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This is Courses—Accounting through Journalism from the 2001-2003
Courses

Accounting (Acct)

Department of Accounting

Curtis L. Carlson School of Management

Acct 5100. Corporate Financial Reporting. (4 cr; QP–Mgmt student, non-accounting major; SP–Mgmt student, non-accounting 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.

Acct 5101. Asset Valuation and Income Determination. (4 cr; QP–Grade of at least B- in 5150, [mgmt major or mgmt grad student]; SP–Grade of at least B- in 2050, [mgmt major or mgmt grad student]; A-F only)
Valuation, measurement, and reporting issues related to selected assets/liabilities of a firm. Theory underlying accounting issues. Applying accounting principles.

Acct 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.

Acct 5125. Auditing Principles and Procedures. (4 cr; QP–3101 or 5101, accounting major; SP–3101/5101 or 5100/6100, [accounting major or grad mgmt student]; A-F only)
Auditing financial information systems. Independent audits and internal auditing. Ethics. Legal responsibilities.

Acct 5126. Internal Auditing. (2 cr; QP–3101 or 5101; SP–5101/5100 or 5100/6100, [accounting major or grad mgmt student]; A-F only)
Financial and operational auditing. Standards. Managing the function.

Acct 5135. Fundamentals of Federal Income Tax. (4 cr; QP–1050 or 8300 or 8130, [mgmt or grad student]; SP–2050 or 8300 or 8130, [mgmt or grad mgmt student]; A-F only)
Introduction to the U.S. 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.

Acct 5150. Current Financial Accounting Issues. (2 cr; QP–M.B.T. student; 1050; SP–M.B.T. student; 2050; A-F only)
Accounting principles and practices underlying preparation of financial statements and additional disclosures. Includes recent pronouncement on financial accounting.

Acct 5160. Financial Statement Analysis. (2 cr; QP–[3101 or 5101], [accounting or finance major]; SP–[5100/6100 or 3101/5101], [accounting or finance major]; A-F only)
Interpretation/analysis of financial statements. Introduces basic techniques of financial statement analysis and applies them in different settings (e.g., in investment/credit decisions).

Acct 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.

Acct 5200. Tax Accounting Methods and Periods. (4 cr; QP–M.B.T. student; 5153; SP–M.B.T. 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.

Acct 5220. Tax Research, Communication, and Practice. (4 cr; QP–M.B.T. student; 5135; SP–M.B.T. student; 5135; A-F only)
In-depth treatment of tax research methodology including tax questions, creating potential authority, assessing potential authority, and communicating research results. Substantive material on dealing with the IRS including sources of IRS practice; processing returns, auditing returns; rulings and determination letters; closing agreements; assessments and collections.

Acct 5230. Corporate Taxation I. (2 cr; QP–MBT student; 5135; M.B.T. student; 5135; 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.

Acct 5236. Introduction to Taxation of Business. (2 cr; QP–5135, acct major; M.B.T. student; 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 memorandums.

Acct 5271. Accounting Information Systems. (2 cr; SP–3101/5101 or 5100/6100)
Applications of electronic data processing systems in accounting, including modeling, financial planning, auditing, and data security. Analysis/design of accounting information systems.

Acct 5281. Special Topics in Financial Reporting. (2 cr; SP–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.

Acct 5310. International Accounting. (2 cr; QP–1050, mgmt student; SP–2050, 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.

Acct 5320. Current Topics in Accounting. (2 cr; QP–5102, acct major; SP–5102, acct major; A-F only)
Topics vary.

Acct 5325. Advanced Tax Principles. (2 cr; QP–5135, M.B.T. student; SP–5135, M.B.T. 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 rules, 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.

Acct 5330. Taxation of Corporations II. (2 cr; SP–5230, M.B.T. student; A-F only)
Corporate redeterminations related to multiple corporations and consolidated returns.

Acct 5333. Tax Aspects of Consolidated Returns. (2 cr; SP–5230, M.B.T. student; A-F only)
Covers aspects of filing consolidated 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.

Acct 5335. Taxation of the Small Business Corporation. (2 cr; SP–5230, M.B.T. student; A-F only)
Federal income taxation of S corporations. Election eligibility; termination of status; treatment of income and deduction items; distributions, basis of stock and debt. Compensation arrangements in closely held corporations; fiscal year issues; personal service corporations; advantages of C corporations vs. S corporations; corporation liquidation and redemption rules; S corporation’s built-in gains tax.

Acct 5340. Taxation of Partnerships and Partnerships. (2 cr; QP–5135, M.B.T. student; SP–5135, M.B.T. student; A-F only)
Reviews tax consequences associated with formation, operation, and dissolution of a partnership.

Acct 5350. Taxation of Estates and Gifts. (2 cr; QP–5135, M.B.T. student; SP–5135, M.B.T. 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 interests; powers of appointment; valuation problems; expenses, debts and taxes; charitable bequests, marital deduction, taxable inter vivos gifts, splitting and credits.

Acct 5351. Estate Planning. (2 cr; QP–5135, M.B.T. student; SP–5135, M.B.T. student; A-F only)
Addresses various topics related to planning the transfer of property during lifetime and at death.

Acct 5353. Income Taxation of Fiduciaries. (2 cr; QP–5135, M.B.T. student; SP–5135, M.B.T. 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.

Acct 5356. Taxation of Compensation Arrangements. (2 cr; QP–5135, M.B.T. student; SP–5135, M.B.T. 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.

Acct 5360. State and Local Taxation. (2 cr; QP–5135, M.B.T. student; SP–5135, M.B.T. student; A-F only)
Examines state levying of individual income, corporate income, property, sales, and excise taxes. Tax problems of businesses with multistate operations.

Acct 5370. Taxation of Property Transactions. (2 cr; QP–5135, M.B.T. student; SP–5135, M.B.T. 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 with emphasis on pension plans, profit sharing plans, stock option plans, individual retirement accounts, annuities and insurance, medical related compensation benefits, and reporting requirements.

Acct 5380. Tax Aspects of International Business I. (2 cr; SP–5230, M.B.T. student; A-F only)
Multinational business operations and transactions involving foreign income. Tax consequences of transactions with foreign organizations and by related foreign companies.

Acct 5381. Tax Aspects of International Business II. (2 cr; SP–5380, M.B.T. 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.


Acct 8801. Empirical Research in Capital Markets. (4 cr; SP–Business admin Ph.D. 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.

Acct 8802. Emerging Issues in Accounting. (4 cr [max 8 cr]; SP–Business admin Ph.D. student or #; offered alt yrs) Topics vary.

AdEd 5102. Perspectives of Adult Learning and Development. (3 cr) Emphasis on major adult development theorists, theories, and current applications. Transformative learning, self-directed learning, experiential learning, and cooperative learning provide theoretical framework for exploring psychological, physiological, sociological, and cultural aspects of adult development through the life span.

AdEd 5103. Designing the Adult Education Program. (3 cr; A-F only) Designing and implementing educational programs for adults. Application of concepts, theories, and models in different adult learning situations.

AdEd 5196. Field Experience in Adult Education. (3 cr; [max 6 cr]; S–N only) Supervised fieldwork and practice. Presentations and evaluations of adult education practices.

AdEd 5201. Introduction to Adult Literacy. (3 cr) Definitions of literacy: workplace, community and family. Issues: poverty, welfare, ethnicity, cultural diversity, social class, language and learning, immigrants. Review of literacy programs, funding, and professionalization. Reaching and recruiting undereducated adults. The role of the family and schools; community, state and local government. New social action approaches required for licensure.

AdEd 5202. Assessment of Adult Literacy. (3 cr) Assessment of adult literacy problems as they affect work, family and community. Setting educational goals; formal versus informal assessment; case studies; educational planning.


AdEd 5301. Survey of Distance Education. (3 cr) Survey of distance education concepts, theory, history, present practice, delivery systems, course design, major issues, and future directions.

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

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


AdEd 5700. Special Topics in Adult Education. (1-8 cr) Exploration of issues, methods, and knowledge in areas of adult education. Content varies.

AdEd 8001. Advanced Theory in Human Resource Development and Adult Education. (3 cr; SP–5001 or HRD 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.

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, 3306; Math 3261; SP–IT upper div or grad, 2012, Math 2243) Three-dimensional Newtonian mechanics, kinematics of rigid bodies, dynamics of rigid bodies, generalized coordinates, holonomic constraints, Lagrange equations, applications.

AEM 5500. Continuum Mechanics. (3 cr; QP–IT upper div or grad, AEM 3216; Math 3261, or AEM 5501 upper div or grad, 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, 5515 or equiv, Math 3252 or #; SP–5401 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 3252 or equiv; SP–4201 or equiv, Math 2263 or equiv) Mathematical and physical principles governing the motion of fluids. Kinematic, dynamic, and thermodynamic properties of fluids; stress and deformation; equations of motion; analysis of rotational and irrotational inviscid incompressible flow; two-dimensional and three-dimensional potential flow.

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

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; horsehoe 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 8221. Rheological Fluid Mechanics. (3 cr; QP–8201, 8510; SP–8201 or 5501 or #) Methods of solution for flows of simple fluids with general constitutive equations. Topics from viscometric flow, extensional flow, perturbations of the rest state with steady and unsteady flow, secondary flows, constitutive equations for non-Newtonian fluids; applications in rarefied and high-temperature systems. Role of model uncertainty/modeling errors in experimental and theoretical studies.

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 hypersonic 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 multistep integration methods for high-performance computers; recent developments and advanced topics.

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

AEM 8271. Experimental Methods in Fluid Mechanics. (3 cr; QP–5200, SP–4201) Overview of computer organization, including external communications and A/D, D/A conversion. Measurement techniques, such as pressure measurements and hot-wire and laser Doppler anemometry. Signal processing and uncertainty; computer control of experiments.

AEM 8295. Selected Topics in Fluid Mechanics. (1-4 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 8400. Seminar: Dynamical Systems and Controls. (1 cr max 4 cr; S- N only) Developing program of research in dynamical systems/controls. Discussions of current research/topics of interest.

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

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

AEM 8412. Nonlinear Systems. (3 cr; QP–8410; SP–8411) Introduction to nonlinear dynamical systems. Method of averaging and its applications; Liapunov stability, center manifold, and normal form theories; bifurcation analysis; introduction to chaotic phenomena.

AEM 8413. Advanced Nonlinear Systems. (3 cr; QP–8412; SP–8411) Dynamical systems with emphasis on higher dimensional (more than three) systems and global and chaotic phenomena. Bifurcation analysis with codimension greater than one, Melnikov method, and Silnikov phenomena. Concepts of symmetry and time reversal in dynamical systems. Application to problems modeled by partial differential equations.

AEM 8421. Robust Multivariable Control Design. (3 cr; QP–8410; SP–8411) Application of robust control theory to aerospace systems. Role of model uncertainty/modeling errors in design process. Control analysis and synthesis, including H-infinity optimal control design and structural singular value m in techniques.

AEM 8426. Optimization and System Sciences. (3 cr; SP–8401; JT grad student; A-F only) Applications of modern finite dimensional optimization techniques in system/control theory. Linear/nonlinear programming, duality, complexity theory, interior point methods, matrix inequalities, convex optimization over cones, bilinear matrix inequalities, rank-constrained problems.

AEM 8431. Trajectory Optimization. (3 cr; QP–5321; SP–4311 or equiv or #) Parameter optimisation problems. Topics in calculus of variations; necessary conditions of nonlinear optimal control problems; classification of trajectory optimization algorithms; steady-state aircraft flight; minimum-time climb aircraft trajectory; aerocasted orbital 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. (1-10 cr; max 10 cr; SP–A) Includes individual student projects completed under guidance of a faculty sponsor.

AEM 8500. Research Seminar in Mechanics of Materials. (1-3 cr; max 12 cr; SP–F; A-F 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-F 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 deformable electromagnetic continua.

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

AEM 8523. Elastodynamics. (3 cr; QP–5580 or 8510; SP–4581 or 5501 or #; A-F 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-F only) Theories of mechanical breakdown. Kinetic rate theories and instability considerations; formation of equilibrium cracks and circular crack propagation under pulses; statistical aspects of strength and fracture of micromolecular systems; time and temperature dependency in fracture problems and instability of composite material systems.

AEM 8533. Theory of Plasticity. (3 cr; QP–8594; SP–5203 or #) Theory of permanent deformation of ductile metals; bi-linear material models, Drucker’s three bar truss, and other examples. 3-D continuum formulation, yield surfaces, hardening rules, and material stability; slip line theory, Prandtl punch solution; single crystal plasticity.

AEM 8541. Mechanics of Crystalline Solids. (3 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 8595. Selected Topics in Mechanics and Materials. (1-4 cr; max 8 cr; SP–A) Includes individual student projects conducted 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 nonsymmetric differential operators; Petrov-Galerkin methods; examples from solid and fluid mechanics; properties of standard finite element families, implementation.

AEM 8887. Thesis Credits: Master’s. (1-18 cr [max 50 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 advisor; written report required.

AEM 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 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 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 5143. Geography of West Africa. (3 cr) West Africa from Senegal to Cameroun. 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; SP–Hist 5458) Ideological, political, religious, and cultural ties that have informed African American and black South African relations from late 18th century to 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 5551. Methods: Use of Oral Traditions as Resources for His/Black Americans. (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 5553. The Afro-American Novel. (3 cr) Contextual readings of 19th- and 20th-century black novelists including Chesnut, 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 5655. African American Cinema. (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 5701. Proseminar: Classic Works in Afro-American Studies. (3 cr) Exploration of classic works in Afro-American studies; conceptual frameworks; multidisciplinary focus.

Afro 5702. Proseminar: 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; GP–Jour major or minor, Jour 3004, A; SP–Jour major or minor, Jour 3004, A; 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 5864. Proseminar: 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, region, sexuality, and religion.

Afro 5865. Proseminar: African-American History. (3-4 cr; SP–#) Construction of a detailed research agenda, locating appropriate depositories of primary materials and secondary sources, and developing appropriate methodologies and frameworks.

Afro 5876. Proseminar: Approaches to African Development. (3 cr) Study, critical analysis, and comparison of primary documents relevant to African development.

Afro 5910. Topics in Afro-American and African Studies. (3 cr [max 9 cr]) Topics specified in Class Schedule.

Afro 8590. Figures in Contemporary Black Fiction. (3 cr) Each term focuses on works of an individual writer, such as Toni Morrison, Paula 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 [max 9 cr]) Topics specified in Class Schedule.

Agricultural, Food, and Environmental Education (AFEE)

Department of Work, Community, and Family Education
College of Education and Human Development

AFEE 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.

