # A-F only) 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.

GeoE 8337. Boundary Element Methods II. (3 cr; QP–8336 or CE 8336; SP–8336, CE 8336 or # A-F only) Transient and nonlinear problems.

GeoE 8351. Advanced Groundwater Mechanics I. (3 cr; QP–CE 5425; SP–4351, IT grad student or # A-F only) Solution transport, shallow flow in leaky aquifers; complex variable methods in groundwater flow; analytic element method: potentials for line sinks, line doublet, line dipoles, area sinks, and special analytic elements; singular Cauchy integrals; analytic elements in domains with closed boundaries.

GeoE 8352. Advanced Groundwater Mechanics II. (3 cr; QP–CE 5425; SP–4351 or CE 4351, IT grad student or # A-F only) Applying complex methods, including conformal mapping, in groundwater mechanics; solving problems with free boundaries using the hodograph method; drains in aquifers with free boundaries; superposition of solutions with drains; singular Cauchy integrals; boundary elements.

GeoE 8361. Engineering Model Fitting. (3 cr; SP–IT grad student or # A-F only) Parameter estimation and inverse modeling for civil engineering problems. Theorems of linear and nonlinear estimation. Various fit criteria; implementing numerical model fitting problems; comparing and selecting various fit criteria; implementing numerical algorithms; analyzing and interpreting results using both statistical and qualitative tools; designing future measurement plans.

GeoE 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

GeoE 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Geo 5301. Aqueous Geochemistry. (3 cr; QP-Chem 5901 or SP-Chem 3501 or QP-Chem 3502) General principles of solution chemistry with application to geochemistry, including solution-mineral equilibria, redox processes in natural waters, geochemistry of hydrothermal fluids, and environmental geochemistry.

Geo 5302. Isotope Geology. (3 cr; QP-3301 or #; SP-2303 or #; A-F only) Theory and uses of radioactive, radiogenic, and stable isotopes in geology. Radioactive dating, geothermometry, and tracer techniques in geologic processes.

Geo 5353. Electron Microprobe Theory and Practice. (2-3 cr; QP-3401, one yr chem and physics or #; SP-2301, one yr chem and physics or #) Theory and practice of characterizing solid materials with electron beam instrumentation, including the reduction of X-ray data to chemical compositions.

Geo 5502. Advanced Structural Geology. (3 cr; QP-5201 or #; SP-4501 or #) Analysis of structures and fabric of deformed rocks. Determination of stresses and strain in rocks and of evolution of these with time. Deformation mechanisms. Extensive reading in journal literature. Field trips.

Geo 5601. Advanced Sedimentology. (4 cr; QP-5653 or #; SP-4602 or #) Modern techniques of sedimentary basin analysis focusing on interactions among the lithosphere, atmosphere, and hydrosphere. Sedimentary facies of modern and ancient systems, petrology of clastic and carbonate deposits, tectonic and paleoclimatic interpretations, paleocurrent analysis, diagenetic effects on subsurface fluid flow, and volcanic sedimentation.

Geo 5503. Dinosaur Evolution for Teachers. (3 cr; QP-1003; ed degree; SP-1003; ed degree) Dinosaurs and Mesozoic Earth used to introduce evolution, plate tectonics, climate change, and organic evolution leading to present ecosystem. Impact of hominid evolution on Earth systems and geological processes on human society. Required project designed to enhance ability to teach Earth history to K-12 students.

Geo 5504. Oceanography for Teachers. (3 cr; QP-1601; ed degree; SP-1006; ed degree) How various processes in the ocean interact. Marine biology, waves, tides, chemical oceanography, marine geology, and human interaction with the sea. Labs include study of live marine invertebrates, manipulation of oceanographic data, and discussion using videos showing unique aspects of ocean research. Required design of modules for presenting course material to elementary or secondary school students.

Geo 5108. Principles of Environmental Geology. (3 cr; QP-Geo core courses through 5201 or equiv or #; SP-Geology major core curriculum through 4500 or #; nonmajors 1001 or #) Human impact on geological environment and effect of geology/geologic processes on human life from an ecosystems and biogeochemical cycles perspective. Geologic limits to resources and carrying capacity of Earth. Land use planning, environmental impact assessment, ecogeologic world models. Field project and trip.

Geo 5201. Time-Series Analysis of Geologic Phenomena. (3 cr; QP-Math 5221 or #; SP-Math 2263 or #; A-F only) Time-series analysis of linear and nonlinear geologic 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 geophysical phenomena.

Geo 5202. Geothermal Thermomechanical Modeling. (3 cr; QP-Math 3261 or #; SP-Math 2263 or #; A-F only) Concept of heat and mass transfer processes in Earth’s crust and mantle. Quantitative study of thermomechanical phenomena. Emphasis on analytical and modern numerical techniques.


Geo 5301. Aqueous Geochemistry. (3 cr; QP-Chem 5901 or SP-Chem 3501 or QP-Chem 3502) General principles of solution chemistry with application to geochemistry, including solution-mineral equilibria, redox processes in natural waters, geochemistry of hydrothermal fluids, and environmental geochemistry.

Geo 5302. Isotope Geology. (3 cr; QP-3301 or #; SP-2303 or #; A-F only) Theory and uses of radioactive, radiogenic, and stable isotopes in geology. Radioactive dating, geothermometry, and tracer techniques in geologic processes.

Geo 5353. Electron Microprobe Theory and Practice. (2-3 cr; QP-3401, one yr chem and physics or #; SP-2301, one yr chem and physics or #) Theory and practice of characterizing solid materials with electron beam instrumentation, including the reduction of X-ray data to chemical compositions.

Geo 5502. Advanced Structural Geology. (3 cr; QP-5201 or #; SP-4501 or #) Analysis of structures and fabric of deformed rocks. Determination of stresses and strain in rocks and of evolution of these with time. Deformation mechanisms. Extensive reading in journal literature. Field trips.

Geo 5601. Advanced Sedimentology. (4 cr; QP-5653 or #; SP-4602 or #) Modern techniques of sedimentary basin analysis focusing on interactions among the lithosphere, atmosphere, and hydrosphere. Sedimentary facies of modern and ancient systems, petrology of clastic and carbonate deposits, tectonic and paleoclimatic interpretations, paleocurrent analysis, diagenetic effects on subsurface fluid flow, and volcanic sedimentation.

Geo 5503. Dinosaur Evolution for Teachers. (3 cr; QP-1003; ed degree; SP-1003; ed degree) Dinosaurs and Mesozoic Earth used to introduce evolution, plate tectonics, climate change, and organic evolution leading to present ecosystem. Impact of hominid evolution on Earth systems and geological processes on human society. Required project designed to enhance ability to teach Earth history to K-12 students.

Geo 5504. Oceanography for Teachers. (3 cr; QP-1601; ed degree; SP-1006; ed degree) How various processes in the ocean interact. Marine biology, waves, tides, chemical oceanography, marine geology, and human interaction with the sea. Labs include study of live marine invertebrates, manipulation of oceanographic data, and discussion using videos showing unique aspects of ocean research. Required design of modules for presenting course material to elementary or secondary school students.
German

Department of German, Scandinavian, and Dutch

College of Liberal Arts

Ger 5011. Advanced Conversation and Composition. (3 cr; SP-3012)
Helps graduate and advanced undergraduate students achieve high proficiency in writing and speaking professional and academic German.

Ger 5016. Advanced Translation: Theory and Practice. (3 cr; SP-3016 or #)
Translation theory, related issues in stylistics, philosophy of language; sample translations; student production of translations with methodological commentary.

Ger 5101. Analysis of German. (3 cr; SP-1004, Ling 3001 or Ling 5001 or #)
Phonology, morphology, and syntax of standard German.

Ger 5410. Topics in German Literature. (3 cr; SP-3104 or equiv)
A single topic on a specific author, group of authors, genre, period, or subject matter. Topic specified in Class Schedule.

Ger 5510. Topics in Contemporary German Culture. (3 cr; SP-3104 or equiv)
A single topic of contemporary German culture explored in depth.

Ger 5610. German Literature in Translation. (3 cr; SP-No knowledge of German required; cr toward major or minor requires reading in German)
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 cr; SP-3xxx film course or #)
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 cr; SP-3xxx or SP-3012)
Historical development of German from the beginnings to 1450.

Ger 5712. History of the German Language II. (3 cr; SP-5711)
Historical development of German from 1450 to 2000.

Ger 5721. Introduction to Middle High German. (3 cr)
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 cr; SP-5721)
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 cr)
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 cr; SP-5731)
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 cr)
Study of the poetry of Old Saxon. Detailed investigation of Old Saxon in comparison with the other Old Germanic languages.

Ger 5740. Readings in Philology. (3 cr)
Philological analysis of a chosen text in any medieval Germanic language.

Ger 5771. Early New High German. (3 cr)
Reading and analysis of Early New High German texts. Formal description of Early New High German phonology, morphology, syntax.

Ger 5781. Varieties of Modern German. (3 cr; SP-5101)
Lexical, syntactic, and phonological variations examined using contemporary methods of dialectology and sociolinguistics.

Ger 5801. German Script Since 1500: Readings. (3 cr)
Handwriting and printed book scripts will be read, 1500-2000.