AFEE 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.

AFEE 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.

AFEE 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.

AFEE 5220. Special Topics in Agriculture Education and Extension. (1-3 cr [max 12 cr]) Content varies by offering.

AFEE 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 levels.

AFEE 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.

AFEE 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.

AFEE 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

For definitions of course numbers and symbols, see the inside back cover. 153
supervision and assessment of teaching performance. Focus for training period of induction into the teaching profession.

AFEE 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.

AFEE 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, FAA and SAE development, school-to-work relationships.

AFEE 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 action responses, and related leadership roles.

AFEE 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.

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

AFEE 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.

AFEE 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.

AFEE 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.

AFEE 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.

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

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

AFEE 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.

AFEE 8094. Research in Agricultural Education and Extension. (1-6 cr; SP–Ag ed student doing Plan B research, 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–A-F only) Individual student 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; A-F only) 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–3 cr or grad in IT or COAFES or Publ or other major with interest in environmental and occupational health and safety; SP–Jr or Sr grad in IT or COAFES or Publ 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–A-F only) 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 5021. Introduction to Plant Breeding. (3 cr; QP–(GCB 3022 or equiv); background in plant science; SP–GCB 5022 or equiv; background in plant science) For majors not specializing in plant breeding. Emphasizes sustainable-production scenarios.

Agro 5310. Research Methods in Crop Improvement and Production. (1 cr; QP–Agro or Hort or PIRR or grad; SP–Applied plant sciences grad; 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 5321. Ecology of Agricultural Systems. (3 cr; QP–SP–Ent 5321; [3xxx or above] course in [Agro or AnSc or Ent or Hort or PIRR or Soil] or SP–SP–Ent 5321; [3xxx or above] course in [Agro or AnSc or Ent or Hort or PIRR or Soil] or SP–A-F only) Ecological approaches to problems in agricultural systems. Formal methodologies of systems inquiry are developed/applicable.

Agro 5999. Special Topics/Workshop in Agronomy. (1-4 cr; QP–SP–A-F only) 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. (1-3 cr; SP–A-F only) Classroom or extension teaching experience in one of the following departments: Agronomy and Plant Genetics; Biosystems and Agricultural Engineering; Horticultural Science; Plant Pathology; 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 SP–A-F only) 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 8231. Cytogenetics. (4 cr; QP–GCB 5034; SP–GCB 5034 or SP–A-F only) 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; SP–GCB 5034 or SP–A-F only) 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 discussion and laboratory demonstrations of current research on genetic mechanisms related to crop improvement.

Agro 8270. Graduate Seminar. (1 cr; SP–Grad major in agro or applied plant sciences or ent or hort or plant brdg or plant path or soil or SP–Grad major in agro or plant brdg or soil or SP–Grad major in agro or plant sciences) Reports and discussions of problems and investigational work.

Agro 8280. Current Topics in Applied Plant Sciences. (1 cr; SP–Grad major in agro or applied plant sciences or ent or hort or plant brdg or plant path or soil or SP–Grad major in agro or plant brdg or soil or SP–Grad major in agro or plant sciences) Topics presented by faculty or visiting scientists.

Agro 8305. Physiologic Ecology of Plants in Natural and Managed Ecosystems. (4 cr; QP–BioC 3021, Biol 1009 or Biol 1201 or 1202; SP–BioC 3021, Biol 1001 or Biol 1002; Biol 1009; A-F only) Introduction to plants and their reactions and responses in managed and natural ecosystems, including carbon and nitrogen allocation, root biology, microbial interaction, secondary metabolism, and plant response to biotic and abiotic stress.

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

#### Department of American Studies

**College of Liberal Arts**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>AmSt 5101</td>
<td>Religion and American Culture. (3 cr; A-F only)</td>
<td>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.</td>
</tr>
<tr>
<td>AmSt 5202</td>
<td>Thought and Practice of American Religions. (4 cr; SP–#)</td>
<td>Holidays, festivals, religious arts, organizations, spirituality, ethics, and systems of thought of “civil religion,” “women’s religion,” indigenous American religions, American versions of Christianity, Judaism, Islam, Buddhism, and other world faiths, and their interactions in the United States and worldwide.</td>
</tr>
<tr>
<td>AmSt 5920</td>
<td>Topics in American Studies. (3-4 cr [max 9 cr])</td>
<td>Topics specified in Class Schedule.</td>
</tr>
<tr>
<td>AmSt 8201</td>
<td>Historical Foundations of American Studies. (3 cr; SP-Grad AmSt major)</td>
<td>Exposition of American civilizations as a field of inquiry, including its history, major theoretical framework, and interdisciplinary methodologies.</td>
</tr>
<tr>
<td>AmSt 8202</td>
<td>Theoretical Foundations and Current Practice in American Studies. (3 cr; SP–Grad AmSt major or #)</td>
<td>Analysis of central theoretical work in the field and survey of key methodologies.</td>
</tr>
<tr>
<td>AmSt 8239</td>
<td>Gender, Race, Class, Ethnicity, and Sexuality in the United States: Research Strategies. (3 cr; A-F only)</td>
<td>Social, cultural, and artistic modes of self-expression. Intellectual analysis of people in the United States identified as female or male as or as members of groups defined by race, ethnicity, class, or sexual orientation.</td>
</tr>
<tr>
<td>AmSt 8240</td>
<td>Gender, Race, Class, Ethnicity, and Sexuality in the United States: Topical Development. (3 cr [max 9 cr]; SP–#; A-F only)</td>
<td>Social, cultural, and artistic modes of self-expression and intellectual analysis of people in the United States identified as female or male or as members of groups defined by race, ethnicity, class, or sexual orientation.</td>
</tr>
<tr>
<td>AmSt 8249</td>
<td>Public Culture: Research Strategies. (3 cr; SP–#; A-F only)</td>
<td>Study of the popular arts in their political and social context. Focuses on issues of race, gender, class, and nationalism.</td>
</tr>
<tr>
<td>AmSt 8250</td>
<td>Public Culture: Topical Development. (3 cr [max 9 cr]; SP–#; A-F only)</td>
<td>Study of the popular arts in their political and social context. Focuses on issues of race, gender, class, and nationalism.</td>
</tr>
<tr>
<td>AmSt 8259</td>
<td>Literature, History, and Culture: Research Strategies. (3 cr; SP–#)</td>
<td>Interdisciplinary study of connections between literary expression and history, particularly as they articulate themes in American culture.</td>
</tr>
<tr>
<td>AmSt 8260</td>
<td>Literature, History, and Culture: Topical Development. (3 cr; SP–#)</td>
<td>Interdisciplinary study of connections between literary expression and history, particularly as they articulate themes in American culture.</td>
</tr>
<tr>
<td>AmSt 8333</td>
<td>FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)</td>
<td>Training in teaching undergraduate courses in American studies.</td>
</tr>
</tbody>
</table>

### Akkadian (Akka)

#### Department of Classical and Near Eastern Studies

**College of Liberal Arts**

<table>
<thead>
<tr>
<th>Course Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Akka 5011</td>
<td>Elementary Akkadian I. (3 cr; SP–Adv undergrads with # or grad)</td>
<td>Introduction to cuneiform script. Basics of Old Babylonian morphology and syntax. Written drills, readings from Hammurabi laws, foundation inscriptions, annals, religious and epic literature.</td>
</tr>
<tr>
<td>Akka 5012</td>
<td>Elementary Akkadian II. (3 cr; SP–#)</td>
<td>Continuation of 5011. Readings include The Gilgamesh Epic, The Descent of Ishtar, Mari Letters, Annals of Sennacherib and Sargodon, Sargon II.</td>
</tr>
<tr>
<td>Akka 5300</td>
<td>Readings in Akkadian. (3 cr [max 18 cr]; SP–#)</td>
<td>Survey of Akkadian literature, including literary, legal, historiographical, and sacred texts. Topics specified in Class Schedule.</td>
</tr>
</tbody>
</table>

### American Indian Studies (AmIn)

#### Department of American Indian Studies

**College of Liberal Arts**

<table>
<thead>
<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>AmIn 5890</td>
<td>Problems in American Indian History. (3 cr; SP–#)</td>
<td>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.</td>
</tr>
<tr>
<td>AmIn 5920</td>
<td>Topics in American Indian Studies. (2-4 cr [max 4 cr]; A-F only)</td>
<td>Intensive examination of a particular topic (e.g., American Indian education. American Indians of the Great Lakes, American Indians of the Southwest, American Indians and the Federal government).</td>
</tr>
</tbody>
</table>

### American Sign Language (ASL)

#### Department of Educational Psychology

**College of Education and Human Development**

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<thead>
<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>ASL 5642</td>
<td>Classroom Communication Through ASL. (1-2 cr [max 5 cr]; SP–Fluency in ASL or #; SP–Fluency in ASL, #; S-N only)</td>
<td>American Sign Language (ASL) form/function, vocabulary production, grammatical features needed by professionals working with children, storytelling strategies, technical sign language for classroom teachers. Content progresses in repeated segments.</td>
</tr>
</tbody>
</table>

### Courses

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<tbody>
<tr>
<td>AmSt 8444</td>
<td>FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)</td>
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</tr>
<tr>
<td>AmSt 8520</td>
<td>Seminar: American Art and Material Culture. (3 cr [max 12 cr]; SP–#)</td>
<td>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.</td>
</tr>
<tr>
<td>AmSt 8666</td>
<td>Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)</td>
<td></td>
</tr>
<tr>
<td>AmSt 8777</td>
<td>Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])</td>
<td></td>
</tr>
<tr>
<td>AmSt 8801</td>
<td>Dissertation Seminar. (3 cr; SP–AmSt doctoral student beginning dissertation work; 5-S N only)</td>
<td>Conceptualizing the research problem for the dissertation and structuring the process of writing a chapter of it.</td>
</tr>
<tr>
<td>AmSt 8888</td>
<td>Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)</td>
<td></td>
</tr>
<tr>
<td>AmSt 8970</td>
<td>Independent Study in American Studies. (1-9 cr [max 9 cr]; SP–#)</td>
<td>Independent study of interdisciplinary aspects of American civilization under guidance of faculty members of various departments.</td>
</tr>
</tbody>
</table>

### Ancient Near Eastern (ANE)

#### Department of Classical and Near Eastern Studies

**College of Liberal Arts**

<table>
<thead>
<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>ANE 5501</td>
<td>Ancient Israel: The Origins of Israel in Biblical Traditions. (3 cr; SP–Knowledge of Hebrew not required)</td>
<td>The foundation of the Hebrew people; traditions of the patriarchal period, development of Israelite religious and legal institutions; Ancient Near Eastern context of Israel’s origins.</td>
</tr>
<tr>
<td>ANE 5502</td>
<td>Ancient Israel: From Conquest to Exile. (3 cr; SP–#3502, §RelA 3502, §RelA5502; Hebrew not required; 5501 recommended)</td>
<td>Israelite history in context of what is known from Egyptian, Canaanite, and Mesopotamian sources. Focus on issues raised by archaeological data related to Israelite conquest of Canaan.</td>
</tr>
<tr>
<td>ANE 5504</td>
<td>History and Development of Israelite Religion II. (3 cr)</td>
<td>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.</td>
</tr>
<tr>
<td>ANE 5701</td>
<td>Studies in Semitic Linguistics and Inscriptions. (3 cr; SP–Adv Hebrew or adv Arabic or #)</td>
<td>Survey of comparative Semitic linguistics with emphasis on Northwest Semitic. Reading of Phoenician, Mobeite, and Judean inscriptions.</td>
</tr>
<tr>
<td>ANE 5713</td>
<td>Introduction to Ugaritic. (3 cr; SP–Adv Hebrew, previous study of biblical texts or #)</td>
<td>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.</td>
</tr>
</tbody>
</table>
Courses

**Anesthesiology (Anes)**

**Department of Anesthesiology**

**Medical School**


Anes 5588. Advanced Clinical Physiology II for Nurse Anesthetists. (3 cr; SP–Advanced Clinical Physiology I for Nurse Anesthetists; A-F only) Respiratory physiology, acid-base physiology; gastrointestinal physiology, metabolism, endocrinology, reproductive physiology, physiology of pregnancy/labor.

Anes 5686. Chemistry and Physics for Nurse Anesthetists. (3 cr; SP–General chemistry or #; A-F only) Chemical equilibrium, organic chemistry, physics of fluids/gases, anesthetic applications.

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 5099. Special Workshop in Animal Science. (1-6 cr [max 12 cr]; SP–#; A-F only) Topics vary. See Class Schedule or department. Topics may use guest lectures/experts.

AnSc 5200. Introductory Statistical Genetics and Genomics. (4 cr; QP–Stat 3091 or equiv; [GCB 3022 or Biol 4003 or equiv]; [GCB 3221 or Stat 3011 or equiv]; [GCB 3022 or Biol 4003 or equiv]; A-F only) Statistical issues in genetics. Gene detection, including statistical analysis/designs for linkage study and for mapping quantitative trait loci. Linkage analysis using pedigree data for codominant/dominant markers. Using radiation hybrid mapping/single cell typing. Design issues in linkage analysis, parentage testing, marker polymorphism.

AnSc 8111. Genetic Improvement of Animals. (3 cr; SP–#) Application of population genetics to livestock breeding; selection index theory and practice; basis of relationships and covariances among relatives; and selection based upon multiple sources of information.


AnSc 8131. Molecular Biology Techniques in Animal Science. (3 cr; QP–Biol 3021, Biol 5003 or equiv; SP–Biol 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 8194. 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; QP–Biol 5331 recommended; SP–#; Biol 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 4 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: Master’s. (1 cr; SP–Master’s student and DGS consent)

AnSc 8340. Concepts and Developments in Swine Nutrition. (1 cr [max 2 cr]; SP–#; A-F only) Emphasis is on genetics, conception, and implantation.

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; QP–#; physiological system 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; QP–3322; 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; QP–#; SP–3305 or #) Blood groups and polymorphic proteins affecting reproduction; immunoglobulin formation; antigens of semen, ovum, and genital secretions; immunopathology; maternal-fetal incompatibility; and antibodies to hormones.

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

AnSc 8451. Reproductive Endocrinology. (2 cr; QP–Biol 3021; SP–3305 or equiv; Biol 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 Science. (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 Credits. (1-18 cr [max 60 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 [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

AnSc 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

**Anthropology (Anth)**

**Department of Anthropology**

**College of Liberal Arts**

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


Anth 5029. Philosophical Anthropology. (3 cr; SP–Sr or grad 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 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 writing and reading of ethnography.