Ger 5993. Directed Studies. (1-4 cr; max 12 cr; SP- & A, Q)
Guided individual reading or study.

Ger 8002. Basic Seminar in German Studies. (3 cr)
Theory and methods applicable in study of German literature and culture; introduction to bibliography and research skills; guided research projects.

Ger 8200. Seminar in Medieval German Literature and Culture. (3 cr; max 9 cr; SP-5721)
Topics on 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 cr; max 9 cr)
Topics on 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 cr; max 9 cr)
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 cr; max 9 cr)
Examination of an author, issue, or movement, using a variety of critical approaches.

Ger 8240. Seminar in 20th-Century German Literature and Culture. (3 cr; max 9 cr; A-F only)
Topics on literature, film, or other forms of “high” and popular culture.

Ger 8300. Topics in Literature and Cultural Theory. (3 cr; max 9 cr)
Authors, themes, movements, and social issues from 1700 to present. Focus varies.

Ger 8333. FTE: Master’s. (1 cr; SP-Master’s student; adviser and DGS consent)

Ger 8444. FTE: Doctoral. (1 cr; SP-Doctoral student, adviser and DGS consent)

Ger 8866. Doctoral Pre-Thesis Credits. (1-18 cr; SP-Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Ger 8700. Philological Seminar. (3 cr; max 9 cr)
Sample topics: history of Germanic tribes, history of scholarship in Germanic philology, Germanic dialects.

Ger 8701. Philological Seminars I: Bibliography. (3 cr; A-F only)
Introduction to bibliography emphasizing Germanic medieval languages and literatures and medieval Latin. See Scan 8702 for Philological Seminars II: History of Germanic Philology.

Ger 8741. Gothic and Methods of Comparative Reconstruction I. (3 cr)
The oldest extant Germanic language and the prehistory of Germanic group of languages.

Ger 8742. Gothic and Methods of Comparative Reconstruction II. (3 cr; SP-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 cr; A-F only)
Introduction to techniques of reading and transcribing medieval German and Latin manuscripts.

Ger 8752. Medieval Text Editing. (3 cr)
Introduction to techniques of historical text-critical editing of medieval Germanic and Latin manuscripts.

Ger 8793. Germanic Philology Directed Study. (1-3 cr; max 12 cr; SP- & A)

Ger 8810. Feminist Literary Theory and History. (3 cr; max 9 cr)
Cultural, historical, and literary examination of writings of German women, 18th-20th centuries, and feminist theoretical tools used to analyze their work.

Ger 8820. Seminar: Advanced Theory. (3 cr; max 9 cr)
Topic in critical thought, e.g., the Frankfurt School, structuralism, reception theory.

Ger 8888. Thesis Credits: Doctoral. (1-18 cr; SP-Max 18 cr per semester or summer; 24 cr required)

Ger 8894. Directed Research. (1-3 cr; max 12 cr; SP- & A; may be taken as tutorial with #)

German, Scandinavian, and Dutch (GSD)

Department of German, Scandinavian, and Dutch

College of Liberal Arts

GSD 5103. Teaching of Germanic Languages. (4 cr)
Second language acquisition theory, methods, testing, and technology applicable to teaching of modern Germanic languages.

GSD 8801. Dissertation Seminar. (3 cr)
For doctoral students in German and Scandinavian studies who are beginning to establish topics and do research for their dissertations. Discussion of a variety of topics related to this process as well as presentation of some written work.

GSD 8802. Dissertation Writing Seminar. (3 cr; SP-8801, successful completion of doctoral prelim exams)
Provides a critical, supportive forum for the discussion of problems and issues related to the dissertation research and writing process. Required for doctoral students who are writing their dissertations.

Germanic Philology (GPhl)

Graduate School

GPhl 8333. FTE: Master’s. (1 cr; SP-Master’s student, adviser and DGS consent)

GPhl 8444. FTE: Doctoral. (1 cr; SP-Doctoral student, adviser and DGS consent)

GPhl 8866. Doctoral Pre-Thesis Credits. (1-18 cr; SP-Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

GPhl 8877. Thesis Credits: Master’s. (1-18 cr; SP-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

GPhl 8888. Thesis Credits: Doctoral. (1-18 cr; SP-Max 18 cr per semester or summer; 24 cr required)
Gerontology (Gero)

Graduate School

Gero 5105. Multidisciplinary Perspectives on Aging. (3 cr)
Sociological, psychological aspects of aging; theories of aging; death and bereavement; issues and problems of older adults in America; human services and their delivery systems (health, nutrition, long-term care, education); public policy and legislation; environment and housing; retirement.

Gero 8200. Seminar in Gerontology. (1 cr; SP- #)
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.

Graduate School (Grad)

Grad 8101. Teaching in Higher Education. (3 cr)
Teaching methods and techniques conveyed through experiential learning, readings, discussion, peer teaching, e-mail dialog, reflective writing, co-facilitation of course. Focus on active learning, critical thinking, practice teaching, and preparation of a portfolio to document and reflect upon teaching.

Grad 8102. Practicum for Future Faculty. (3 cr; SP- 8100 or equiv; SP- 8101 or equiv; S-N only)
Collegial support for teaching; faculty mentorship at regional college or university; investigation of faculty role at variety of institutions, classroom observation and feedback, preparation for academic job search. Non-native English speakers must pass University proficiency exam.

Greek (Grk)

Department of Classical and Near Eastern Studies

College of Liberal Arts

Grk 5012. Prose Composition. (3 cr)
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 5013. Advanced Composition. (3 cr; SP- 5012 or #)
Detailed study of English-to-Greek verse composition and/or the writing styles of individual Greek authors.

Grk 5032. Text Criticism. (3 cr; SP- Greek 3114)
Theory and practice. Elements of paleography and manuscript study. Basic tools for analyzing a textual apparatus with some independence; constructing a critical edition of a literary text.

Grk 5121. Biblical and Patristic Greek. (3 cr; SP- 3114 or 3120)
Septuagint, Philo, Josephus, New Testament, Apostolic Fathers, and other patristic literature to 5th century C.E. Reading and discussion of selected texts in the major genres.

Grk 5310. Greek Literature: Oratory. (3 cr [max 9 cr])
One or more appropriate authors studied in a given course.

Grk 5320. Greek Literature: Tragedy. (3 cr [max 9 cr])
Reading of Greek tragedy on advanced level.

Grk 5330. Greek Literature: Comedy. (3 cr [max 9 cr])
Advanced readings in Greek comedy.

Grk 5340. Greek Literature: History. (3 cr [max 9 cr])
Advanced readings from the Greek historians; traditions of Greek historiography.

Grk 5350. Greek Literature: Philosophy. (3 cr)
Read one or more works of Plato or Aristotle in the original Greek and find out what they really mean. Selections vary with each offering.

Grk 5360. Religious Texts. (3 cr [max 9 cr])
Reading and discussion of religious texts from Greek antiquity, such as the Homeric Hymns, cultic verse, aretaology, sacred tales, oracle texts.

Grk 5370. Greek Literature: Epic. (3 cr [max 9 cr])
Reading of classical Greek epic on an advanced level.

Grk 5380. Greek Literature: Lyric. (3 cr [max 9 cr])
Selections from the Greek lyric poets.

Grk 5390. Greek Literature: Romance. (3 cr [max 9 cr])
Selections from the Hellenistic Romances of, e.g., Chariton, Longus.

Grk 5440. Greek Literature: Later Authors. (3 cr [max 9 cr])
Selected topics in later Greek literature, especially Byzantine prose.

Grk 5450. Greek Literature: Classical Authors. (3 cr [max 9 cr])
Selected topics in classical Greek literature; topics specified in Class Schedule.

Grk 5621. Greek Paleography. (3 cr)
Analysis of various hands used in Greek manuscripts with attention to date and provenance; history of the transmission of Greek literature.

Grk 5715. Introduction to the Historical-Comparative Grammar of Greek and Latin. (3 cr; SP- or 2 yrs college Latin)
Historical and comparative grammar of Greek and Latin from their Proto-Indo-European origins to the classical norms.

Grk 5716. History of Greek. (3 cr; SP- Grk/Lat 5715 or equiv; 2 yrs Greek)
Reading and formal analysis of documents illustrating the evolution of the Greek language from Mycenaean to modern times.

Grk 5993. Directed Studies. (1-4 cr [max 18 cr]; SP- #, ∆, Q)
Guided individual reading or study.

Grk 5994. Directed Research. (1-12 cr [max 18 cr]; SP- #, ∆, Q)
Supervised original research on topic chosen by student.

Grk 5996. Directed Instruction. (1-12 cr [max 20 cr]; SP- #, ∆, Q)
Supervised teaching internship.

Grk 8120. Greek Text Course. (3 cr [max 15 cr]; SP- 3111 or ∆, not for students in dept of Classical and Near Eastern Sts) Students attend 3xxx Greek courses. Supplementary work at discretion of instructor.

Grk 8262. Survey of Greek Literature I. (3 cr)
Extensive selections from all genres of Greek literature of archaic and early classical periods.

Grk 8263. Survey of Greek Literature II. (3 cr)
Extensive selections from Greek authors of the classical and Hellenistic eras.