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

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

Anth 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 thinking in education.

Anth 5980. Topics in Anthropology. (5 cr [max 3 cr]) Topics specified in Class Schedule.

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.
Courses

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 extended focus on ethnographic, 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.

Anth 8004. Foundations of Anthropological Archaeology. (3 cr; SP–8001, 8002)
Theoretical foundations of anthropological archaeology in historical and contemporary perspectives.

Anth 8120. Problems in Culture Change and Applied Anthropology. (3-6 cr [max 6 cr])
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, global environmental change, 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 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 year)
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, recordation, analysis, and interpretation of archaeological materials.

Anth 8230. Development and Management of Anthropological Research Projects. (1 cr [max 4 cr]; SP–Anth grad student or #; A-F only)
Training seminar on research development, coordination, grant management, field/laboratory research management, and fundraising.

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

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

Anth 8510. Topics in Anthropology. (3-9 cr [max 9 cr]; SP–Grad anth major or #)
Seminar examines current issues and problems of semiotic, structuralist, and interpretive approaches in anthropology. Methodology, in the broadest sense of the concept, is evaluated. Students conduct three research exercises and set up an ethnographic research project.

Anth 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Anth 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required (Plan A only))

Anth 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

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–#)

Anth 8993. Directed Study. (1-18 cr; SP–#)

Anth 8994. Directed Research. (1-18 cr; SP–#)

Applied Economics (ApEc)

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

Statistical and econometric techniques for applied economists. Theory and application of multivariate regression model using data sets from published economic studies. Emphasis on use of statistical technique to understand market behavior.

ApEc 5151. Applied Microeconomics: Firm and Household. (3 cr; SP–ApEc 5151 or SP–Fec 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–ApEc 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, econometric models. Sources and properties of economic and sector-wide data, and empirical applications.

ApEc 5321. Regional Economic Analysis. (3 cr; SP–3006 or Econ 3102 or #; Econ 3006 or Econ 3102 or #)
Regional economic 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 #; SP–3001 or #; A-F only)
The organization, delivery, economic analysis and finance of state and local public services and functions.

ApEc 5401. Price Analysis, Futures, and Options Markets. (3 cr; QP–3001 or #; Math 1142 or #; SP–3001 or #)
Development/application of price models. Unique market institutions in agriculture that have been developed in response to marketing/logistics problems. Futures/options trading. Hedging, speculative uses of futures/options contracts. Price efficiency, market performance/regularations.

ApEc 5511. Labor Economics. (3 cr; QP–3101 or Econ 3101 or #; SP–3101 or Econ 3101 or #)
Theoretical foundations of labor markets, including intertemporal/household labor supply. Demand for labor, efficiency wages. Human capital theory, unemployment, migration decisions. Analysis of econometric research applied to labor policy issues such as minimum wage, tax policy, social insurance, education.

ApEc 5551. Food Marketing Economics. (3 cr; QP–FScn 5474, 5550; 3001 or Econ 3101; SP–54451, 53451; Econ 3001; A-F only)

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; QP–Sr or grad or #; SP–Sr or grad or #)
Economic regulation of agriculture. Industrial organization and market structure in agriculture, 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,
Courses

natural resource scarcity or adequacy, environmental quality and sustainability, political 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 promotion; 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 5731. Economic Growth and International Development. (3 cr; QP–3101, 3102) or equiv or #; SP–3101, 3102 or equiv or #)

ApEc 5751. Agricultural Trade and Trade Policy: Issues and Analysis. (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 and common market areas, exchange rate impacts, primary commodities and market instability, current trade issues.

ApEc 5811. Cooperative Organization. (3 cr; QP–3001, 3002 or #; SP–3001, 3002 or #)
Application of economic analysis to the cooperative form of organization. Producer and consumer cooperatives used to examine economic issues such as changing market organization, financing, management incentives, taxation, and antitrust regulations. Cooperatives as a tool for economic development included.

ApEc 5861. Economics of Agricultural Production. (3 cr; SP–5151 or Econ 5151 or #)
Production economics applied to agriculture, profitable combination of production factors; comparative advantage and location of production.

ApEc 5881. Independent Study: Advanced Topics in Farm and Agribusiness Management. (1-4 cr; QP–#; SP–#)
Special topics or individual work suited to the needs of particular groups of students.

ApEc 5991. Special Topics and Independent Study in Applied Economics. (1-4 cr; max 12 cr; QP–#; SP–#)
Special classes, independent study, and supervised reading and research on subjects and problems not covered in regularly offered courses.

ApEc 8202. Mathematical Optimization in Applied Economics. (3 cr; SP–[5151, Econ 5151] or equiv or #)
Economic foundations and applications of mathematical and dynamic programming and optimal control. Mathematical optimization concepts; structures and economic interpretations of various models of the firm, consumer, household, sector, and economy. Model building and solution techniques.

ApEc 8203. Applied Welfare Economics and Public Policy. (3 cr; SP–Calc II; intermediate econ theory)
Basic concepts underlying measurement of welfare change, problems of market failure and externalities, social welfare functions, and distribution within and across generations. Application of concepts, based on case studies of the environment, returns to research, technical change, and agricultural policy.

ApEc 8204. Applied Financial Economics. (3 cr; QP–[Econ 5151, Econ 5151] or Econ 8101, 8102; A-F only)

ApEc 8211. Econometric Analysis I. (4 cr; QP–[Math 1261 or equiv; Stat 3122 or 3133], Ph.D. student) or #; SP–[Math 1272 or equiv; Stat 4102 or 5102], Ph.D. student) or #)
Topics include classical multiple linear regression, stochastic regressors, heteroscedasticity, autocorrelated disturbances, panel data and discrete dependent variables.

ApEc 8212. Econometric Analysis II. (4 cr; SP–[8211 or equiv or #)
Second semester of econometrics for Ph.D. students. Specification tests, instrumental variables, heteroscedasticity, panel data, simultaneous equations, bootstrap methods, limited dependent variable models, semiparametric estimation, econometrics of program evaluation, general method of moments, time series, hazard models.

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

ApEc 8401. Consumption Economics. (3 cr; SP–[5151, Econ 5151] or equiv, ApEc 8230 or #)
Analytic treatments of consumers' economic behavior. Theory applied to explain household consumption choices under uncertainty, and shifts in demand and welfare due to changes in private information or public policy. Demand models and value of nonpriced characteristics are estimated.

ApEc 8402. Marketing Economics. (3 cr; SP–[5151, Econ 5151] or equiv, ApEc 8230 or #)

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

ApEc 8601. Natural Resource Economics. (3 cr; SP–[5151, Econ 5151] or equiv, ApEc 8220, 8230 or #)

ApEc 8602. Earnings of the Environment. (3 cr; SP–Econ 8211 or 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; max 60 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 8202 or 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–[8230, Econ 8002 or 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; max 50 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; max 6 cr; SP–Ag and applied econ M.S. student; S-N only)

ApEc 8801. Production Functions and Supply Analysis. (3 cr; SP–[5151, Econ 5151] or equiv, ApEc 5030 or #)
Cost minimizing and profit maximizing conditions; substitution elasticities; specification and estimation of production, supply, and input demand functions; specification bias; labor and capital markets; technical change; productivity analysis; human capital.

ApEc 8802. Managerial Economics. (3 cr; SP–[5151, Econ 5151] or equiv, ApEc 8220 or #)
Analysis of managerial decisions by individual entrepreneurs and organizations. Theories of decision making under uncertainty, assessment of risk and risk preferences, application of expected utility theory to investment and resource allocation decisions, boundaries of the firm, mechanisms for vertical coordination, and organizational design.

ApEc 8888. Thesis Credits: Doctoral. (1-24 cr; max 100 cr; SP–Max 18 cr per semester or summer; 24 cr total required)

ApEc 8901. Graduate Seminar: M.S. Program. (1 cr; SP–Ag and applied econ M.S. student; S-N only)
Writing, critiquing, and oral presentation skills for M.S. students. Oral presentation of research proposal for thesis or Plan B project critiqued by peers and committee members.

ApEc 8902. Graduate Seminar: Ph.D. Program. (1 cr; SP–Ag and applied econ Ph.D. student; S-N only)
Faculty, students, and outside speakers present research ideas and results, which participants critique. Topics vary according to interests of the speakers.

ApEc 8991. Advanced Topics in Applied Economics. (1-6 cr)
Special seminars or individual work on subjects suited to needs of students.

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; max 60 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; max 50 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

APSc 8888. Thesis Credits: Doctoral. (1-24 cr; max 100 cr; SP–Max 18 cr per semester or summer; 24 cr required)
**Arabic (Arab)**

*College of Liberal Arts*

**Arab 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.

**Arab 5011. Islam in Africa.** (3 cr) Ideological, doctrinal, and ritual aspects of continental African Islam. Emphasis on various religious brotherhoods and Sufi orders from different African countries in the 20th century. No knowledge of Arabic required.

**Arab 5036. Islam: Religion and Culture.** (3 cr; SP—§Arab 3542) Islamic dynasties, Mamluks and Mongols, and prophet, the Orthodox and Umayyad Caliphs. The rise of Islam in its Arabian setting. All readings in English.

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

**Arab 5502. Arabic Novel in Translation.** (3 cr) The novel as a new genre in Arabic literature. Trends: realist, psychological, existentialist, feminist, post-modernist, fantastic, experimentalist. Emphasizes major writers such as Mahfouz, Ghanem, Salih, Jabra, El Sa’daawi, Munif, and Khouri. Theoretical/critical essays. All readings in English.

**Arab 5503. Islamic Civilization.** (3 cr; SP—§Arab 3536) Islamic legacy in the classical age (800—1400), including medical/natural sciences, mathematics, philosophy, literature, and their transmission to Europe.

**Arab 5504. Arab World: 1920 to 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 5900. Topic in Arabic Literature and Culture.** (3 cr [max 9 cr]; SP—§Arab 5102 or #) Readings and discussion of selected works in Arabic. Topics specified in Class Schedule.

**Arab 5992. Directed Readings.** (1—3 cr; SP—#) Individual research and readings for advanced students.

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

**Arab 5901. Biblical Aramaic and Old Aramaic Inscriptions.** (3 cr; SP—§Arab 5102 or #) Biblical Aramaic—grammar, fluency in reading Biblical Aramaic and Old Aramaic inscriptions.

**Arab 5912. Syriac.** (3 cr; SP—§Arab 5102 or #) Emphasis on fundamentals of grammar and reading Syriac texts fluently.

**Arabic (Arm)**

*Department of Classical and Near Eastern Studies*

**Arab 5011. Biblical Aramaic and Old Aramaic Inscriptions.** (3 cr; SP—§Arab 5102 or #) Biblical Aramaic—grammar, fluency in reading Biblical Aramaic and Old Aramaic inscriptions.

**Arab 5012. Advanced Arabic I.** (4 cr; SP—§Arab 5102 or #) Advanced readings in classical and modern Arabic. Compositions based on texts.

**Arab 5036. Advanced Arabic II.** (4 cr; SP—§Arab 5102 or #) Readings of Arabic texts. Writing compositions based on texts. Continuation of 5101.

**Arab 5491. Classical Islamic Civilization.** (3 cr; SP—§Arab 3536) Islamic legacy in the classical age (800—1400), including medical/natural sciences, mathematics, philosophy, literature, and their transmission to Europe.

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

**Arab 5502. Arabic Novel in Translation.** (3 cr) The novel as a new genre in Arabic literature. Trends: realist, psychological, existentialist, feminist, post-modernist, fantastic, experimentalist. Emphasizes major writers such as Mahfouz, Ghanem, Salih, Jabra, El Sa’daawi, Munif, and Khouri. Theoretical/critical essays. All readings in English.

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

**Arab 5504. Arab World: 1920 to 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 5900. Topic in Arabic Literature and Culture.** (3 cr [max 9 cr]; SP—§Arab 5102 or #) Readings and discussion of selected works in Arabic. Topics specified in Class Schedule.

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**Arab 5912. Syriac.** (3 cr; SP—§Arab 5102 or #) Emphasis on fundamentals of grammar and reading Syriac texts fluently.

**Aramaic (Arm)**

*Department of Architecture*

**College of Architecture and Landscape Architecture**

**Arch 5123. Architectural Thesis.** (8 cr; SP—§Arab 5122, 5241; B.A. 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; SP—§Arab 5122, 5242; B.A. Arch. major; students must submit thesis plan in semester before writing thesis; A-F only)

Introduction to 3-D drawing capabilities. Use of dimension variables, attributes, blocks, symbols, and the creation of customized menus.

**Arch 5321. Architecture in Watercolor.** (3 cr; SP—§Arab 5122, 5242; B.A. Arch. major; students must submit thesis plan in semester before writing thesis; 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 5350. Topics in Architectural Representation.** (1-3 cr; SP—§Arab 5122, 5242; B.A. Arch. major; students must submit thesis plan in semester before writing thesis; A-F only)

Topics in architectural representation. Selected topics in architectural representation.

**Arch 5351. AutoCAD I.** (3 cr; SP—§Arab 5122, 5242; B.A. Arch. major; students must submit thesis plan in semester before writing thesis; A-F only)

Basic concepts, tools, and techniques of computer-aided drafting with current AutoCAD Release. Strategies and techniques for producing dimensioned and annotated drawings suitable for plotting and an introduction to 3-D drawing capabilities. Use of dimension variables, attributes, blocks, symbols, and the creation of customized menus.

**Arch 5352. AutoCAD II.** (3 cr; SP—§Arab 5122, 5242; B.A. Arch. major; students must submit thesis plan in semester before writing thesis; A-F only)

Intermediate concepts, tools, and techniques of computer-aided drafting with current AutoCAD Release. Strategies and techniques for producing dimensioned and annotated drawings suitable for plotting. Use of dimension variables, attributes, blocks, symbols, and the creation of customized menus.