Grk 8333. FTE: Master’s. (1 cr; SP- Master’s student, adviser and DGS consent)

Grk 8444. FTE: Doctoral. (1 cr; SP- Doctoral student, adviser and DGS consent)

HInf 5430. Health Informatics I. (4 cr; A-F only)
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 5435. Systems Analysis and Operations Research Methods in Health Services. (3 cr; SP- #)
Models for queueing, inventory, networks, linear programming, and scheduling.

HInf 8444. FTE: Doctoral. (1 cr; SP- Doctoral student, adviser and DGS consent)

HInf 8446. Professional Studies in Health Informatics. (2 cr; SP- 5432 or #; grad hlth inf major)
Health informatics as a profession, including discipline, responsibilities, resources, and job opportunities. Directed experiences in consulting, teaching, writing, conducting research, and managing facilities.

HInf 8492. Advanced Readings in Health Informatics. (1-6 cr; SP- #)
Directed readings in topics of current or theoretical interest in medical informatics.

HInf 8494. Research in Health Informatics. (1-6 cr; SP- #)
Directed research under faculty guidance.

HInf 8666. Doctoral Pre-Thesis Credits. (1-18 cr; S-P-Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

HInf 8770. Plan B Project. (4 cr; SP- Plan B MS student, #; no cr toward PhD)
Research project. Topic arranged between student and instructor. Written report required.

HInf 8777. Thesis Credits: Master’s. (1-18 cr; SP- Max 18 cr per semester or summer; 10 cr total required [Plan A only])

HInf 8888. Thesis Credits: Doctoral. (1-18 cr; SP- Max 18 cr per semester or summer; 24 cr required)

For definitions of course numbers and symbols, see inside back cover.
Courses

Hebrew (Hebr)

Department of Classical and Near Eastern Studies
College of Liberal Arts

Hebr 5992. Directed Readings. (1-4 cr; max 12 cr; SP–3012 or #) Guided individual reading or study.

Hindi (Hndi)

Institute of Linguistics and Asian and Slavic Languages and Literatures
College of Liberal Arts

Hndi 5710. Topics in Hindi Language, Literature, and Culture. (4-5 cr)
Topics in Hindi literature or the linguistic structure of Hindi.
Hndi 5990. Directed Research. (3-5 cr; SP–#) Guided individual reading or study of modern Hindi texts.
Hndi 8790. Research. (1-5 cr; SP–#)

History (Hist)

Department of History
College of Liberal Arts

Hist 5011. Quantitative Methods for Historical Research. (4 cr; SP–#)
Basics of quantitative historical data collection, measurement, and analysis.
Hist 5035. The Germ Theory and Modern Medicine. (3 cr; SP–History of medicine or other science course recommended for undergrads)
A study of the development of the modern germ theory of disease and of its applications in medicine and public health. Emphasis will be placed on developments between 1860 and 1950.
Hist 5045. The Modern Medical Profession. (3 cr; SP–History of medicine or science course recommended for undergrads)
A comparative history of the medical professions in the United States and in selected northern European nations. Analyze the process of professionalization and the role the profession has played in western industrial societies since 1800.
Hist 5061. History of the Greek World from Earliest Times to 400 B.C. (3 cr)
Trace the history of the Greeks from their initial appearance in Greece in the Bronze Age to the close of the 5th century B.C. Emphasis on the polis, military development, and intellectual change.
Hist 5062. History of the Greek World: 400 to 30 B.C. (3 cr)
Trace the history of the Greeks from the end of the Peloponnesian War through the decline of the polis, the rise of Macedon and Alexander the Great, the fragmentation of Alexander’s empire in the Hellenistic World and the eventual Roman take over of that world.
Hist 5111. Proseminar in the History of Medieval Europe. (3 cr; SP–Advanced undergrads of exceptional ability or grads, #–A-F only)
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 cr; SP–Reading knowledge of Latin)
Writing of history in Western Europe during the Middle Ages. Focus on idea of history, philosophy of various historians, techniques of research by medieval historians and chroniclers, history as literature, and value of medieval histories to modern research scholars. Latin texts only.
Hist 5264. Imperial Russia: Formation and Expansion of the Russian Empire in the 18th and 19th Centuries. (3-4 cr)
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 cr)
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 5274. Southeastern Europe/Ottoman Empire and Successor States. (3 cr [max 3 cr])
The legacy of empires; 18th-century background; rise of Balkan nationalism; the Eastern Questions in the 18th and 19th centuries; the Balkans in the 20th century; population movements or exchanges; ethnic conflict in the Communist and Post-Communist periods.
Hist 5276. Intellectual and Cultural History of Modern Greece. (3 cr)
Literary and cultural contributions of modern Greece. The modern Greek experience seen through Greek historical and cultural monuments. An attempt at self-definition.
Hist 5294. Social History of Russia and Eastern Europe Through the 19th Century. (3 cr)
Lives of peasants and workers, nobles and merchants. Topics include family, marriage, sexuality, culture and tradition; transformation from an agricultural to a modern society.
Hist 5295. Social History of Russia and Eastern Europe From the Late 19th Century to the Present. (3 cr)
Social movements (revolutionary, nationalist, women’s; communist and post-communist societies.
Hist 5337. Criminal Justice in U.S. 1900-2000. (4 cr; SP–# or #)
Major developments in 20th-century U.S. criminal justice. The influences of ideology, culture, and social science on defining crime and on crime control policies and practices.
Hist 5379. Problems in Early American History. (3 cr)
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 cr [max 4 cr]; SP–1301, 1302)
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 5436. Social History of African Women: 1850 to the Present. (3 cr; SP–# for undergrads)
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 5446. Problems in African History. (3 cr; SP–# for undergrads)
This problem-centered course explores several of the major historiographical, methodological, and theoretical debates in West African history. Core topics include state formation, trade, slavery, Islam, gender, and colonialism.
Hist 5464. China in the Song, Yuan, and Ming Dynasties. (3 cr; SP–#; 3464, 3464A)
China during the Song (970-1279), Yuan (1279-1368) and Ming (1368-1644) dynasties, political institutions, and social structures. Attention to primary sources and how historians ask and answer questions about the past.
Hist 5465. China in the Ming and Qing Dynasties. (3 cr; SP–3465, 3465A)
Examine the political and social history of China from about 1600 until the end of the Qing dynasty in 1911. Topics include ethnicity, daily life, legal structures, city life, and peasantry.
Hist 5467. State and Revolution in Modern China. (3 cr; SP–3467, 3467A)
Modern China’s political evolution including the Taiping Rebellion, Republican Revolution, rise of Nationalist and Communist parties, Maoist era; reform under Deng Xiaoping, and the emergence of democracy in Taiwan.
Hist 5468. Social Change in Modern China. (3 cr; SP–#)
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 5473. Family, School, and Work in Modern Japanese History. (3 cr; SP–#; 3473)
Impact of economic, social, and cultural change on males and females in the family, the educational system, the employment system from the 17th century through the 20th centuries.
Hist 5501. Medieval Europe and the World. (3 cr; A-F only)
An examination of the place of medieval Europe in the world. The relations of Europe with Asia, Africa, and the Americas. European knowledge of the world’s other great cultures. European travelers and explorers. Assessment of other cultures’ knowledge of Europe in the period.
Hist 5616. Proseminar in Medieval Spain. (3 cr; SP–#; A-F only)
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.
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 5631. Proseminar: Comparative Early Modern History. (3 cr; SP–Hist grad student or # A-F only)
Critical reading of historical literature dealing with integration of the globe during the early modern period, ca. 1350-1750; book reports, class discussion.
Hist 5634. Proseminar in Medieval and Early Modern European Russia. (3 cr; SP–Some coursework in history of medieval and early modern European Russia or #; A-F only)
Selected readings covering the major studies, key primary sources, and basic interpretations of the peoples of medieval and early modern European Russia as well as an analysis of the new approaches and interpretations in the field.
Hist 5650. Proseminar: Early Modern Europe. (3 cr; #; Hist grad student or # A-F only)
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.
Courses

Hist 5652. Proseminar in Stuart England: 1603-1689. (3 cr; SP- #; A-F only)
A critical study of principal writings about English history during the Tudor and Stuart periods.

Hist 5671. Proseminar: Modern Britain. (3 cr; SP- #; A-F only)
Critical study of principal writings about English history.

Hist 5715. Readings in European Women's History: 1450-1750. (3 cr; A-F only)
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 5721. Contemporary Europe From the Late 19th Century to the Beginning of the Cold War: 1890-1950. (3 cr; SP- 3-12 1st semester in 16th- and 20th-century Europe, #)
The historical literature and debates surrounding major issues in the social, political, cultural, and economic development of Europe from the turn of the century through the impact of WWII. Topics include the development of imperialism, national rivalries, social and political conflict, the rise of fascism and communism, and the origins of war.

Hist 5735. European Women's History: 1750 to the Present. (3-4 cr; SP- #)
Selected themes in modern European women's history including forms of patriarchy; women in the Enlightenment; women and revolution; gender, class and family life; women in the labor force; sexuality and reproduction; female education; women's political movements; women and imperialism; gender and fascism.

Hist 5740. Topics in Modern German History. (3-4 cr [max 12 cr]; SP- #; A-F only)
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 5756. Modern Greece; Mid-18th Century to the Present: Greek Nationalism and Establishment of the Greek State. (3 cr)
Evolution of modern Greece from mid-18th century to the present. Political, cultural, and socioeconomic factors that contributed to Greek nationalism. Establishment of independent Greece and its role in the European community of nations.