**Arch 5361. Topics in Architectural Representation: 3-D Architectural Modeling and Design.** (3 cr; SP—§Arab 5122, 5242; B.A. Arch. major; students must submit thesis plan in semester before writing thesis; 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—§Arab 5122, 5242; B.A. Arch. major; students must submit thesis plan in semester before writing thesis; A-F only)

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

**Arch 5372. Computer Methods II.** (1 cr; SP—§Arab 5122, 5242; B.A. Arch. major; students must submit thesis plan in semester before writing thesis; A-F only)

Introduction to current techniques, computer programs, and their application to architectural computing.
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<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Description</th>
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<tbody>
<tr>
<td>Arch 5374</td>
<td>Computer Methods IV. (1 cr; SP–5373, 6524, M.Arch. major or #)</td>
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<td>Advanced architectural computing applications in design, history, theory, representation, and technology.</td>
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<tr>
<td>Arch 5381</td>
<td>Introduction to Computer Aided Architectural Design. (3 cr; SP–Arch or B.E.D. or M.Arch. or grad student in LA or #; A-F only)</td>
<td>2-D drawing, 3-D modeling, animation, printing, plotting. Electronic networking/communications, database management, spreadsheet analysis, land-use analysis, project management.</td>
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<tr>
<td>Arch 5382</td>
<td>Computer Aided Architectural Design. (3 cr; SP–5383, undergrad, [B.Arch. major or B.E.D. major] or M.Arch. major or graduate LA major or #; A-F only)</td>
<td>2-D/D-CAD, image manipulation. Advanced multimedia visualization techniques for design, including solid modeling, photo-realistic imaging, animation, video-editing/recording.</td>
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<td>Arch 5410</td>
<td>Topics in Architectural History. (3 cr; max 12 cr) SP–For undergrads 3412, arch major; for grads M.Arch. major or #; A-F only</td>
<td>Advanced study in architectural history. Readings, research, and seminar reports.</td>
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<td>Arch 5411</td>
<td>Principles of Design Theory. (3 cr; SP–M.Arch. major or #; A-F only)</td>
<td>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.</td>
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<tr>
<td>Arch 5423</td>
<td>Gothic Architecture. (3 cr; SP–For undergrads 3411, arch major; for grads M.Arch. major or #; A-F only)</td>
<td>History of development of architecture and urban design in Western Europe from 1150 to 1400.</td>
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<tr>
<td>Arch 5424</td>
<td>Renaissance Architecture. (3 cr; SP–For undergrads 3411, arch major; for grads M.Arch. major or #; A-F only)</td>
<td>History of architecture and urban design in Italy from 1400 to 1600. Emphasis on major figures (Brunelleschi, Alberti, Bramante, Palladio) and the evolution of major cities (Rome, Florence, Venice).</td>
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<td>Arch 5425</td>
<td>Baroque Architecture. (3 cr; SP–For undergrads 3411, arch major; for grads M.Arch. major or #; A-F only)</td>
<td>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).</td>
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<td>Arch 5426</td>
<td>Architecture and Nature: 1500–1750. (3 cr; SP–For undergrads 3411, 3412, arch major; for grads M.Arch. major or #)</td>
<td>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.</td>
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<tr>
<td>Arch 5431</td>
<td>18th-Century Architecture and the Enlightenment. (3 cr; SP–For undergrads 3412, 3413, arch major; for grads M.Arch. major or #; A-F only)</td>
<td>Architecture and urban design in Europe from 1700 to 1850.</td>
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<td>Arch 5432</td>
<td>Modern Architecture. (3 cr; SP–For undergrads 3412, arch major; for grads M.Arch. major or #; A-F only)</td>
<td>Architecture and urban design in the United States from the early 19th century to World War II.</td>
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<tr>
<td>Arch 5434</td>
<td>Contemporary Architecture. (3 cr; SP–For undergrads 3412, arch major; for grads M.Arch. major or #; A-F only)</td>
<td>Developments, theories, movements, and trends in architecture and urban design from World War II to the present.</td>
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<td>Arch 5439</td>
<td>History of Architectural Theory. (3 cr; SP–For undergrads 3412, arch major; for grads M.Arch. major or #; A-F only)</td>
<td>History of architectural theory from antiquity to the 20th century.</td>
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<tr>
<td>Arch 5450</td>
<td>Topics in Architectural Theory. (1-3 cr [max 9 cr]; SP–Arch or B.E.D. major or M.Arch. major or #; A-F only)</td>
<td>Selected topics in architectural theory and criticism.</td>
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<tr>
<td>Arch 5451</td>
<td>Architecture: Defining the Discipline. (3 cr; SP–M.Arch. major or #; A-F only)</td>
<td>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.</td>
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<tr>
<td>Arch 5452</td>
<td>Architecture: Design, Form, Order, and Meaning. (3 cr; SP–M.Arch. major or #; A-F only)</td>
<td>Architecture and the issue of meaning. Explores fundamental and constituent elements of architectural form and order; their inherent tectonic, phenomenal, experiential, and symbolic characteristics; their potential and implications for the creation and structure of meaningful human places.</td>
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<tr>
<td>Arch 5454</td>
<td>Semiotics and Deconstruction in Architecture. (3 cr; CP–5401, M.Arch. major or #; SP–5411, M.Arch. major or #; A-F only)</td>
<td>Expressive and cultural dimensions of architecture, especially their relationship to linguistic analogies, knowledge production, and contemporary philosophy. Broad critical perspective of architectural discussion and argumentation addressing current issues.</td>
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<tr>
<td>Arch 5455</td>
<td>Typology and Architecture: Theories of Analysis and Design. (3 cr; CP–5401, M.Arch. major or #; SP–5411, M.Arch. major or #; A-F only)</td>
<td>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.</td>
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<td>Arch 5458</td>
<td>Architecture and Culture. (3 cr; SP–3412, arch major or grad student or #; A-F only)</td>
<td>Architecture as a cultural medium. Relationships among architecture, people, and culture; research findings and design; vernacular and high style architecture. Physiological and symbolic messages; reception theory in architecture; cultural critique and change; implications for architectural practice.</td>
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<td>Arch 5459</td>
<td>Gender and Architecture. (3 cr; SP–Arch or WoSt major or M.Arch. major or #)</td>
<td>Examination of relationships related to gender and architecture, gendered and non-gendered places and practices, and their relations to cultural norms and change.</td>
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<td>Arch 5461</td>
<td>North American Indian Architecture. (3 cr; SP–For undergrads 3412, arch major or #; A-F only)</td>
<td>Architecture and the issue 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.</td>
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<td>Arch 5501</td>
<td>Environmental and Material Forces in Architecture. (4 cr; CP–5301, 5315, arch major or #; SP–5281, LA 3501, arch major or #; A-F only)</td>
<td>Exploration of ideas related to gender and architecture, gendered and non-gendered places and practices, and their relations to cultural norms and change.</td>
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<td>Arch 5511</td>
<td>Material Construction in Architecture. (3 cr; SP–M.Arch. major or #; A-F only)</td>
<td>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.</td>
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<tr>
<td>Arch 5512</td>
<td>Building Methods in Architecture. (3 cr; SP–M.Arch. major or #; A-F only)</td>
<td>Analysis of architectural materials, building systems, and construction operations related to enclosure systems design, building infrastructure, and detailing. Application of legal construction standards (e.g., ADA, building codes, life-safety issues) in preparation of drawings, specifications, and construction documents for building design.</td>
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<td>Arch 5513</td>
<td>Environmental Technology I: Thermal Design in Architecture. (3 cr; SP–M.Arch. major or #; A-F only)</td>
<td>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.</td>
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<td>Arch 5514</td>
<td>Environmental Technology II: Lighting and Acoustic Design. (3 cr; SP–M.Arch. major or #; A-F only)</td>
<td>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.</td>
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<td>Arch 5525</td>
<td>Design in Masonry. (3 cr; CP–5521, M.Arch. major or #; SP–5512, M.Arch. major or #; A-F only)</td>
<td>Design principles, construction methods, and document production for masonry structures.</td>
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<td>Arch 5534</td>
<td>Daylighting and Architecture Design. (3 cr; CP–5531, M.Arch. major or #; SP–5514, M.Arch. major or #; A-F only)</td>
<td>Role of daylighting in architectural design: principles, strategies, energy and environmental issues, psychology of light, color, and integration of electric lighting. Design projects investigate qualitative and quantitative issues through drawing, physical models, and photometric analysis.</td>
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<td>Arch 5542</td>
<td>Building Energy Systems. (3 cr; CP–5541, M.Arch. major or #; SP–5513, M.Arch. major or #; A-F only)</td>
<td>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.</td>
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<td>Arch 5550</td>
<td>Topics in Architecture Technology. (1-3 cr [max 6 cr]; SP–Arch or M.Arch. major or #)</td>
<td>Selected topics in architecture technology, including construction, environmental management, energy performance, lighting, or materials.</td>
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<td>Arch 5561</td>
<td>Building Production Processes. (3 cr; SP–5523, arch major or B.E.D. major or M.Arch. major or #; SP–5522, SP–5501, arch major or B.E.D. major or M.Arch. major or #)</td>
<td>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.</td>
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<td>Arch 5571</td>
<td>Architectural Structures I: Wood and Steel Design. (3 cr; SP–M.Arch. major or #; A-F only)</td>
<td>Influence of history and theory on architectural and structural systems. 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, funicular structures, bending and compression elements, plates and grids, tensile architecture, shells. Description of traditional construction materials.</td>
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<td>Arch 5572</td>
<td>Architectural Structures II: Concrete and Masonry Design. (3 cr; CP–5573, M.Arch. major or #; SP–5571, M.Arch. major or #; A-F only)</td>
<td>Overview of advanced materials: reinforced fiberglass, structural glass, and structural tensile fabrics. Impact of construction technology on architecture and</td>
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methods of integrating knowledge of structural materials and construction methods into the design process.

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

Arch 5621. Professional Practice in Architecture. (3 cr; SP–M.Arch. 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–M.Arch. 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 B.A. Arch. major; for grads M.Arch. major or #)
Fundamentals of real estate development and investment building. Processes and rules of specialists in development of investment projects. Topics include pro forma financial analysis, 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 5621, M.Arch. 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 M.Arch. major or #)
Selected topics in the theory, philosophy, research, and fundamentals of architectural historical preservation.

Arch 5671. Historic Preservation. (3 cr; SP–3412 or #)
Philosophy, theory, and origins of historic preservation. Historic architecture 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 such as primary and secondary resources and on controversial aspects of preservation.

Arch 5672. Historic Building Conservation. (3 cr; SP–3412, 5411 or #; SP–3412, 5671 or #)
Historic building materials, systems, and methods of conservation. Discussion of structural systems, building repair and pathology, introduction of new environmental systems in historic buildings, and conservation of historic interiors. Research on historic building materials and techniques using primary and secondary resources and on documentation of a specific historic site through large-format photography and measured drawings.

Arch 5673. Historic Building Research and Documentation. (3 cr; SP–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 B.E.D. major or M.Arch. 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 B.E.D. or Greg major or M.Arch. 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, M.Arch. or LA grad major or #; A–F only)
Special topics in theory and practice of urban design.

Arch 5993. Directed Study. (1-4 cr; SP–#; A–F only; A–F only)
Guided individual reading or study.

Arch 8101. Subjects and Methods in Architecture. (2 cr; SP–Grad arch major or #; F–N 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)

Arch 8251. 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; SP–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; SP–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; SP–8256; SP–8254, grad arch major or #; A–F only)
Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort.

Arch 8295. Directed Graduate Architectural Design. (6 cr; SP–8255, grad arch major or #; A–F only)

Art (ArtS)

Department of Art
College of Liberal Arts

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

Art 5105. Advanced Dimensional Painting. (4 cr; SP–3105 or #)
Illusionary space applied to sculptural forms. Practical applications of spatially-based concepts. Emphasizes critical/visual judgment. Development of cohesive body of work reflecting interaction of two/three dimensions.

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

Art 5110. Advanced Drawing. (4 cr; max 12 cr; SP–3101 or 3111 or #)
Developing personal direction in form/content. Various media. Various aesthetic/conceptual approaches.

Art 5120. Advanced Painting. (4 cr; max 12 cr; SP–3102 or #)
Developing personal vision/content through painting. Emphasizes critical thinking, self-evaluation, and independent pursuit of ideas.

Art 5130. Advanced Painting: Watercolor. (4 cr; max 12 cr; SP–3102 or #)

Art 5310. Advanced Sculpture: Direct Metal. (4 cr; max 12 cr; SP–3301 or #)
Direct metal sculpture in steel, other metals. Studio practice, investigation of historical/contemporary methods/concepts. Development of personal sculpture imagery.

Art 5320. Advanced Sculpture: Spatial Problems. (4 cr; max 12 cr; SP–3302 or #)
Sculptural practice outside traditional media/approaches. Installation, theater, public art, architecture as topics for individual investigations into spatial organization.

Art 5330. Advanced Sculpture: Metal Casting. (4 cr; max 12 cr; SP–3303 or #)
Metal casting of sculpture in bronze, iron, aluminum, other metals. Studio practice, investigation of historical/contemporary methods/concepts. Development of personal sculptural imagery.

Art 5340. Advanced Sculpture: Carving and Construction. (4 cr; max 12 cr; SP–3304)

Art 5350. Advanced Sculpture: Kinetics. (4 cr; max 12 cr; SP–3305 or #)

Art 5360. Advanced Performance Art and Installation. (4 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.

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


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

Arts 5405. Visual Narrative Structures. (4 cr; SP–1–1401, or SP–3501 or #) One 1xxx art course or SP–1001, one 1xxx art course or SP–3403 or #) Visual/verbal investigation of structures of visual narratives. Contemporary efforts to integrate cogen images in visual texts. Development of methods for personal visual communication of cultural, spiritual, aesthetic, environmental experiences. Historical/cultural focus. Studio work.

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

Arts 5490. Workshop in Art. (1–4 cr; max 12 cr) Selected topics and intensive studio activity. Topics vary yearly.


Arts 5520. Advanced Printmaking: Relief and Lithography. (3 cr; max 12 cr; SP–3502 or #) Relief printing, lithography for creative expression. Studio practice with stone, metal, wood. Developing personal visual language/aesthetics. Historical/contemporary awareness, evolving technologies/strategies.

Arts 5550. Advanced Papermaking. (4 cr; max 12 cr; SP–3505 or #) Distinct expressive qualities of handmade paper, its versatility as contemporary art form. Independent research pursued in consultation with instructor.

Arts 5610. Advanced Interactive Media. (4 cr; max 12 cr; SP–3601 or #) Web-screen-based and installation/performance projects in consultation with instructor. Focuses on individual expression, role of artist/audience, and synthesis of artistic form/content using interactive digital technologies.

Arts 5620. Advanced Digital Video. (4 cr; max 12 cr; SP–3602; A-F only) Individual projects exploring elements of time, cinematic space, narrative, and montage through experimental, documentary, or installation-based video art. Articulation of relationships between conceptual, aesthetic, and artistic process.

Arts 5710. Advanced Photography. (4 cr; max 12 cr; SP–Two sem of 3xxx photography or #) Design/implementation of individual advanced projects. Demonstrations, lectures, critique. Reading, writing, discussion of related articles/exhibitions.