Hist 5761. Proseminar— Imperial Russia. (3 cr; SP- Knowledge of Russian or German or French)
Western and Russian historiography on crucial issues of imperial Russia. Political institutions; culture and society; modernization and reforms; new interpretations.

Hist 5762. Proseminar in 20th Century Russia. (3 cr; SP- Knowledge of Russian or German or French)
Western and Russian historiography on crucial issues of 20th-century Russia. The nature of revolutions, debate over the evolution of the Soviet regime, the collapse of empires, new interpretations.

Hist 5777. Proseminar in Habsburg Central Europe. (3 cr; SP- #)
Central Europe under Habsburg rule from the reforms of Maria Theresa to imperial collapse. Continuity and change in society; economic and political modernization; the rise of national consciousness and anti-Semitism; politics and culture in the fin de siecle; the Empire and World War I.

Hist 5794. Proseminar in European Economic History. (3 cr; SP- #)
Europe's rise in the world economy; England's industrial revolution and uneven development in Europe; imperialism and World War I; the Great Depression; the post-1945 economic miracle; continuity and change in Eastern Europe.

Hist 5797. Methods of Population History. (3 cr)
Standard methods of population analysis with a special focus on methods widely used for historical population research.

Hist 5801. Seminar in Early American History. (3 cr; A-F only)
Introduction to the literature of early American history. Readings selected from some of the best scholarship in the field, the questions that now hold the attention of colonial historians, and the theories, methods, and sources they use in pursuit of those questions.

Hist 5841. Proseminar in American Economic History. (3 cr; SP- #; A-F only)
Historical literature on American economic and business history from American Revolution to the modern economy.

Hist 5844. U.S. Labor History. (3 cr)
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 5857. Proseminar: Readings in the History of American Women. (3 cr; SP- #)
An intensive graduate-level readings course. Survey selected significant topics in historical literature, conceptual frameworks, and methodological problems in the history of American women from 1600 to the present.

Hist 5861. History of American Immigration. (3 cr; SP- #; A-F only)
Readings in historical literature on immigration to the United States. Emphasis on recent works distinguished by new research methodologies and interpretations.

Hist 5862. History of American Immigration. (3 cr; SP- #; A-F only)
Readings in historical literature on immigration to the United States. Emphasis on recent works distinguished by new research methodologies and interpretations. Each student undertakes an independent reading and/or research project.

Hist 5864. Proseminar: African-American History. (3 cr; SP- #; A-F only)
Readings in African-American history designed for both incoming and advanced graduate students. Structured around various themes and issues including slavery, Reconstruction, the Great Depression, and the civil rights movement.

Hist 5865. Proseminar: African-American History. (3 cr; SP- #)
The second half of the graduate sequence in African-American history is oriented primarily toward thinking about and performing independent research.

Hist 5871. Readings in U.S. Intellectual History: 19th-20th Centuries. (3 cr; SP- #)
Definitions of American national identity from 1789 to the present as expressed in politics, religion, literature, painting, music, architecture, and history.

Hist 5881. American Foreign Relations to 1895. (3 cr; SP- #)
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 5882. American Foreign Relations Since 1895. (4 cr; SP- #)
Intensive readings in the historiography of American foreign relations with emphasis on American imperialism, domestic courses of foreign policy, and international political, economic, and cultural relations.

Hist 5890. Problems in American Indian History. (3 cr; SP- #)
Intensive consideration of topics in American Indian history. Topics may include social history, history of particular regions, political systems, education, and American Indian policy.

Hist 5900. Topics in European/Medieval History. (1-4 cr [max 16 cr]; SP-Grad or advanced undergrad with #)
Selected topics in European or Medieval History not covered in regular courses, taught as staffing permits.

Hist 5901. Latin America Proseminar: Colonial. (3 cr; SP- #)
Introduces beginning graduate and advanced undergraduate students to major historical writings on various Latin American themes.

Hist 5902. Latin America Proseminar: Modern. (3 cr; SP- #)
Introduces beginning graduate and advanced undergraduate students to major historical writings on various Latin American themes.

Hist 5910. Topics in U.S. History. (1-4 cr [max 16 cr]; SP-Grad or advanced undergrad with #)
Selected topics in U.S. history not covered in regular courses. Taught as staffing permits.

Hist 5920. Topics in African Social History. (3 cr; SP-Grad or #)
Focuses on the experiences of Africans in their workplaces, households and communities. Detailed treatment of selected historical themes. Topics vary.

Hist 5930. Topics in Ancient History. (1-4 cr [max 16 cr]; SP-Grad or #; A-F only)
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 cr; SP- #; A-F only)
Recurring themes in Third World History. Topics specified in Class Schedule.

Hist 5932. African Historiography and Methodology. (3 cr; A-F only)
Recent analysis of several major themes in the historiography of pre-colonial and colonial Africa and the methods used by African historians to reconstruct the African past.

Hist 5933. Seminar in Ancient History. (3 cr; SP- Previous coursework in Greek or Roman history, #; A-F only)
Seminar on a selected topic in ancient history.

Hist 5940. Topics in Modern Chinese History. (1-4 cr [max 16 cr]; SP- #; A-F only)
Possible topics include cultural, economic, intellectual, political, and social history.

Hist 5941. Readings in Chinese Documents. (3 cr; SP- Reading knowledge of Chinese)
Readings in Chinese on a topic to be selected by the instructor. Depending on the topic and the time period, readings may involve a mixture of modern and classical Chinese or may be entirely in modern Chinese. Consult instructor for more information.

Hist 5942. Topics in the History of Medicine. (3 cr; SP- Prior history of medicine or history of science course recommended for undergrads)
An exploration of topics central to the history of medicine. Emphasis on mid-19th century to the present. Topics vary.

Hist 5950. Topics in Latin American History. (1-4 cr [max 16 cr]; SP-Grad or advanced undergrad with #; A-F only)
Selected topics in Latin American history not covered in regular courses. Taught as staffing permits.

Hist 5960. Topics in History. (1-4 cr [max 16 cr]; SP-Grad
Courses

or advanced undergrad with #; A-F only)
Selected topics in history not covered in regular
courses. Taught as staffing permits.
Hist 5962. Expansion of Europe. (3 cr; A-F only)
A research seminar on the actions of Europeans in
the wider world from 1350 to 1790. Based on
documents in the James Ford Bell Library.
Hist 5964. Comparative Economic History. (3 cr; SP–#)
Theoretical approaches guide cross-cultural
examinations of major issues in the economic history
of East Asia, Europe, and the New World. Agrarian
structures in economic development, markets, the state
and economic development, and the industrial
revolution.
Hist 5970. Advanced Research in Quantitative
History. (4 cr [max 16 cr])
Students will carry out publishable-quality research on
a quantitative historical topic.
Hist 5993. Directed Study. (1-16 cr [max 16 cr]; SP–#,
A-F only)
Qualified senior and graduate students may register
for work on tutorial basis. Guided individual reading
or study.
Hist 5994. Directed Research. (1-16 cr [max 16 cr]; SP–#,
A-F only)
Qualified senior and graduate students may register
for work on a tutorial basis.
Hist 8015. Scope and Methods of Historical Studies. (3 cr; SP–A-F only)
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 8110. Medieval History: Research Seminar. (3 cr;
SP–# good reading knowledge of Latin, French, one
other European language; A-F only)
Research in medieval European history, using primary
source material.
Hist 8239. Readings in Gender, Race, Class, and/or
Ethnicity in the United States. (3 cr; SP–# A-F only)
Dynamics of gender, racial, class, and ethnic relations
in U.S. history; intersections of these forces.
Hist 8240. Research in Gender, Race, Class, and/or
Ethnicity in the United States. (3 cr [max 6 cr]; SP–
A-F only)
Dynamics of gender, racial, class, and ethnic relations
in U.S. history; intersections of these forces.
Hist 8333. FTE: Master’s. (1 cr; SP–Master’s student,
adviser and DGS consent)
Hist 8390. Research in American Indian History. (3 cr;
SP–5800 or Armin 5890 or #; A-F only)
Research and writing skills in American Indian history.
With instructor and other participants, students
identify their research questions, locate sources with
which to answer these questions, conduct original
research, and produce a substantial research paper.
Hist 8400. Editing and Publishing Seminar. (3 cr; SP–
A-F only)
Evolution of modern scholarly publication as a system of
knowledge; survey of history of printing and manufacture
of books; recent changes in information technology;
contemporary academic publishing; basics of editing and
editorial policy; journals and presses.
Hist 8444. FTE: Doctoral. (1 cr; SP–Doctoral student,
adviser and DGS consent)
Hist 8464. Research in Yuan, Ming, and Qing History. (3 cr; SP–Good working knowledge of classical Chinese,
background in history of late imperial China; A-F only)
Basic skills and resources for doing research in history
of late imperial China. Bibliographic exercises;
reading and translating primary documents.
Hist 8465. Research in Yuan, Ming, and Qing History. (3 cr; SP–Good working knowledge of classical Chinese,
background in history of late imperial China; A-F only)
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 8630. Seminar in World History. (3 cr; SP–#,
A-F only)
Critical examination of historical literature dealing
with theoretical approaches to world history and
teaching of world history.
Hist 8666. Doctoral Pre-Thesis Credits. (1-18 cr;
SP–Max 18 cr per semester or summer; doctoral student
who has not passed prelim oral)
Hist 8715. Research on European Women’s History, 1450-1750. (3 cr; SP–5715)
Research techniques for completing a major research
paper based on primary sources.
Hist 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max 18
per semester or summer; 10 cr total required [Plan A
SP–#])
Hist 8857. Seminar: Research in the History of
American Women. (3 cr; SP–5857, #; A-F only)
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 25-35-page scholarly
article, and read and comment upon each other’s
drafts.
Hist 8858. Research in Early American History. (3 cr;
SP–5801 or #; A-F only)
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 Credits: Doctoral. (1-18 cr; SP–Max 18
per semester or summer; 24 cr required)
Hist 8900. Topics in European/Medieval History. (1-4
cr [max 16 cr]; SP–Offered as staffing permits; A-F only)
Topics not covered in regular courses.
Hist 8910. Topics in U.S. History. (1-4 cr [max 16 cr];
SP–Offered as staffing permits; A-F only)
Topics not covered in regular courses.
Hist 8920. Topics in African History. (1-4 cr [max 16 cr];
SP–Offered as staffing permits; A-F only)
Topics not covered in regular courses.
Hist 8930. Topics in Ancient History. (1-4 cr [max 16 cr];
SP–Offered as staffing permits; A-F only)
Topics not covered in regular courses.
Hist 8940. Topics in Asian History. (1-4 cr [max 16 cr];
SP–Offered as staffing permits; A-F only)
Topics not covered in regular courses.
Hist 8944. Research Seminar: New Directions in
African Social History. (3 cr; SP–# A-F only)
First semester expands 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. (3 cr; SP–8944, #; A-F only)
Second semester: students conceptualize and write
major research paper.
Hist 8950. Topics in Latin American History. (1-4 cr
[max 16 cr]; SP–Offered as staffing permits; A-F only)
Topics not covered in regular courses.
Hist 8960. Topics in History. (1-4 cr [max 16 cr];
SP–Offered as staffing permits; A-F only)
Topics not covered in regular courses.
Hist 8993. Directed Study. (1-16 cr; SP–# A-F only)
Hist 8994. Directed Research. (1-16 cr; SP–# A-F only)

History of Medicine (HMed)

Medical School

HMed 5002. Public Health Issues in Historical
Perspective. (3 cr; SP–History of medicine or history of science course recommended for undergrads)
HMed 5035. The Germ Theory and Modern Medicine. (3 cr; SP–History of medicine or history of science course recommended for undergrads)
HMed 5045. The Modern Medical Profession. (3 cr; SP–History of medicine or history of science course recommended for undergrads)
HMed 5040. African Social History. (3 cr; A-F only)
Palaeopathology; primitive medicine; medicine in ancient and classical civilizations; transmission of Greek medicine through Islam to the Latin West; medieval medicine; revival of anatomy; discovery of blood circulation, lymphatic vessels, lymphatic system, and capillaries; new concepts of disease and treatment in the seventeenth century.
HMed 5201. History of Medicine from 1700 to 1900. (3 cr)
Founding of hospitals, medical teaching at Leyden and Edinburgh, anatomical teaching and the rise of surgery and pathological anatomy; inoculation for smallpox and the discovery of vaccination; discovery of percussion and mediate auscultation; anatomical definition of diseases; discovery of anesthesia; epidemiology and public health; germ theory of disease; antiseptic surgery; rise of bacteriology; discovery of diphtheria antitoxin.
HMed 5202. History of Medicine in the 20th Century. (3 cr)
Topics include immunology, nutritional deficiency
diseases, vitamins, pure water and pasteurized milk,
tuberculosis, diphtheria immunization, malaria,
inulin, antibiotics, blood transfusion, fluid and
electrolyte balance, polio vaccines, heart surgery,
immune deficiency diseases, organ transplantation,
Medicare and managed health care, infectious
diseases, increased life expectancy.
HMed 5210. Seminar: Emergence of Modern
Medicine. (3 cr; A-F only)
HMed 5211. Seminar: Emergence of Modern
Medicine. (3 cr; A-F only)
HMed 5940. Topics in the History of Medicine. (3 cr;
SP–History of medicine or history of science course recommended for undergrads)
Topics vary. Emphasis on mid-18th century to the present.
HMed 8333. FTE: Master’s. (1 cr; SP–Master’s student,
adviser and DGS consent)
HMed 8444. FTE: Doctoral. (1 cr; SP–Doctoral student,
adviser and DGS consent)
HMed 8631. Directed Study. (3-6 cr; A-F only)
HMed 8632. Directed Study. (3-6 cr; A-F only)
HMed 8666. Doctoral Pre-Thesis Credits. (1-18 cr;
SP–Max 18 cr per semester or summer; doctoral student
who has not passed prelim oral)
HMed 8777. Thesis Credits: Master’s. (1-18 cr; SP–Max
18 cr per semester or summer; 10 cr total required [Plan A only])
HMed 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max
18 cr per semester or summer; 24 cr required)
History of Science and Technology (HSci)

Department of History of Science and Technology
Institute of Technology

HSci 5211. Biology and Culture in the 19th and 20th Centuries. (3 cr; SP–5211) Changing conceptions of life and aims and methods of biology; changing relationships between biology and the physical and social sciences; broader intellectual and cultural dimensions of developments in biology.

HSci 5242. The Darwinian Revolution. (3 cr; QP–Biol 1009 or Biol 1101 or #; SP–$3242; Biol 1009 or Biol 1101 or #) Development of evolutionary thought in the 19th and 20th centuries, emphasizing Darwin’s theory of evolution by natural selection; scientific, economic, political, religious, and philosophical dimensions of Darwinism; comparative reception of Darwinism in different countries and cultures.

HSci 5244. History of Ecology and Environmentalism. (3 cr; SP–5244) Development of ecological thought from 18th century natural theology to contemporary ecology and conservation biology; changing views of “balance” and the “ecology” of nature; conceptual and methodological developments in ecosystems ecology; connections between ecology and conservation, population and environmental politics.

HSci 5331. Technology and American Culture. (3 cr; QP–$3331; SP–$3331) Development of American technology in its cultural and intellectual context from 1790 to present. Technology of Native Americans; transfer of technology to America; establishment of an infrastructure promoting economic growth; and social response to technological developments.

HSci 5332. Science and American Culture. (3 cr; QP–$3332; SP–$3332) Development of American science, including transfer of science to America; development of indigenous traditions for pursuit of science; establishment of infrastructure for education and research; response of public to scientific development.

HSci 5401. Ethics in Science and Technology. (3 cr; SP–$3401) Historical issues involving research ethics (e.g., human experiments and environmental, nuclear, and safety issues).

HSci 5993. Directed Studies. (1-15 cr [max 15 cr]; QP–#; SP–#) Guided individual reading or study.

HSci 5994. Directed Research. (1-15 cr [max 15 cr]; QP–#; SP–#)

Hort Science (Hort)

Department of Horticultural Science
College of Agricultural, Food, and Environmental Sciences

Hort 5007. Advanced Plant Propagation. (3 cr; QP–3001; SP–3005) Control of growth and dvelopment in sexual and asexual reproduction of plants including effects of environment, plant growth substances and protocols on dormancy, origin and development of adventitious structures, and success with specialized propagation techniques. Lecture/lab.

Hort 5021. Landscape Design, Implementation and Management II. (3 cr; QP–5041 or ApEc 1250 or #; 4021 or ApEc 1250) Residential, commercial, and recreational sites. Architectural, and graphic techniques, plan drawings, sections elevations, perspectives, and working drawings. Grading and site manipulation including surveying, irrigation, and drainage. Development of business and grounds management plans. Landscape estimating and bidding.

Hort 5022. Topics in Plant Science for Teachers. (1-4 cr; QP–Biol 1103 or equiv or course in ed; no cr for Hort majors or grad students; SP–Biol 2012 or equiv or course in ed; no cr for Hort majors or grad students)

Hort 5023. Public Garden Management. (2 cr)

Hort 5031. Sustainable Fruit and Vegetable Production Systems. (4 cr; QP–1036 or #; SP–1001, 3005) Integrated management of horticultural food production systems with an ecological perspective. Evolution, taxonomy, environmental control of plant growth and development, site selection. Intensive use of writing, decision cases, discussion.

Hort 5041. Nursery Production and Management II. (3 cr; QP–5046 or #; SP–4041; A-F only) In-depth look at nursery practices including innovative production systems. Specific crop schedules, using technical and economic data for production. Pest management and regulations for the nursery industry.

Hort 5051. Floriculture Production and Management II. (3 cr; QP–5054 or #; SP–4051; A-F only) Propagation, production, and utilization of floral crops with emphasis on ornamental plants and cut flowers. Grow, market, and utilize herbaceous plants. Cultural practices; concepts behind manipulation of environmental factors to achieve desired plant growth and quality. Lab, field trips.