Arts 5810. Advanced Ceramics. (4 cr; max 12 cr; SP–3801, 3802 or #) Critical discourse of aesthetics, history, and contemporary issues in clay and criticism. Independent, advanced projects.

Arts 5821. Ceramic Materials Analysis. (4 cr; SP–3801 or 3802 or #) Ceramic materials, their interrelationships. Advanced investigation of glazes, slip formulation, clay bodies in high/low temperature ranges. Individual interests related to students’ aesthetic needs.


Arts 5840. Advanced Neon. (4 cr; max 12 cr; SP–3804 or #) Emphasis on the development of personal sculptural sensibility. 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 SP–3803 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 M.F.A. student) Tutorial in drawing and/or painting.

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


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) Controversial 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.


Art History (ArtH) Department of Art History College of Liberal Arts

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

ArtH 5103. Hellenistic and Early Roman Art and Archaeology. (3 cr; SP–Class/ArtH 3008, or #) Sculpture and painting, topography and chronology 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–ArtH/Class 3008, 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, 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 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 identification and dating buildings; analysis of methods and techniques.

ArtH 5120. Field Research in Archaeology. (3–6 cr; max 6 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–Intro art history course or #) The architecture, painting, and sculpture of urban houses, country estates, and tombs in the Roman World. Relationships between public and private spheres, and literary and physical evidence; usefulness of physical evidence in illuminating gender roles.

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

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

ArtH 5252. History of Early Christian Art in Context. (3–4 cr; SP–3xxx ArtH course or #) The role played by art in the formation of early Christian and Byzantine communities, and in establishing their relationships with the Pagan world and early Islam.
Arth 5323. Art of the Italian Renaissance: 14th-16th Centuries. (3 cr)
Chronological/anthemic study of painting, sculpture, and architecture. Emphasizes major artists' commissions, but lesser students/followers also considered.

Arth 5324. 15th-Century Painting in Northern Europe. (3 cr; SP–3011 or grad or #)
The origin, character, and development of painting in France, the Netherlands 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 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, Algarotti, Borromini, Piranesi).

Arth 5347. 17th- and 18th-Century Art of Northern Europe. (3 cr; SP–3011 or grad or #)
Seventeenth- and eighteenth-century French architecture, sculpture, and painting (e.g., Versailles, Poussin, Watteau).

Arth 5347. Twentieth Century Theory and Criticism. (3 cr; SP–3464 or #)
Trends in 20th-century art theory, historical methodology, criticism. Key philosophical ideas of modernism/postmodernism: formalism, semiotics, poststructuralism, feminism, Marxism, psychoanalysis, deconstruction.

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, Manet, Pissarro. Movements linked with historical changes emphasizing contextualization of monuments.

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, dadasism, surrealism, non-objective painting, constructivism, Orphism, early abstraction. Framed against postimpressionism and internationalism at turn of century.

Arth 5465. Modernism and Modernity 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)
American 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 chronicler of the Western frontier.

Arth 5536. Topical Studies in American Art. (3 cr, SP–3011 or grad or #)
Course description varies from year to year, depending on the current research interests of the instructor and the needs and interests of advanced undergraduate and graduate students in modern and American art.

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

Arth 5725. 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 non-chronologic way to understand the unique qualities of an individual work of art. Concentration is on accessible works of art in local private and museum collections.

Arth 5766. Chinese Painting. (3 cr)
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; special attention to 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 500 C.E. (2 cr; SP–Art history course or #)
An historical course focusing on the sculpture and architecture of 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. (3 cr)
Artistic developments under the three most powerful Ottomans.

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

Arth 5925. History of Photography as Art. (3 cr)
Origins and development of photography, with attention to technology and cultural impact. Major aesthetic achievements in photography from its beginning to present.

Arth 5927. Documentary Cinema. (4 cr; A-F only)
History of nonfiction filmmaking, from early forms of reportage and birth of documentary to emergence of "film-verite" and "guerrilla television" and work by independents (e.g., Errol Morris, Michael Moore).

Arth 5940. Topics: Art of the Film. (3 cr)
Topics in film history including individual directors (e.g., Hitchcock, Welles), genres (e.g., westerns, musicals), and other topics (e.g., American independent filmmaking, film noir).

Arth 5950. Topics: Art History. (3 cr–4 cr)
Topics specified in Class Schedule.

Arth 5956. Topics: Art History. (3 cr; max 6 cr)
Topics specified in Class Schedule.

Arth 5993. Directed Study. (1-4 cr; SP–max 12 cr; SP–A-F only)

Arth 5994. Directed Research. (1-4 cr; SP–max 12 cr; SP–A-F only)

Arth 8190. Seminar: Issues in Ancient Art and Archaeology. (3 cr; max 12 cr; SP–#)
Selected topics, with special attention to current scholarly disputes. Topics specified in Class Schedule.

Arth 8200. Seminar: Medieval Art. (3 cr; max 12 cr; SP–#)
Focus on a major art historical theme, artist, period, or genre.

Arth 8333. FTE: Master's 1-4 cr; SP-Master's student, adviser and DGS consent)

Arth 8340. Seminar: Baroque Art. (3 cr; max 12 cr; SP–#)
Topics vary.

Arth 8400. Seminar: Issues in 19th-Century Art. (3 cr; max 12 cr; SP–#)
Typical seminars have included symbolism, role of the academy and the avant-garde, surrealism in art and theory, and Franco-American relationships at the turn of the 20th century.

Arth 8440. Seminar: Issues in Contemporary Art. (3 cr; max 12 cr; SP–#)

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

Arth 8520. Seminar: American Art and Material Culture. (3 cr; max 12 cr; SP–#)
Topics in American art, popular art, and material culture, emphasizing methods and techniques of inquiry: creation and use of archives, oral history, sources for pictorial evidence, and current approaches to interpreting traditional and non-traditional data.

Arth 8666. Doctoral Pre-Thesis Credits. (1-18 cr; max 60 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Arth 8710. Seminar: Islamic Art. (3 cr; max 12 cr; SP–#)
Focus depends on current research interests of the professor and needs and interests of graduate students in Islamic and Asian art history.

Arth 8720. Seminar: East Asian Art. (3 cr; max 12 cr; SP–#)
Research focuses on closely defined topic, such as a short period of Chinese art, a restricted subject, or role of a single artist. A substantive research paper is required and participation in the seminar dialogue is expected.

Arth 8770. Seminar: Art of India. (3 cr; max 12 cr; SP–3 cr art hist, #)
Selected problems and issues in history of South Asian art. Topics varies by offering.

Arth 8888. Thesis Credits: Doctoral. (1-24 cr; max 100 cr; SP–Max 18 cr per semester or summer; 24 cr required)
Astronomy (Ast)
Department of Astronomy

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 #)
Large-scale structure and history of the universe. Introduction to Newtonian and relativistic world models. Physics of early universe, cosmological tests, formation of galaxies.

Ast 5201. Methods of Experimental Astrophysics. (4 cr; QP–3051, Phys 3512, SP–Upper div IT or grad or #)
Contemporary astronomical techniques and instrumentation. Emphasizes data reduction and analysis, including image processing. Students make astronomical observations at O’Brien Observatory and use department’s computing facilities for data analysis. Image processing packages include IRAF, AIPS, IDL, MIDAS.

Ast 8001. Radiative Processes in Astrophysics. (4 cr; SP–#)
Introduction to classical/quanum physics of electromagnetic radiation as it applies to astrophysics. Emphasizes radiative processes (e.g., emission, absorption, scattering) in astrophysical contexts (e.g., ordinary stars, ISM, neutron stars, active galaxies).

Ast 8011. High Energy Astrophysics. (4 cr; SP–#)
Energetic phenomena in the universe. Radiative processes in high energy regimes; supernovae, pulsars, and X-ray binaries; radio galaxies, quasars, and active galactic nuclei.

Ast 8021. Stellar Astrophysics. (4 cr; SP–#)
Stellar structure, evolution, and star formation. Emphasizes contemporary research.

Ast 8031. Astrophysical Fluid Dynamics. (4 cr; SP–#)
Contemporary topics. Numerical techniques for modeling astrophysical fluids and plasmas. Supernovae shocks, convection, astrophysical jets, and cloud dynamics.

Ast 8041. Comparative Planetology. (4 cr; SP–#)
Overview of current knowledge of the solar system. Formation history of protostellar nebulae, physical properties of major planetary bodies/moons. Sun and fossils of epoch of planetary system formation: comets, asteroids, minor bodies.

Ast 8051. Galactic Astronomy. (4 cr; SP–#)
Content, structure, evolution, and dynamics of Milky Way Galaxy. Emphasizes recent observations from space-ground-based telescopes.

Ast 8061. Radio Astronomy. (4 cr; SP–#)

Ast 8071. Infrared Astronomy. (4 cr; SP–#)

Ast 8081. Cosmology. (4 cr; SP–#)
Role of gravity in cosmology. Background, recent research advances.

Ast 8110. Topics in Astrophysics. (2-4 cr; SP–#)

Ast 8120. Topics in Astrophysics. (2-4 cr; SP–#)

Ast 8200. Astrophysics Seminar. (1-3 cr; SP–#)

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

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

Ast 8666. Doctoral Pre-Thesis Credits. (1-18 cr; max 60 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Ast 8777. Thesis Credits: Master’s. (1-18 cr; max 50 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A or Plan B for 50 cr degree level])

Ast 8888. Thesis Credits: Doctoral. (1-24 cr; max 100 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Ast 8990. Research in Astronomy and Astrophysics. (1-4 cr; SP–#)
Research under supervision of a graduate faculty member.

Biochemistry (BioC)

Department of Biochemistry, Molecular Biology, and Biophysics

College of Biological Sciences and the Medical School

BioC 5309. Biocatalysis and Biodegradation. (3 cr; QP–§MicC 5309; chem through organic chem; knowledge of word processing, e-mail access to Web, access to college-level science library recommended; SP–§MicC 5309; chem through organic chem; knowledge of word processing, e-mail access to 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; QP–§MicB 5352; BioC 3021 or BioC 5331 or MicB 5321, Biol 5013 or #; SP–§MicC 5352; Bio/C 3021 or BioC 4331 or MicB 4111, MicB 3301 or Biol 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 5361. Microbial Genomics. (3 cr; SP–College-level course in [organic chemistry, biochemistry, microbiology])
Introduction to genomics. Emphasizes microbial genomics. Sequencing methods, sequence analysis, genomics databases, genome mapping, pkaryotic horizontal gene transfer, genetics in biotechnology, intellectual property issues.

BioC 5401W. Advanced Metabolism and Its Regulation. (3 cr; QP–3021 or 5331; SP–3021 or 4331 or Biol 3021)
Underlying principles that determine metabolism of common/unusual compounds in plants, animals, microorganisms. Regulation of carbon, energy flow in whole organisms.

BioC 5444. Muscle. (3 cr; QP–3021 or 5331 or Phsl 3052 or #; SP–§Phsl 5444; Biol/BioC 3021 or Biol 4331 or Phsl 3061 or #)
Muscle structure/function: molecular mechanism by which force is generated.

BioC 5446. Membrane Biochemistry. (2 cr; QP–3021 or 5331 or #; SP–3021 or 4331 or Biol 3021 or #)
Membrane structure. Mechanisms and physiological roles of channels, pumps, and membrane enzymes.

BioC 5527. Physical Biochemistry: Macromolecular Structure, Energetics, and Dynamics in Biological Systems. (4 cr; QP–§MdBc/Chem 5527; intro physical chem or equiv; intro biochemistry recommended; SP–intro biochemistry, intro physics or chemical or #)
Introduction to diffraction methods used to obtain macromolecular structures. Principles underlying structural biology and structure/function relationships. Thermodynamic principles in protein and nucleic acid folding, structure, and dynamics.

BioC 5528. Physical Biochemistry: Spectroscopy. (4 cr; QP–§Chem 5528; MdBc 5528; intro physical chem or equiv; intro biochemistry recommended; 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; max 9 cr; QP–§Chem 5530, MdBc 5530, 5525 or MdBc 5525 or Chem 5525 or 5527 or 5528 or #)
Topics from current literature on biophysics of molecules, inclusion, membranes. Content/ instructors vary from one offering to another, on an approximately every other year rotation.

BioC 5531. Macromolecular Crystallography I: Fundamentals and Techniques. (1 cr; QP–§[One organic chem or biochemistry course], two calculus or college physics courses]); #; SP–§[One organic chem or biochemistry course], two calculus or college physics courses]; #; S-N only)
Macromolecular crystallography for protein structure determination/engineering. Determining macromolecule structure by diffraction.

BioC 5532. Macromolecular Crystallography II: Techniques and Applications. (1 cr; QP–5531; 5533; S-N only)
Determining structure of macromolecule by diffraction. Using software in macromolecular crystallography.

BioC 8001. Advanced Biochemistry I: Protein Structure, Function, and Metabolism. (4-5 cr; QP–§MdBc 8001, one qtr biochem, three qtrs organic chem, two qtrs physical chem; SP–§One sem biochem, two qtrs organic chem, one sem physical chem or Physical Chemistry); #)
Protein structure, methods to determine structure, protein folding, forces stabilizing macromolecular structure, protein engineering, design. Dynamic properties of proteins/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. (4-5 cr; §MdBc 8002; Bio/C 8001; §Bio/C 8001 or §Bio/C 8001 or #)
Bioc 8007. Cell Biology and Biochemistry of the Extracellular Matrix. (3 cr; SP–MIMP 8007; 8002 or MIMP 8002 or 8004 or #; A-F only)
Concepts in cell adhesion/tissue composition.

Bioc 8084. Research and Literature Reports. (1 cr [max 5 cr]; SP–Grad BMBB major or #; S-N only)
Reports on recent developments in the field and on research projects in the department.

Bioc 8123. Selected Topics in Molecular Biology. (4 cr; QP–8002 or MDbc 8002; SP–SGCD 8213; 8002 or #)
Current topics such as DNA replication, recombination and gene conversion, regulation of gene expression, chromatin structure and transcription, developmental gene regulation, organelle gene expression, RNA splicing, initiation/control of translation, animal viruses, transposable elements, somatic recombination, oncogenes.

Bioc 8216. Signal Transduction and Gene Expression. (4 cr; QP–8003; SP–8002 or #)
Cell signaling, metabolic regulation in development. Procaryotic/eucaryotic systems used as models for discussion. Literature-based course.

Bioc 8290. Current Research Techniques. (3 cr [max 9 cr]; SP–Grad BMBB major or #; S-N only)
Research project carried out in laboratory of a staff member.

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

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

Bioc 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Bioc 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Bioc 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Biological Sciences

College of Biological Sciences

Biol 5407. Ecology. (3 cr; QP–5340; [1109 or 1201 or equiv]; [Math 1142 or Math 1251 or equiv], grad or #; SP–5340; [1101 or 1009 or equiv]; [Math 1142 or Math 1271 or equiv], grad or #)
Principles of population growth/interactions and ecosystem function applied to ecological issues, including regulation of human populations, dynamics/impacts of disease, invasions by exotic organisms, habitat fragmentation, and biodiversity. Lab.

Biol 5409. Evolution. (3 cr; QP–5340; [1109 or 1202], grad or #; SP–5340; [1101 or 1009], grad or #)
Diversity of forms in fossil record and in presently existing biology. Genetic mechanisms of evolution. Examples of ongoing evolution in wild/domesticated populations and in disease-causing organisms. Lab.

Biol 5501. Biological Collections: Curation and Management. (1 cr; QP–7103 or 1106 or 3011 or 3012; SP–2012 or 2022 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 [max 12 cr]; QP–B.A. or B.S. in science or science ed or elementary ed or K-12 licensed teacher; SP–B.A. or B.S. in science or science ed or elementary ed or K-12 licensed teacher)
Courses developed for K-12 teachers depending on topics or subtopics which might include any of the following: plant biology, animal biology, genetics, cell biology, biochemistry, microbiology.

Biol 5913. Biology for Teachers: Monarchs in the Classroom. (3 cr; SP–[Elementary or middle school or high school or preservice] teacher or #, application)
Two-week summer workshop. Week one focuses on monarch butterfly biology taught through fieldwork, labs, lecture, and research projects. A 2- to 3-week break follows, when students raise monarchs, conduct simple experiments. Week two focuses on designing classroom activities/projects based on monarch biology. Follow-up meetings held during academic year.

Biomedical Engineering (BMEn)

Biomedical Engineering

Institute of Technology

BMEn 5001. Advanced Biomaterials. (3 cr; SP–1st yr grad BMEn major; [general chem, organic chem, biochem, polymer sci] recommended; A-F only)
Commonly used biomaterials. Chemical/physical aspects. Practical examples from such areas as cardiovascular/orthopedic applications, drug delivery, and cell encapsulation. Methods used for chemical analysis and for physical characterization of biomaterials. Effect of additives, stabilizers, processing conditions, and sterilization methods.

BMEn 5041. Tissue Engineering. (3 cr; SP–IT upper div or grad student or med student or #)
Fundamentals of wound healing and tissue repair; characterization of cell-matrix interactions; case study of engineered tissues, including skin, bone marrow, liver, vessel, and cartilage; regulation of biomaterials and engineered tissues.

BMEn 5101. Advanced Bioelectricity/Instrumentation. (3 cr; SP–Phsl 5440, calculus, college physics)
Instrumentation, computer systems, and processing requirements for clinical physiological signals. Electrode characteristics, signal processing, and interpretation of physiological events by ECG, EEG, and EMG. Measurement of respiration and blood volume/flow.

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

BMEn 5150. Biomedical MEMS. (4 cr; SP–Analog circuit principles, basic electromagnetic theory; A-F only)

BMEn 5201. Advanced Biomechanics. (3-4 cr; SP–[IT upper div or grad student], AEM (statics, deformable media) or #)

BMEn 5311. Advanced Biomedical Transport Processes. (3-4 cr; SP–IT upper div or grad student or #)

BMEn 5350. Cell Engineering. (3 cr; QP–Cell biol or equiv; SP–5301 or equiv, 5310 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 cell/matrix interactions.

BMEn 5371. Biomedical Applications of Heat Transfer in Humans. (3-4 cr; SP–Phsl 3053, 3056, 5441; SP–Phsl 3053, 3056, 5441)
Overview of physiology underlying thermoregulation in humans, clinical applications of heat transfer in humans, and framework for design project.

BMEn 5501. Biology for Biomedical Engineers. (3-4 cr; SP–Engineering upper div or grad student)

BMEn 5502. Pathobiology of Medical Devices. (3 cr; IT–upper division or grad student, SP–IT upper division or grad student; A-F only)
Biological response to biomaterials presented in context of fundamental principles of cell injury, adaptation, repair, or death. Diversity of medical uses of biomaterials, by organ system. Unique features of specific biological systems in which medical devices are used.

BMEn 5910. Special Topics in Biomedical Engineering. (1-4 cr; SP–Doctoral student or grad student)
Special topics.

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 8401. New Product Design and Business Development. (4 cr; QP–IT grad student or CSOM grad student), some design experience; 8401, 8402 must be taken same yr; SP–IT grad student or CSOM grad student), some design experience; 8401, 8402 must be taken same yr; A-F only)
Student teams work with IT and CSOM faculty and company representatives to develop a product concept for sponsoring company. Assignments include concept/detail design, manufacturing, marketing, introduction strategy, profit forecasting, production of product prototype.

BMEn 8402. New Product Design and Business Development. (4 cr; QP–8401; SP–8401; A-F only)
Student teams work with IT and CSOM faculty and company representatives to develop a product concept for sponsoring company. Assignments include concept/detail design, manufacturing, marketing, introduction strategy, profit forecasting, production of product prototype.

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

BMEn 8601. 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.

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

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Courses

BMEn 8602. 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 8630. Biomedical Engineering Graduate Student Seminar. (1 cr; max 3 cr; SP–Grad BMEn major; S-N only) Student presentations of current thesis research or other areas of biomedical engineering.

BMEn 8666. Doctoral Pre-Thesis Credits. (1-18 cr; max 60 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

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

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

BMEn 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

BMEn 8820. Plan B Project. (3 cr [max 3 cr]; SP–BMEn M.S. student) Project chosen by student and adviser to satisfy M.S. Plan B project requirement. Written report required.

BMEn 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

BMEn 8900. Special Topics in Biomedical Engineering. (1-4 cr; A-F only) Topics in biomedical engineering.

BMEn 8910. Independent Study. (1-3 cr [max 3 cr]; SP–Grad BMEn major) Research or study of a topic determined by interests of student in consultation with faculty supervisor. Requires approval by faculty supervisor and director of graduate studies.

BPhys 7170. Basic Radiological Physics. (3 cr; QP–#; SP–#) Theoretical/experimental aspects of radiological physics. Physical properties of various ionizing radiations, interactions of ionizing radiations with matter, methods of radiation dose measurement.

BPhys 7171. Medical and Health Physics of Imaging I. (3 cr; QP–#; SP–#) Physics of diagnostic imaging: specification/quantification of image quality, X-ray production, image receptors, magnetic resonance imaging, radiation exposure and protection. Special imaging techniques, including mammography, computed tomography, and direct digital image capture.

BPhys 7172. Radiation Biology. (3 cr; QP–#; SP–#) Effects of ionizing radiation on cells, tissues, and organisms. Biological rationale for radiation therapy practices.


BPhys 7174. Medical and Health Physics of Imaging II. (3 cr; QP–#; SP–#) Physics of diagnostic imaging. Ultrasound, theoretical/experimental applications of radionuclides in medicine and biology. Counting statistics and imaging systems associated with radiopharmaceuticals, radiation dosimetry, and safety in nuclear medicine.

BPhys 8147. Advanced Physics of Magnetic Resonance Imaging (MRI). (3 cr; QP–#; SP–#) NMR (nuclear magnetic resonance) and MRI physics, spatial selection and encoding, imaging hardware and system engineering. Imaging sequences, associated contrast/resolution. Recent developments in MRI.


BPhys 8293. Directed Study in Biophysical Sciences and Medical Physics. (1-12 cr [max 12 cr]; QP–#; SP–#) Individualized study under faculty direction.

BPhys 8294. Directed Research in Biophysical Sciences and Medical Physics. (1-12 cr; QP–#; SP–#) Individualized research under faculty direction.

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

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

BPhys 8666. Doctoral Pre-Thesis Credits. (1-18 cr; max 60 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

BPhys 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

BPhys 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Biosystems and Agricultural Engineering (BAE)

Institute of Technology and College of Agricultural, Food, and Environmental Sciences

BAE 5095. Special Problems. (1-5 cr; QP–#; SP–#) Advanced individual-study project. Application of engineering principles to specific problem.

BAE 5513. Watershed Engineering. (3 cr; QP–Upper div IT or grad, 3052 or CE 3300, CE 3400; 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 8003. Research Seminar II. (1 cr; max 2 cr; SP–#; S-N only) Organize and critique seminars in biosystems and agricultural engineering.

BAE 8005. Supervised Classroom or Extension Teaching Experience. (2 cr; QP–§Agro 8000, §Hort 8000, §PIPA 8000, §Soil 8000; SP–§Agro 8005, §Hort 8005, §PIPA 8005, §Soil 8005; 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; QP–Stat 3091 or equiv, computer programming course; SP–Stat 3021 or equiv, computer programming course; A-F only) Procedures for estimating parameter values and parameter uncertainty from experimental data. Values and interpretation of linear and nonlinear models using ordinary and weighted least-square methods. Design of experiments. Application to biosystems and agricultural engineering problems.

BAE 8094. Advanced Problems and Research. (2-6 cr; QP–§Agro 8000, §Hort 8000, §PIPA 8000, §Soil 8000; SP–§Agro 8005, §Hort 8005, §PIPA 8005, §Soil 8005; S-N only) Project work.

BAE 8303. Machinery Modeling. (3 cr; QP–AEM 3036, CE 3400; SP–AEM 2021, CE 3502) Machinery systems modeling using multibody dynamics simulation software (MBSS). 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)

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

BPhys 8513. Hydrologic Modeling of Small Watersheds. (3 cr; QP–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.

Biophysical Sciences (BPhys)

School of Physics and Astronomy

Institute of Technology and the Medical School

BPhys 5138. Research Seminar. (1 cr; max 4 cr; S-N only) Topics introduce techniques/goals of biophysical sciences and medical physics. Lectures/demonstrations.

BPhys 5139. Seminar and Journal Club. (1 cr; max 2 cr; S-N only) Current research/topics related to goals/methods of biophysical sciences and medical physics. Lectures/discussions.
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; max 60 cr; SP—Max 16 cr per semester or summer; doctoral student who has not passed prelim oral)

BA 8888. Thesis Credits: Doctoral. (1-24 cr; max 100 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)
- Examination of business needs requiring computerized databases. Using 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)
- Content varies by offering.

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. (3 cr; SP—5111, 5112, 5121, 5122; 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 backdrop of early foundations.

BIE 5344. Facilities Management in Business and Industry. (3 cr; SP—5112; A-F only)
- Planning, evaluating, and managing industrial education shop and lab facilities.

BIE 5365. Curriculum Development in Technology Education. (3 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 5475. Curriculum Development for Business and Marketing Education. (3 cr; A-F only)
- How to prepare programs of instruction, identify/make decisions regarding course content for business/marketing courses at secondary/postsecondary level.

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 develop 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; SP—A-F 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)
- Overview 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 5628. Multimedia Presentations in Business. (3 cr; SP—5011 or equiv)
- Creating, designing, and presenting information using multimedia resources in business settings.

BIE 5629. Course Development for Business and Industry. (2 cr; A-F only)
- Identifying content, objectives, sequencing, planning lessons, methods, and media for instruction, evaluation, and feedback.

BIE 5661. 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 processors, spreadsheets, graphics, desktop publishing, databases, and communications; public school and industry settings.

BIE 5796. Field Based Projects in Business and Industry. (1-4 cr; max 4 cr; S-N only)
- Curriculum, instructional, developmental, or evaluative problems and projects applicable 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.
Courses

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 and Organization
Curtis L. Carlson School of Management
BGS 8841. Seminar: Theory and Methods of Measurement. (4 cr; SP–MBA 8045 or MBA 8210 or equiv; SP–MBA 6210 or equiv; business admin Ph.D. 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, bailees, 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).

Center For Spirituality and Healing (CSpH)
Health Sciences
CSpH 5000. Explorations in Complementary Therapies and Healing Practices. (1-4 cr [max 12 cr]) Research/practice, delivery of complementary therapies, regulatory issues.
CSpH 5100. Introduction to Complementary Healing Practices. (3 cr)
Cultural contexts of healing traditions, complementary therapies practiced by practitioners, including traditional Chinese medicine, meditation, mind-body healing, spiritual practices, energy healing, naturopathy, herbalism, movement therapies, homeopathy, manual therapies, and nutrition.
CSpH 5110. Ways of Thinking About Health. (2 cr)
Diverse healing traditions of selected cultures. Use of herbal medicines as essential component of social structure. Links between nature, humans, and indigenous healers. Use of foods as healing medicines in India, China, and ancient Greece. Connection between spirituality and healing powers in indigenous/modern cultures. Rise of scientific traditions, their influence on ways of thinking about healing.
CSpH 5200. Art of Healing: Self as Healer. (1 cr)
Introduction to individual transformational journey as part of health science education. Students become aware of their responsibility/resources to facilitate development of the self. Research data, experience of self that is part psychoneuroimmunology, mind-body-spirit approaches. Lecture, scientific literature, meditation, imagery, drawing, group interaction.
CSpH 5201. Spirituality and Resilience. (2 cr)
Links between resilience and spirituality. Applications of resilience/health realization model to students’ personal/professional lives. Review of literature, theory, and research.
CSpH 5210. Peacemaking and Spirituality: A Journey Toward Healing and Strength. (2 cr; A-F only)
Influence of spirituality on resolving conflict, making peace in intense interpersonal/intrapersonal conflicts in multiple health care, social work settings.
CSpH 5300. Cultures, Faith Traditions, and Health Care. (2 cr; A-F only)
Culturally/spiritually based health care practices of selected native/immigrant populations in Minnesota. Clinical implications. Personal/professional conflicts for delivery of competent care to culturally diverse groups by those trained in Western health care.
CSpH 5310. Introduction to Traditional Chinese Medicine. (2 cr; A-F only)
Philosophical roots of Shamanism, Confucianism, Taoism, and Buddhism. Influence of these philosophies on Chinese medicine. Evolution of concepts of the tai, Yin-Yang, microcosm, macrocosm. Development of herbal medicine, Tui Na, Qi Gong, acupuncture, moxibustion. Traditional Chinese medicine etiology of disease, physiology, diagnosis, therapy, disease prevention, ethics, psychology, cosmology.
CSpH 5321. Introduction to International Health. (2 cr)
Primary public health problems, priorities, and interventions in developing countries. Issues related to culture/indigenous health systems and of concern to health care providers who work abroad or with refugee communities in countries of resettlement.
CSpH 5400. Dietary Supplements: Regulatory, Scientific, and Cultural Perspectives. (3 cr)
CSpH 5401. Introduction to Ethnopharmacology. (3 cr)
Investigation of biologically active substances used in traditional cultures. Ethnopharmacology’s past, current, and potential contributions to human knowledge. Concrete examples.
CSpH 5500. Clinical Aromatherapy I. (2 cr)
CSpH 5502. Clinical Aromatherapy II. (2 cr)
Additional applications of clinical aromatherapy, including chemical basis for therapeutic effects, clinical use of 14 essential oils.
CSpH 5601. Music in the Healthcare Environment. (2 cr)
CSpH 8100. Special Topics in Complementary Therapy and Healing Practices. (1-6 cr [max 12 cr])
Criticizing research on complementary therapies (e.g., design, outcome measures). Synthesizing research findings for a therapy. Hypothesizing future directions for research on complementary therapies.
CSpH 8191. Independent Study in Complementary Therapies and Healing Practises. (1-6 cr; SP–Grad student in CSpH minor or #)
Students propose area for individual study with faculty guidance. Students write proposal, which includes outcome objectives and work plan. Faculty member directs student’s work and evaluates project.