Hort 5061. Turfgrass Science. (3 cr; QP–3072; SP–4061) For advanced students in turf with career objectives in professional turf management. Emphasis on ecology, physiology, and theory of turf population dynamics and specialized management techniques such as golf course, commercial sod production, and fine turf athletic settings.

Hort 5071. Restoration and Reclamation Ecology. (3 cr; QP–Biol 1103 or 3012; Biol 1201; Biol 5041, Ecol 3001 or equiv or #; Biol 3202 or Biol 3002; Biol 1001 or Biol 3407 or equiv #) Ecological and physiological concepts as a basis for revegetation of grasslands, wetlands, forests, and other landscapes. Plant selection, stand establishment, evaluating revegetation success. State and federal programs that administer restoration and reclamation programs. Field trips within Minnesota.

Hort 5090. Directed Studies. (1-6 cr [max 18 cr]; QP–#; SP–# upper div Hort courses; SP–# upper div Hort courses) In-depth exploration of concepts, techniques, aterials, or programs in specific area to expand professional competency and self-confidence. Planning, organizing, implementing, and evaluating knowledge obtained from formal education and experience.

Hort 5183. Water, Minerals, and Translocation. (3 cr; QP–Soil 3125 or equiv, Pllph 3xxx or #; SP–Soil 2125 or equiv, Pllph 1xxx or #) Transport processes in plants including water and nutrient absorption and distribution, effects of and adaptations to water and nutrient stress, functions of mineral nutrients, and translocation of photosynthates.

Hort 5990. Special Workshop in Horticulture. (1-4 cr [max 12 cr]; QP–#; SP–#) Workshops on a variety of topics in horticulture offered in locations other than the Twin Cities Campus. See Class Schedule or department for current offerings.

Hort 8005. Supervised Classroom or Extension Teaching Experience in Horticulture. (2 cr) 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. (1-5 cr; QP–12 grad cr in agr or bio sciences; SP–9 grad cr in agr or bio sciences) 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. (2 cr; QP–13 grad majors or grad students; SP–Biol 2012 or equiv or course in ed; no cr for Hort majors or grad students)
Human Resource Development (HRD)

Department of Work, Community, and Family Education

College of Education and Human Development

HRD 5001. Survey: Human Resource Development and Adult Education. (3 cr)
Overview of fields of human resource development and adult education. Includes societal context, theories, processes, definitions, philosophies, goals, sponsoring agencies, professional roles, participants, and resources. Focus on the unique characteristics and ways the fields overlap and enhance one another.

HRD 5101. Foundations of Human Resource Development. (1 cr)
Introduction to human resource development as a field of study and practice.

HRD 5102. Economic Foundation of Human Resource Development. (1 cr; SP–5101)
Introduction to economics as a core discipline supporting the theory and practice of human resource development.

HRD 5103. Psychological Foundation of Human Resource Development. (1 cr; SP–5101)
Introduction to psychology as a core discipline supporting the theory and practice of human resource development.

HRD 5104. Systems Foundation of Human Resource Development. (1 cr)
Introduction to system theory as a core discipline supporting the theory and practice of human resource development.

HRD 5105. Strategic Planning through Human Resources. (3 cr; SP–5001 or S101, S102, S103, S104; A-F only)
The theory and practice of strategically developing, utilizing, and aligning human resources as a major contributor to organizational and quality improvement success.

HRD 5106. Evaluation in Human Resource Development. (3 cr; A-F only)
Evaluation of human resource development efforts from the perspective of impact on organizations, work processes, and individuals, plus follow-up decisions.

HRD 5111. Facilitation and Meeting Skills. (1 cr)
Introduction to the disciplines of planning and running effective meetings. Tools and methods for meeting management and evaluation are presented within the context of organization development.

HRD 5196. Internship: Human Resource Development. (1-10 cr [max 10 cr]; SP–5001, S201 or 5201; S-N only)
Students apply and contract for human resource development positions. Contracts describe specific HRD responsibilities to be fulfilled during internship and theory-to-practice learning outcomes.

HRD 5201. Personnel Training and Development. (3 cr; A-F only)
Introduction to the personnel training and development process in organizations and the advancement of expertise in the areas of analysis, design, development, implementation, and evaluation.

HRD 5202. Training on the Internet. (3 cr)
Major concepts, skills, and techniques for giving and receiving training on the Internet.

HRD 5301. Organization Development. (3 cr; A-F only)
Introduction to major concepts, skills, and techniques for organization development and change.

HRD 5302. Managing Work Teams in Business and Industry. (3 cr; SP–Two core courses in HRD; A-F only)
Frameworks and strategies for developing effective work teams. Skill development in facilitating resolution of conflicts in organizations. Provides foundational information as well as practical applications for participants (upper-level and graduate students) to become small team leaders.

HRD 5408. International Human Resource Development. (3 cr)
Problems, practices, programs, theories, and methodologies in human resource development as practiced internationally.

HRD 5409. Planning and Decision-Making Skills. (1 cr)
Introduction to the disciplines of planning and decision making typically used in process improvement interventions. Tools and methods for facilitating group decisions and problem solving.

HRD 5496. International Field Study in Human Resource Development. (3 cr; SP–5001)
Field study of the organization development, personnel training and development, career development, and quality improvement theories and practices in a selected nation.

HRD 5601. Student and Trainee Assessment. (2 cr; A-F only)
Development of tests of knowledge, effect, and processes for programs focused on instruction of skills associated with business and industry; development of learning progress reporting systems; evaluation of instructional effectiveness.

HRD 5611. Futurism in Human Resource Development and Adult Education. (3 cr)
Exploration of the implications of future developments in several arenas on theory and practice in human resource development and adult education.

HRD 5612. Managing and Consulting in Human Resource Development and Adult Education. (3 cr; SP–5001)
The theory of managing and consulting in human resource development and adult education. Includes a personal assessment of role requirements and experimentation with management and consultation processes and techniques.

HRD 5624. Sales Training. (3 cr; A-F only)
Strategies and techniques for developing effective sales people.

HRD 5625. Technical Skills Training. (3 cr)
Analyzing technical skills training practices in business and industry. Systems and process analysis and trouble-shooting of work behavior; design methods and developing training materials.

HRD 5626. Customer Service Training. (3 cr; A-F only)
Overview of customer service strategies used by successful organizations and training practices used to develop customer-oriented personnel.

HRD 5627. Management and Supervisory Training and Development. (3 cr)
Problems, practices, programs, and methodologies relating to the training and development of managers and supervisors, including needed competencies, needs assessment, delivery modes, and evaluation.

HRD 5628. Multimedia Presentations in Business. (3 cr; SP–BE 5011 or equiv)
Designing, creating, and presenting information using multimedia resources in business settings.

HRD 5629. Course Development in Business and Industry. (2 cr; A-F only)
Identifying content, stating objectives, sequencing, planning lessons, and selecting methods and media for instruction and evaluation and feedback.

HRD 5661. Instructional Methods in Business and...
Industry Education. (2 cr)

Exploration of diverse strategies and techniques used by instructors in settings ranging from schools and colleges to business and industry.

HRD 5662. Computer Training in School and Industry Settings. (2 cr; SP–BIE 5011 or equiv)

Alternative practices for teaching business applications software use—such as word processors, spreadsheets, graphics software, desktop publishing software, databases, and communications software—in both public school and industry settings.

HRD 5770. Special Topics in Human Resource Development. (1-4 cr [max 12 cr])

Explanation of issues, methods, and knowledge in HRD areas. Content varies.


Nature of diverse populations and their unique learning and training needs, exemplary programs, and collaborative efforts among persons representing work, community, and family settings.

HRD 5822. Diversity and Organizational Transformation in Education, Work, and Community. (2 cr)

Develop models for understanding the impact of diversity on individual, organizational, and community outcomes. Discuss organizational change in relation to diversity.

HRD 8001. Advanced Theory in Human Resource Development and Adult Education. (3 cr; SP–5001 or AdEd 5001; A-F only)

Theoretical understanding of individuals and organizations as adaptive entities; roles of human resource development and adult education in mediating complex demands.

Human Resources and Industrial Relations (HRIR)

HRIR 5000. Topics in Human Resources and Industrial Relations. (1-8 cr)

Selected topics of current relevance to human resource management and industrial relations.

HRIR 5021. Systems of Conflict and Dispute Resolution. (4 cr)

Introduction to theoretical and practical treatment of conflict settlement in interpersonal, work-related, community, business, and international settings. Lectures, discussions, observations of actual dispute resolution sessions, and lab exercises with students participating in dispute resolution simulations applied to real world conflicts.

HRIR 5061. Labor Policy. (3 cr)

Analysis of public policies regarding employment, unions, and labor markets. Public programs affecting wages, unemployment, training, worker mobility, security, and quality of work life. Policy implications of the changing nature of work.

HRIR 5991. Independent Study in Human Resources and Industrial Relations. (1-8 cr [max 8 cr]; QP–MAHRIR office approval; SP–MAHRIR office approval)

Individual readings or research topics in human resources and industrial relations.

HRIR 8000. Graduate Topics in Human Resources and Industrial Relations. (1-8 cr [max 8 cr]; QP–8002; SP–HRIR MA student or Sch Mgmt approval; grad majors must register A-F)

HRIR 8011. Quantitative Methods in Human Resources and Industrial Relations. (4 cr; SP–Grad HRIR major or A-F; grad majors must register A-F)

Applications of descriptive and inferential statistics, including probability, hypothesis testing, confidence intervals, analysis of variance, and regression. Computer applications and exercises.