Chemical Engineering (ChEn)
Department of Chemical Engineering and Materials Science
Institute of Technology
ChEn 5103. Porous Media. (3 cr;QP–ChEn 5103, 5202; SP–MME 8219, Chern 4003, 4102; A-F only)
ChEn 5104. Coating Process Fundamentals. (3 cr;QP–ChEn 5103, 5202; SP–ChEn 4003, 4102; A-F only)
Basic process functions; viscous flow and rheology, capillarity, wetting; electrodeposition; 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.

Central Asian Studies (CAS)
Institute of Linguistics, ESL, and Slavic Languages and Literatures
College of Liberal Arts
CAS 5311. Medieval Sages. (3 cr;SP–MELC 5311; background in Iranian, Central Asian, or Islamic studies recommended)
Study and discussion of the intellectual life of the region from the rise of the Ghaznavids (A.D. 1000) to the fall of the Timurids (A.D. 1500). Ibn Sina (Avicenna), al-Biruni, al-Ghazali, Rumi, Sa’di, and Ferdowsi are among the sages whose lives are examined.
CAS 5526. Islam and Communism. (3 cr;SP–53526, MELC 5526)
Development of medieval Islamic culture in Transoxiana; formation of Sufi orders; rise and development of Communist ideology; introduction of socialist principles into Central Asia; clash of Islamic principles with Communist dicta; Pan-Islamism; Pan-Turkism.
CAS 5532. Russia and Central Asia. (3 cr;SP–53532, MELC 5532)
Rise and fall of the Mongol Empire, formation of the Chaghatai Khanate and the Golden Horde. Russian expansion into Central Asia and rivalry with Britain. Russia and the Central Asian republics during and after the Soviet period.
CAS 5601. Fiction of Iran and Central Asia in Translation. (3 cr;SP–53601, MELC 5601)
Social, political, and religious thought of Iranian and (Soviet) Central Asian writers of fiction since the early years of the 20th century, emphasizing themes of tradition, modernization (Westernization and Sovietization), women’s rights, and secularization.
CAS 5602. Persian Poetry in Translation. (3 cr;SP–53602, MELC 5602)
Major poetic works of Iran dealing with life at the medieval courts. Sufic poetry, and “new” poetry are studied. Rudaki, Khayyam, Rumi, Hafiz, Yushuj, and Farrokhzad are among the poets whose works are examined.
CAS 5994. Directed Research. (1-10 cr;SP–, A)
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, nonideal flow in reactors, polymerization, solids processing, multiphase reactors, and mechanisms of catalytic reactions. Industrial examples in petroleum/chemical industries.

ChEn 5595. Special Topics. (1-4 cr; QP; A-F; SP) New or experimental special topics.

ChEn 5751. Biochemical Engineering. (3 cr; QP-ChEn 5103 or #; SP-ChEn 4002; A-F only) Chemical engineering examples 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. (Biomedical) Biomedical Transport Processes. (3 cr; QP-ChEn senior or #; SP—ME 5381, #BEn 5310, ChEn 4003 or ME 3322) Introduction to fluid flow, mass, and heat transport in biological systems. Mass transfer across membranes, fluid flow in capillaries, interstitium, veins and arteries. Heat transfer in single cells and tissues. Whole organ and body heat transfer issues. Blood flow and oxygenation. Heat and mass transfer in respiratory system. Biotransport issues in artificial organs, membrane oxygenators, and drug delivery applications.

ChEn 5754. Food Processing Technology. (3 cr; QP-ChEn 5103; 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 5771. Colloids and Dispersions. (3 cr; SP—Physical chemistry; A-F only) Preparation, stability, coagulation kinetics or colloidal solutions. DLVO theory, electrokinetic phenomena. Properties of micelles, other microstructures.

ChEn 8101. Fluid Mechanics I: Change, Deformation, Equations of Flow. (3 cr; QP-ChEn 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-ChEn 8118; SP-ChEn 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 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 and 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 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) Presentation and discussion of papers concerning the newer developments in chemical engineering.

ChEn 8888. Thesis Credits: Doctoral. (1-24 cr; max 100 cr) Survey of the fundamentals of the finite element method as applied mathematics. Develop ability to construct basic finite element codes and put them into successful operation.

ChEn 8993. Directed Study. (1-12 cr) For graduate students who have not passed prelim oral

ChEn 8994. Directed Research. (1-12 cr) New or experimental courses offered by department or visiting faculty.

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)

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; max 60 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; max 50 cr; SP—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

ChPh 8888. Thesis Credits: Doctoral. (1-24 cr; max 100 cr; SP—Max 18 cr per semester or summer; 24 cr required)

ChPh 8995. Special Topics. (1-4 cr)
Chemistry (Chem)

Department of Chemistry
Institute of Technology

Chem 5011. Mechanisms of Chemical Reactions. (3 cr; QP–3302 or equiv; SP–2302 or equiv)

Chem 5021. Computationa Chemistry. (3 cr; QP–Chem grad or #; SP–3502 or equiv)

Chem 5201. Materials Chemistry. (4 cr; QP–[3301, 5501 or 5534] or #; SP–3501 or equiv or #)
Crystal systems/unit cells, phase diagrams, defects/ interfaces, optical/dielectric properties, electrical/ thermal conductivity, X-ray diffraction, thin film analysis, electronic structure, polarons/phosphons, solid state chemistry, liquid/molecular crystals, polymers, magnetic/optical materials, porous materials, ceramics, piezoelectric materials, biomedical materials, catalysts.

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

Chem 5221. Introduction to Polymer Chemistry. (4 cr; QP–[3302, 5502] or #; SP–S-Mate 5221, 2302, 3501 or #)
Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

Chem 5223W. Polymer Laboratory. (2 cr; QP–5610 or #; SP–5-Mate 5221, 5221 or 8211 or #)

Chem 5311. Chemistry of Industry. (3 cr; QP–Chem sr or grad 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 or #)
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 or #)
Topics vary, including natural products, heterocycles, asymmetric synthesis, organometallic chemistry, and polymer chemistry. (See instructor for details.)

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

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

Chem 5411. Bioorganic Chemistry. (3 cr; QP–3302 or equiv; SP–2302 or equiv or #)
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 or #)
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 or #)
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 homogeneous catalytic reagents in organic and inorganic systems.

Chem 5735. Bioinorganic Chemistry. (3 cr; QP–5702 or equiv, chem grad or #; SP–4701 or equiv, chem grad 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 5755. X-Ray Crystallography. (4 cr; QP–Chem grad student or #; SP–Chem grad student or #; A-F only)
Essentials of crystallography as applied to modern, single crystal X-ray diffraction methods. Practical training in use of instrumentation in X-ray crystallography facility in Department of Chemistry. Date collection, correction/refinement, structure solutions, generation of publication materials, use of Cambridge Crystallographic Structure Database.

Chem 8011. Mechanisms of Chemical Reactions. (4 cr; QP–3302 or equiv; SP–3502 or equiv or #)

Chem 8021. Computational Chemistry. (4 cr; QP–3502 or equiv)
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 by year depending on instructor and development of the field.

**Chem 8321. Organic Synthesis.** (4 cr; QP–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; QP–3302 or equiv; SP–2302 or equiv)
Modern studies. Topics, which vary by year, include natural products, heterocycles, asymmetric synthesis, organometallic chemistry, and polymer chemistry.

**Chem 8323. FTE: Masters.** (1 cr; SP–Master’s student, adviser and DGS consent)

**Chem 8352. Physical Organic Chemistry.** (4 cr; QP–8002 or 3302 or equiv; #; SP–5011/8011 or 2302 or equiv, #)
Fundamental concepts and mechanistic tools for understanding and critical analysis of organic reaction mechanisms. Solution, reactive intermediates, gas phase chemistry, photochemistry, and/or strained-ring chemistry.

**Chem 8361. Interpretation of Organic Spectra.** (4 cr; QP–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 by year depending on instructor and development of the field.

**Chem 8411. Bioorganic Chemistry.** (4 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; an overview of techniques used to characterize these biomolecules.

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

**Chem 8413. Nucleic Acids.** (4 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, 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 DGS consent)

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

**Chem 8551. Quantum Mechanics I.** (4 cr; QP–Undergrad physical chem course; SP–Undergrad physical chem course)

**Chem 8552. Quantum Mechanics II.** (4 cr; QP–8532; SP–8551)

**Chem 8561. Thermodynamics, Statistical Mechanics, and Dynamics I.** (4 cr; QP–Undergrad physical chem course; SP–Undergrad physical chem course)
Two-part sequence covering thermodynamics, equilibrium statistical mechanics, ensemble theory, partition functions. Applications include ideal gases and crystals. Theories of simple liquids, Monte Carlo, and molecular dynamics simulations. Reaction dynamics from a microscopic viewpoint.

**Chem 8562. Thermodynamics, Statistical Mechanics, and Dynamics II.** (4 cr; SP–8561)
Two-part sequence covering thermodynamics, equilibrium statistical mechanics, ensemble theory, partition functions. Applications include ideal gases and crystals. Theories of simple liquids, Monte Carlo, and molecular dynamics simulations. Reaction dynamics from a microscopic viewpoint.

**Chem 8580. Special Topics in Physical Chemistry.** (2-4 cr; SP–Grad chem major or #)
Topics (and availability) vary depending on instructor and development of the field.

**Chem 8601. Seminar: Modern Problems in Chemistry.** (1 cr; SP–Grad chem major or #; S-N only)
Weekly seminar series on modern chemical topics.

**Chem 8602. Seminar Presentation: Modern Problems in Chemistry.** (1 cr; SP–Grad chem major or #; A-F only)
Weekly seminar series on modern chemical topics presented by students.

**Chem 8666. Doctoral Pre-Thesis Credits.** (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

**Chem 8715. Physical Inorganic Chemistry.** (4 cr; QP–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, Mössbauer and mass spectroscopy, magnetic measurements, X-ray diffraction.

**Chem 8725. Organometallic Chemistry.** (4 cr; QP–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 in terms of modern electronic and structural theory; emphasis on their use as stoichiometric and homogeneous catalytic reagents in organic and inorganic systems.

**Chem 8735. Bioinorganic Chemistry.** (4 cr; QP–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; QP–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 [max 50 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 by year 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.** (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)
Courses

Child and Adolescent Psychiatry (CAPy)
Department of Psychiatry
Medical School

CAPy 5620. Disruptive Behavioral Disorders I: Attention Deficit Hyperactivity Disorder Throughout the Life Span. (1 cr)
Clinical characteristics of anorexia, bulimia nervosa in children/adolescents. Methods of crisis intervention, treatment, and prevention.

CAPy 5621. Workshop: Eating Disorders in Children and Adolescents. (1 cr)

CAPy 5623. Treatment Interventions With Anxiety and Depression in Children and Adolescents. (1 cr)

CAPy 5624. Eating Disorders in Children and Adolescents: Medical and Psychological Perspectives. (1 cr; A-F only)

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. Assessment of Anxiety and Depressive Disorders in Children and Adolescents. (1 cr)

CAPy 5634. Workshop: Developmental Dyslexia: Theory, Research, and Clinical Differentiation. (1 cr)

CAPy 5635. Workshop: Disruptive Behavioral Disorders V. (1 cr)
Theoretical basis, therapy outcome research literature related to CBT. Problem-solving techniques, verbal self-instruction training, attributional retraining, stress inoculation procedures. Procedures applied to common problems experienced by disruptive children/adolescents. Anger/frustration management, conflict resolution, interpersonal problem-solving, self-esteem enhancement, negative thought/feeling management.

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 5641. Workshop: Prevention Science I—Risk Factors, Protective Factors, and Models of Disorder. (1 cr)

CAPy 5643. Workshop: Multicultural Issues in Assessment and Treatment of Children With Psychiatric Problems. (1 cr)

CAPy 5644. Workshop: Child Abuse/Neglect and Child Psychopathology—Implications for Assessment/Treatment. (1 cr)

CAPy 5645. Workshop: Innovative Methods in Psychotherapy. (1 cr)

Child Psychology (CPsy)

Institute of Child Development
College of Education and Human Development

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. (2 cr; SP–Doctoral student or #)
History of developmental psychology and child development movement in context of classic studies. Presentations by students/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 8360. Seminar: Developmental Psychology. (1-3 cr; max 21 cr; SP–Doctoral student)
Intensive study in the following topics. Section 1: ethology of child behavior. Section 2: language development. Section 3: perceptual development. Section 4: social development. Section 5: cognitive development. Section 7: applied child development.

CPsy 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)
CPsy 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

CPsy 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

CPsy 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 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 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)
Department of Asian 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 5015. Chinese Philosophical/Historical Texts. (4 cr; SP–3112) Readings from major texts in Chinese philosophical and historical traditions.


Chn 5120. Topics in Chinese Linguistics. (4 cr [max 8 cr]; SP–4121 or 4125) 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.

Chn 5240. Topics in Chinese Poetry. (4 cr [max 8 cr]; SP–3112) Selected major Chinese poets and poetic forms.


Chn 5250. Topics in Chinese Fiction. (4 cr [max 8 cr]; SP–3032 or 3112) Studies of traditional and modern Chinese fiction.

Chn 5260. Topics in Pre-modern Chinese Prose. (4 cr [max 8 cr]; SP–3112) Studies of representative Chinese prose writings of the pre-modern period.