HRIR 8012. Advanced Quantitative Methods in Human Resources and Industrial Relations. (2 cr; QP–8001; SP–8011, grad HRIR major or A-F; grad majors must register A-F)

Sampling and experimental design, factor analysis, and multiple regression using instrumental variables. Computers used for data analysis, including a course paper employing quantitative tools.

HRIR 8013. Research Methods in Social and Labor Policy. (3 cr; QP–8001; SP–8011, grad HRIR major or A-F; grad majors must register A-F)

Application of social science research methods to public policy issues.

HRIR 8019. Advanced Quantitative Methods in Human Resources and Industrial Relations (Transition). (4 cr; QP–HRIR 8001)

Sampling and experimental design, factor analysis, and multiple regression using instrumental variables. Computers used for data analysis, including a course paper employing quantitative tools. Semester transition course for 1999–2000 for those who completed HRIR 8001 under quarters but did not complete HRIR 8019 under quarters.

HRIR 8021. Introduction to Human Resources and Industrial Relations. (3 cr; QP–Econ 1101, Econ 1102, Psy 1001; SP–Econ 1101, Econ 1102, Psy 1001; A-F; grad HRIR majors must register A-F)

Human resource management in contexts of labor markets and organizations. Valuing, employing, developing, motivating, and maintaining human resources in an industrial society. Staffing, training, and development; organizational behavior and theory; compensation and benefits; labor market analysis; and labor relations and collective bargaining.

HRIR 8022. Field Project. (4 cr; QP–IR core; SP–8011, 8031, 8041, 8051, 8061, 8071, grad HRIR major or A-F; day program only; grad majors must register A-F)

Teams formulate and execute a study of an actual business problem currently faced by business, non-profit, and governmental organizations, generally in the Twin Cities metropolitan area.

HRIR 8023. International Human Resource Management. (2 cr; QP–8002 or MBA 8015; SP–MBA 6215 or grad HRIR major or A-F; grad majors must register A-F)

Growing U.S. interdependence with rest of the world and its implications for human resource management policies and practices at home and abroad.

HRIR 8024. Comparative and International Labor Movements. (2 cr; QP–8002; SP–Grad HRIR major or A-F; grad majors must register A-F)

Emergence, evolution, structures, functions, and current challenges of labor movements in industrialized societies. Industrial relations systems and collective bargaining in comparative perspective. International labor organizations.

HRIR 8025. Human Resource Information Systems. (2 cr; QP–IR core; SP–Grad HRIR major or A-F; grad majors must register A-F)

Hardware and database fundamentals, software applications, security issues, vendor evaluation, system and software development and design issues, and strategies for gaining user acceptance.

HRIR 8031. Staffing, Training, and Development. (4 cr; QP–8002; SP–Psy 1001; grad HRIR major or A-F; grad majors must register A-F)

Introduction to staffing processes (recruitment, selection, promotion, demotion, transfer, dismissal, layoff, retirement); training development theory and techniques as mechanisms for influencing individual and organizational outcomes, such as performance, satisfaction, and climate.

HRIR 8032. Staffing and Selection: Strategic and Organizational Concerns. (2 cr; QP–8003; SP–8031, grad HRIR major or A-F; grad majors must register A-F)

Theory and practice related to staffing decisions (recruitment, selection, promotion, transfer, dismissal, layoff, retirement) in organizations. Legal environment in which staffing decisions are made. Staffing from strategic and organizational perspectives.

HRIR 8033. Employee Training: Creating a Learning Organization. (2 cr; QP–8003; SP–8031, grad HRIR major or A-F; grad majors must register A-F)

Theory, research, and practice related to design and implementation of employee training programs. Instructional design, training techniques, transfer of training, and program evaluation and costing. Role of employees and firm policies and practices in training process.

HRIR 8034. Employee Development: Creating a Competitive Advantage. (2 cr; QP–8003; SP–8031 or A-F; grad HRIR major or A-F; grad majors must register A-F)

Career development and planning, employee and management development techniques, and organizational and employee concerns related to mobility, job stress, balancing work and family, obsolescence and plateauing, and cross-cultural assignments.

HRIR 8041. Design and Management of Organizations. (4 cr; QP–8002; SP–Econ 1101, Econ 1102, Psy 1001 or #; grad HRIR major or A-F; grad majors must register A-F)

Introduction to micro through macro organizational issues at individual, dyadic, group, organizational, and environmental levels; their implications for organizational design, control, coordination, and development.

HRIR 8042. Organizational Structure and Environmental Systems. (2 cr; QP–8004; SP–8041 or #; grad HRIR major or A-F; grad majors must register A-F)

Impact of environmental systems on organizational design and dynamics of organization redesign. Employing organizations in terms of general and specific environmental conditions: technological, legal, political, economic, demographic, ecological, and cultural.

HRIR 8043. Comparative Organization Design. (2 cr; QP–8004; SP–8041 or #; grad HRIR major or A-F; grad majors must register A-F)

Variations in organizational practices related to variations in ownership (profit, nonprofit, government, cooperative), economic systems, culture, technology, market structure, etc. Organizational practices: employee empowerment, job enrichment, profit sharing, employee stock ownership, individual incentives, information sharing, and integration mechanisms.

HRIR 8044. Motivation and Work Behavior in Contemporary Organizations. (2 cr; QP–8004; SP–8041 or #; grad HRIR major or A-F; grad majors must register A-F)

In-depth study of major topics in microlevel organizational behavior. Accountability, organization citizenship behaviors, forms of organizational attachment, motivation, and issues of equity and justice.

HRIR 8051. Compensation and Benefits. (4 cr; QP–8005; SP–Econ 1101, Econ 1102, Psy 1001 or #; grad HRIR major or A-F; grad majors must register A-F)


HRIR 8052. Compensation Theory and Applications. (2 cr; QP–8005; SP–8051 or #; grad HRIR major or A-F; grad majors must register A-F)

Relationship between economic and psychological theories and the design and operation of compensation programs. Demographic influences on compensation programs and outcomes. Statistical analysis applied to pay
program design and administration. Global pay variations. Current issues and controversies.

HRIR 8053. Employer-Sponsored Employee Benefit Programs. (2 cr; QP–8005; SP–8011, 8051) or #, grad HRIR major or #, grad majors must register A-F)

Design and administration of nonmandatory compensation benefit programs; medical expense insurance, pension sharing plans, disability, and other employee benefits. Effects of providing benefits on workers’ incentives with regard to performance, acquisition and maintenance of human capital, mobility, and risk sharing.

HRIR 8054. Public Policy and Employee Benefits. (2 cr; QP–8005; SP–8011, 8051 or #, grad HRIR major or #, grad majors must register A-F)

Survey of federally and state-mandated employee benefits: worker compensation, unemployment insurance, temporary disability insurance, and social security. Effects of providing benefits on workers’ incentives with regard to performance, acquisition and maintenance of human capital, mobility, and risk sharing.

HRIR 8061. Introduction to Labor Market Analysis. (4 cr; QP–8002; SP–Econ 1101, Econ 1102 or #, grad HRIR major or A; grad majors must register A-F)

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; efficiency and determination.

HRIR 8062. Human Resource Strategy and Planning. (2 cr; QP–8006; SP–8061 or #, grad HRIR major or A; grad majors must register A-F)

Case studies used to diagnose strategy.

HRIR 8063. Human Resources and Organizational Performance. (2 cr; QP–8006; SP–8061 or #, grad HRIR major or A; grad majors must register A-F)

Impact of human resource policies and practices on organizational productivity and effectiveness. Role of government, unions, and private sector institutions on organizational effectiveness.

HRIR 8064. Topics in Micro Labor Market Analysis. (3 cr; QP–8006; SP–8061 or #, HRIR PhD student or A; grad majors must register A-F)

May include micro aspects of unemployment, implicit contracts and efficiency wages, investment in human capital, occupational choice, job search, job matching and turnover, migration, labor force participation, and government program evaluation.

HRIR 8065. Topics in Macro Labor Market Analysis. (3 cr; QP–8006; SP–8061 or #, HRIR PhD student or A; grad majors must register A-F)

May include theories of unemployment based on sectoral shocks, theories of wage rigidity, efficiency wage theories, intermediaries wage structure, role of labor market in resource allocation, and effects of government intervention in labor market.

HRIR 8071. Labor Relations and Collective Bargaining. (4 cr; QP–8002; SP–Econ 1101, Econ 1102 or #, grad HRIR major or A; grad majors must register A-F)

Evolution of U.S. labor unions and public policy; bargaining environment and structure, goals and negotiations, contract administration and practice. International comparisons, labor-management cooperation, and newly emerging issues.

HRIR 8072. Labor Movements in a Changing World. (2 cr; QP–8007; SP–8071 or #, grad HRIR major or A; grad majors must register A-F)

Labor movement philosophies. Critical evaluation of labor movement growth and adjustment to environmental changes. Domestic and international perspectives of labor movement innovations.

HRIR 8073. Dispute Resolution: Labor Arbitration. (2 cr; QP–8007; SP–8071 or #, grad HRIR major or A; grad majors must register A-F)

Arbitration to resolve grievances and impasses arising out of the collective bargaining agreements’ administration and negotiation. Arbitration law and legal issues, procedures and practices, case presentation, management rights, discipline and discharge, enforcement contract language interpretation, and remedies. Newly emerging approaches.

HRIR 8074. Labor-Management Negotiations. (2 cr; QP–8007; SP–8071 or #, grad HRIR major or A; grad majors must register A-F)


HRIR 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)

HRIR 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

HRIR 8666. Doctoral Pre-Thesis Credits. (1–18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

HRIR 8777. Thesis Credits: Master’s. (1–18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

HRIR 8811. Advanced Quantitative Research Methods in Human Resources and Industrial Relations. (3 cr; QP–IR core; SP–HRIR core or #, HRIR PhD student or A; grad majors must register A-F)

General linear model and its assumptions and violations; simultaneous equations; pooling cross-section and time series; limited qualitative dependent variable models; sample selection models; hazard models. Emphasizes application to human resources and industrial relations.

HRIR 8812. Seminar: Human Resources and Industrial Relations Research Methodology. (3 cr [max 6 cr]; SP–HRIR PhD student or A; grad majors must register A-F)

Application in research projects.

HRIR 8821. Seminar: Human Resources and Industrial Relations Systems. (3 cr; QP–IR core; SP–HRIR core or #, HRIR PhD student or A; grad majors must register A-F)

Thought and research in the field. Investigating, integrating, and synthesizing more traditional related disciplines, theories, and research into interdisciplinary body of knowledge concerned with human resource and industrial relations problems and employment relationships.

HRIR 8830. Seminar: Staffing, Training, and Development. (3 cr [max 6 cr]; QP–8003; SP–8031 or #, HRIR PhD student or A; grad majors must register A-F)

Concepts, problems, and research.

HRIR 8840. Seminar: Organization Theory. (3 cr [max 6 cr]; QP–8004; SP–8041 or #, HRIR PhD student or A; grad majors must register A-F)

Application in human resources and industrial relations research and practice.

HRIR 8850. Seminar: Compensation and Reward. (3 cr [max 6 cr]; QP–8005; SP–8051 or #, HRIR PhD student or A; grad majors must register A-F)

Relevant theoretical models; formulation of research into compensation and reward issues.

HRIR 8860. Seminar: Analysis of Current Labor Market Theory and Empirical Research. (3 cr [max 6 cr]; QP–8006; SP–8061 or #, HRIR PhD student or A; grad majors must register A-F)

Functions and operations of labor markets, theory, and research.

HRIR 8870. Seminar: Labor Relations and Collective Bargaining. (3 cr [max 6 cr]; QP–8007; SP–8071 or #, HRIR PhD student or A; grad majors must register A-F)

Analysis of contemporary theoretical and empirical research.

HRIR 8888. Thesis Credits: Doctoral. (1–18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

HRIR 8991. Independent Study in Human Resources and Industrial Relations. (1–8 cr [max 8 cr]; SP–A; F, A only)

Individual readings and/or research projects.
IE 5551. Production Planning and Control. (4 cr; QP–IT or grad student; IEOR 5040, ME 3900; SP–Upper div or grad student)
Modern methods of production planning and inventory. Inventory analysis and optimization, demand forecasting, capacity planning, material planning, material requirement planning, just-in-time manufacturing, production scheduling, and shop floor control. New production planning and control methodologies such as time-based manufacturing, Theory of Constraints, group technology, and flexible manufacturing.

IE 5552. Design and Analysis of Manufacturing Systems. (4 cr; QP–IT or grad student, IEOR 5010, IEOR 5020, IEOR 5030, IEOR 5040; SP–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 of Manufacturing Systems. (4 cr; QP–IT upper div or grad student; SP–Upper div or grad student)
Discrete event simulation. Using an integrated simulation/animation environment, students learn to create, analyze, and evaluate realistic models for a variety of manufacturing, assembly, and material handling systems. Experimental design for simulation, random number generation, selection of input distributions and simulation output evaluation.

IE 5554. Facility Planning. (4 cr; QP–IT or grad student; SP–Upper div or grad student)
Design and planning of manufacturing and service facilities. Warehousing and storage, facility layout and location, material handling, and material transportation distribution.

IE 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)
IE 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)
IE 8531. Engineering Optimization II. (4 cr; QP–5040)
Survey of computational tools and algorithms for solving constrained and unconstrained optimization problems. Necessary and sufficient conditions of optimality; Jacobian and Lagrangian method; Kuhn-Tucker Condition; direct search and gradient methods; separable, quadratic, geometric, and stochastic programming. Emerging search techniques and heuristics.

IE 8532. Stochastic Processes and Queueing Systems. (4 cr; QP–SAE; SP–5421 or equiv)
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 8533. Advanced Stochastic Processes and Queueing Systems. (4 cr; SP–5852 or SP–8532 or SP–8531)
Renewal and generative processes, Markov and semi-Markov processes, single and parallel server queuing systems, queuing networks, network decomposition and approximations, computational methods, fluid models and Brownian motion.

IE 8534. Advanced Optimization. (4 cr; SP–5531)
Combinatorial optimization, search techniques and algorithms, complexity theory, heuristics, and emerging computational methods such as genetic algorithms, simulated annealing, neural networks, and pattern recognition. Applications to product and process optimization.

IE 8541. Decision Support Systems. (4 cr; SP–#)
Introduction to theory of decision analysis, including value analysis, utility theory, multi-objective decision making, analytical hierarchy process, behavioral decision making, cognitive engineering, knowledge systems, and learning systems. Development of tools for decision support systems and computer-assisted decision making.

IE 8551. Computer Integrated Manufacturing. (4 cr; SP–#)
Introduction to communication networks and databases, computer-aided manufacturing, real-time shop floor control, automated material handling and robotics, and computer-aided quality and inspection.

IE 8552. Advanced Production Systems. (4 cr; QP–5361; SP–5551, 5552)

IE 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)
IE 8773. Graduate Seminar. (1 cr; S-N only)
Recent developments.

IE 8774. Graduate Seminar. (1 cr; QP–8773; SP–8773; S-N only)
Recent developments.

IE 8777. Thesis Credits: Masters. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])
IE 8794. Industrial Engineering Research. (1-6 cr [max 10 cr]; SP–#)
Directed research.

IE 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)
IE 8990. Topics in Industrial Engineering. (3 cr)
Key issues in computer integration, such as communication networks and databases, computer-aided process planning, computer-aided manufacturing, and real-time shop floor control.

IE 8991. Research in Industrial Engineering. (1 cr; SP–5100)
Directed research.

IDSc 8511. Conceptual Topics and Research Methods in Information and Decision Sciences. (4 cr; SP–Business admin PhD student or SP–# offered alt yrs)
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. (4 cr; SP–Business admin PhD student or SP–# offered alt yrs)
Concepts and practice in information systems development; process and data analysis; system development life cycle; project management; research methods, emphasizing modeling and simulation.

IDSc 8711. Cognitive Science. (4 cr; SP–Business admin PhD student or SP–# offered alt yrs)
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. Cognitive Psychology and Decision Making. (4 cr; SP–Business admin PhD student or SP–# offered alt yrs)
Cognitive bases for human decision making grounded in study of memory, cognition, and reasoning; judgments and use of values and uncertainty in decision making; descriptive and normative perspectives.

IDSc 8800. Research Seminar in Information and Decision Sciences. (4 cr [max 20 cr]; SP–Business admin PhD student or SP–#)
Topics, which vary by semester, are selected from new areas of research, research methods, and significant issues.

IDSc 8892. Readings in Information and Decision Sciences. (1-8 cr; SP–Max 16 cr; SP–Business admin PhD student or SP–#)
Readings useful to a student’s individual program and objectives that are not available through regular courses.

IDSc 8894. Graduate Research in Information and Decision Sciences. (1-8 cr; SP–Max 16 cr; SP–Business admin PhD student or SP–#)
Individual research on an approved topic appropriate to student’s program and objectives.

Insurance (Ins)

Insurance (Ins)

Industrial Relations Center

Curtis L. Carlson School of Management

Ins 5100. Corporate Risk Management. (2 cr)
Theory applied to corporate risk management and insurance practices. Identification, measurement, and treatment of an organization’s financial risks integrated with its property, liability, workers’ compensation, and human resource risks. Selection and application of risk control and risk financing tools: risk retention, reduction and transfer, including insurance.

Ins 5101. Employee Benefits. (2 cr; SP–Ins 5100)
Design and administration of employee benefit plans and pension programs: health insurance, disability plans, and salary reduction and deferred compensation programs, from social insurance to executive benefits. Multiple employer trusts, and alternative funding methods, including self-insurance. Ethical issues, legal liability, and compliance with regulations.

Ins 5200. Insurance Theory and Practice. (2 cr)
Risk theory is applied to practices in health, liability, life, property, and workers’ compensation insurance. Insurance marketing, pricing, underwriting, and claims administration, with adverse selection and moral hazard effects. Policy issues of tort versus no-fault compensation systems. Self-insurance and integrated risk financing methods.

Ins 5201. Personal Financial Management. (2 cr; SP–Ins 5200)