Chn 5393. Directed Study. (1-5 cr [max 18 cr]; SP–#–A, #–D) Guided individual reading or study.

Chn 8320. Seminar in Chinese Linguistics. (4 cr; SP–5120 or #) Emphasizes examining relevant theoretical models for selected issues in analysis of structure and history of Chinese language.

Civil Engineering (CE)
Department of Civil Engineering
Institute of Technology
CE 5170. Internet Based Study. (1-5 cr [max 15 cr]; SP–Upper div IT; A-F only) Internet based teaching with bi-weekly exercises on topic of concern.

CE 5211. Traffic Engineering. (3 cr; QP–IT or grad, 3200; SP–3201; Stat 3201 or equival) Principles of vehicle and driver performance as they apply to the safe and efficient operation of highways. Design and use of traffic control devices. Capacity and level of service. Trip generation and traffic flow analysis. Safety and traffic studies.

CE 5212. Urban Transportation Planning. (3 cr; QP–IT or grad, 3200; SP–3201 or equival) Techniques of analysis and planning for transportation services; demand-supply interactions; evaluating transportation alternatives; travel demand forecasting; integrated model systems; citizen participation in decision-making.

CE 5214. Transportation Systems Analysis. (3 cr; SP–3201) Systems approach, its application to transportation engineering/planning. Prediction of flows and level of service. Production functions, cost optimization, utility theory, demand modeling, transportation network analysis, assignment and distribution, demand modeling, transportation network analysis, assignment and distribution, decision analysis, multivariable evaluation of transportation projects.

CE 5231. Pavement Management and Rehabilitation. (3 cr; QP–Upper div IT or grad, 5603; SP–Upper div IT or grad, CE 4231 or #) Concepts and practices in monitoring, maintaining, and rehabilitative flexible and rigid pavement systems. Manual and automated means of pavement assessment, 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, CE 4232 or #) 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; QP–Upper div IT or grad, 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, 5603; SP–Upper div IT or grad, 4301 or #; A-F only) Machine stiffness, closed-loop testing. Small-strain theory. Measurement of deformation: strain gages, LVDT’s, accelerometers, and associated circuits. Direct and indirect testing. Material behavior: experiments on anisotropic, damaged, and fluid-filled solids.

CE 5321. Geomechanics. (3 cr; QP–Upper div IT or grad; SP–Upper div IT or grad, 4301 or #; 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, 3300; SP–Upper div IT or grad, 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, 5600, AEM 3036; SP–Upper div IT or grad, C or better in 4401 or #; A-F only) Principal stresses and failure criteria 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, 5611, 5612; 5613 recommended; SP–Upper div IT or grad, C or better in 4401 or #; 4412 recommended; A-F only) 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, 5600 or #; SP–Upper div IT or grad, C or better in 3401 or #; 4401 recommended; A-F only) Masonry materials and their production; mortars and grouts; design of unreinforced, reinforced, and prestressed masonry structural systems; walls; columns; lintels; arches. Codes and specifications, testing and inspection.

CE 5431. Wave Methods for Nondestructive Testing. (4 cr; QP–[AEM 3016, 3036] or #; SP–5GeoE 5431[AEM 2021, 3031] or #; A-F only) Introduction to contemporary methods for nondestructive characterization of objects of civil infrastructure (e.g., highways, bridges, geotechnical sites). Imaging technologies based on propagation of elastic waves such as ultrasound/acoustic emission methods, seismic surveys, and acoustic emission monitoring. Lecture, lab.

CE 5541. Environmental Water Chemistry. (3 cr; SP–3501, Chem 1021, 1022; A-F only) Introduction to water chemistry. Physical chemical principles, geochemical processes controlling chemical composition of waters, behavior of contaminants that affect the suitability of water for beneficial uses.

For definitions of course numbers and symbols, see inside back cover.
CE 5542. Experimental Methods in Environmental Engineering. (3 cr; SP–3501, Chem 1021, Chem 1022; A-F only)
Tools necessary to conduct research in environmental engineering and chemistry. Theory of operation of analytical equipment and data handling methods, statistical analyses, experimental design, laboratory safety. Lecture, laboratory.

CE 5551. Environmental Microbiology Laboratory. (4 cr; QP–3500, [upper div or grad] student; SP–3501, [upper div or grad] student; A-F only)
Role of microorganisms in environmental bioremediation, pollution control, water/wastewater treatment, biogeochemistry, and human health. Basic microbiological techniques: isolation, identification/ enumeration of bacteria, BOD, biodegradation kinetics, disinfection. Lecture, lab.

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 or #: SP–upper div IT or grad 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, CERCLA, Clean Air Act, and Resource Conservation and Recovery Act.

CE 8032. 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 deformable finite element methods.

CE 8094. Civil Engineering Research. (1-4 cr [max 12 cr]; SP–#)
Research or independent study in concrete, structural steel, soils, hydraulics, hydrology, and municipal, environmental, or transportation problems. Investigations, reports, tests, or designs.

CE 8211. Traffic Flow and Traffic Operations. (4 cr)
Microscopic/macroscopic traffic flow models, measurements, characteristics. Shock waves, statistical distributions of traffic variables. Simulation, modeling. Urban traffic systems, including signal timing/ control of large scale networks. Project that includes simulation/control software in practice.

CE 8212. Advanced Travel Demand Modeling and Supply Analysis. (3 cr; QP–Stat 3091; SP–5211 or equiv, Stat 3021)
Application of random utility theory to model travel demand; deterministic and stochastic trip assignment; network design problems; transportation planning software.

CE 8214. Transportation Economics. (3 cr; A-F only)

CE 8215. Stochastic Transportation Modeling. (3 cr; QP–8210 or 8211, Stat 5021 or equiv)
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, Burningham model, and Wechegard model; load transfer in rigid pavements; temperature induced stresses; mechanics of drainage.

CE 8300. Seminar: Geomechanics. (1-3 cr [max 4 cr]; SP–A-F only)
Presentations on various topics.

CE 8301. Fracture of Geomaterials. (3 cr; SP–IT grad student, 5321, GeoE 5321 or #: A-F only)

CE 8302. Soil/Rock Plasticity and Limit Analysis. (4 cr; QP–3300; SP–IT grad student, 4301 or #: A-F only)

CE 8311. Advanced Rock Mechanics. (3 cr; QP–5305; SP–IT grad student, 4311 or GeoE 4311 or #: A-F only)

CE 8321. Thermoporoelasticity. (4 cr; QP–AEM 5580; SP–IT grad student, 5321 or GeoE 5321 or #: A-F only)

CE 8322. Storage and Flow of Granular Materials. (3 cr; QP–5301 or 5302; SP–IT grad student, 4301 or #: A-F only)

CE 8331. Modeling Geomechanical Processes. (3 cr; QP–5300; SP–IT grad student, 5321 or GeoE 5321; A-F only)

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 or #: A-F only)
Transient and nonlinear problems.

CE 8351. Advanced Groundwater Mechanics I. (1 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. (1 cr; QP–5425; SP–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 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 fitting criteria; implementing numerical algorithms; analyzing and interpreting results using both statistical and qualitative tools; designing future measurement plans.

CE 8400. Seminar: Structures. (1 cr [max 3 cr]; S-N 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–4111 or #: A-F only)
Elements of calculus of variations; weak and strong formulations of linear continuum and structural problems. Isoparametric elements and numerical integration. Basic concepts of error analysis and convergence. Analysis of plates and shells. Introduction to mixed methods and time dependent problems.

CE 8402. Nonlinear Finite Element Analysis. (3 cr; QP–8605; SP–8401 or #: offered alt yrs; A-F only)

CE 8411. Plate Structures. (3 cr; SP– #: offered alt yrs; A-F only)

CE 8412. Shell Structures. (3 cr; SP– #: offered alt yrs; A-F only)

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–4111 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 inelastic material behavior on buckling.

CE 8441. Plastic Design of Steel Structures. (3 cr; QP–5610; SP–4111 or #: A-F only)
Plastic analysis and design of structures with applications to girders, continuous beams, portal and gable frames. Collapse mechanisms and plastic deformations. Minimum weight design.
CE 8442. Nonlinear Analysis of Structural Systems. (3 cr; QP–5601, 5602, or equiv; SP–4411, 4412; A-F only) Advanced theory and computational techniques for analyzing complex structural building systems. Using comprehensive geometric and material nonlinear analysis for designing steel and composite structures.

CE 8443. Fracture and Fatigue of Steel Structures. (3 cr; SP–IT grad student or #; A-F only) Fracture mechanics, ductile fracture, ferrous metallurgy, welding, S-N curves of steel structures. Emphasis on design and materials selection, evaluation, and repair of existing structures. Case studies such as fracture of steel structures during earthquakes, fatigue of large vehicle frames, and fatigue of bridge 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 modeling to design code provisions. Moment-curvature analysis of members. Shear; torsion; disturbed regions. Beam column joints; shear walls. Effects of earthquake loading. Limit analysis.

CE 8461. Structural Reliability. (3 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) Topics vary depending on faculty and student interests.

CE 8500. Environmental Seminar. (1 cr [max 3 cr]; SP–Grad CE major or #; A-F 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. Irotational flow; gravity waves. Similitude and inspectional analysis. Laminar boundary layers and slender flows. Application to engineering and environmental problems.

CE 8502. Environmental Fluid Mechanics II. (4 cr; QP–5430 or equiv; 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 #; A-F only) Principles of inphase and interfacial chemical transport and fate in the environment, specifically the processes of diffusion, dispersion, and convection. Application to surface water and atmospheric mixing, dispersion in groundwater, and transport between various 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 and physical processes used in treating and controlling water quality, including adsorption, ion exchange, sedimentation, thickening, filtration, gas transfer, coagulation, flocculation, membrane processes, and disinfection.

CE 8505. Biological Processes. (3 cr; QP–3405, 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 nutrients. 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–Stat 5021 or equiv or #; A-F 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–8500; A-F only) Notions of scale-invariance, scaling, and multiscaling in geophysical processes; methods of multiscalar analysis; wavelet transforms; time-frequency-scale analysis and fractal analysis. Applications in atmospheric, hydrologic, and geomorphologic processes.

CE 8508. Ecofluid Dynamics. (4 cr; QP–3400, 3500 or equiv; SP–3502 or equiv or #; A-F only) Theoretical principles underlying environmental fluid dynamics of biochemical processes in lakes, rivers, wetlands, coastal, and integrating small-scale fluid motion, dominant fluid path, growth kinetics, thin layers, microstructure measurements.


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–5506; 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: Molecular Theory and Methods. (3 cr; SP–5531 or #; A-F only) Introduction to microbial genetics and molecular phylogeny. Application of nucleic-acid techniques in environmental microbiology and microbial ecology.

CE 8552. Groundwater Microbiology: Laboratory. (4 cr; SP–Grad CE major or #; exposure to basic environmental and microbial; A-F only) Subsurface microbial ecology, biogeochemical cycling, metabolic classification of subsurface bacteria, modeling and diagnosis of microbial induced fouling (MIF) events, bioremediation of contaminated aquifers. Lectures and four lab hours per week.


CE 8562. Analysis and Modeling of Aquatic Environments II. (3 cr [max 6 cr]; QP–8550; SP–Sem grad work or #) Models for transport and transformation of pollutants, nutrients, particulates, ecosystems, etc., from recently completed thesis, 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, 5405, 5500; SP–5501 or #; A-F only) Introduction to industrial waste treatment. Individual industries, emphasizing constituents of the waste-stream and how best to recycle, recover, or reduce wastes. Cost concerns and regulations. Field trips to various industries to gain first-hand knowledge of processes involved in treatment.

CE 8571. Hydraulic Measurements. (3 cr; QP–3400; SP–3502 or #; A-F only) Lab and field methods and instruments for measuring hydraulic pressure, velocity, and discharge.

CE 8572. Computational Hydrodynamics I. (3 cr; QP–5401; SP–IT grad student or #; A-F only) Method of characteristics and finite difference methods and their application to one-dimensional unsteady flows. Stability, convergence, and consistency of finite difference methods. Navier-Stokes equations and their physical meaning. Finite volume method and its application to two- and three-dimensional flows. Grid generation methods.

CE 8573. Computational Hydrodynamics II. (3 cr; QP–8418; SP–IT 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.

CE 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

CE 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

CE 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Classic (Clas)

Department of Classical and Near Eastern Studies
College of Liberal Arts

Clas 5001. Classical Lyric and Satire. (3 cr; SP–3001, two literature courses or #) Greek and Roman lyric poetry; Roman satire.

Clas 5013. Roman Law and Society. (3 cr) Survey of Roman law from social and historical perspectives. Basic concepts of Roman private law and legal procedure.

Clas 5070. Topics in Ancient Religion. (3 cr; SP–RelA 3071 or #; 3072 or 5071 or 5072 or 5073 or any RelA course or #) Study of a specific aspect of religion in Classical and Near Eastern antiquity such as healing cults, magic and divination, Gnosticism and eschatological topics. Topics specified in Class Schedule.
Courses

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

Clas 5072. The New Testament. (3 cr; SP–3072)

Clas 5073. Roman Religion and Early Christianity. (3 cr; SP–3073)

Clas 5080. New Testament Proseminar. (3 cr; SP–3082 or 3072 or equiv)
Study of some specific aspect of the New Testament and related literature. The class is organized as a discussion seminar. Topics specified in Class Schedule.

Clas 5081. Classical Epic in Translation. (3 cr; SP–3081)
Homer’s Iliad and Odyssey; Virgil’s Aeneid; cultural context of epic; development of the hero; epic style; sources of poetic.

Clas 5082W. Greek Tragedy in Translation. (3 cr; SP–3082)
Origins of tragedy; ancient theatres; selected plays of Aeschylus, Sophocles and Euripides.

Clas 5083. Ancient Comedy. (3 cr; SP–3083)
Greek/Roman comic drama (e.g., Aristophanes, Menander, Plautus, Terence).

Clas 5085. Greek Philosophy: The Pre-Socratics to Plato. (3 cr)
Fragmented of the pre-Socratics and Sophists and selected dialogues of Plato.

Clas 5088. Archaeology in Biblical Lands I: Old Testament Period. (3 cr; SP–3088)

Clas 5089. Archaeology in Biblical Lands II: New Testament Period. (3 cr; SP–3089)

Clas 5102. Hellenistic and Early Roman Art and Archaeology. (3 cr; SP–Jr, Clas/ArtH 3008 or #)
Sculpture, architecture, painting, and topography in developing centers of Hellenistic culture in eastern Mediterranean and in Etruscan and Roman towns from 400 B.C. to the beginnings of the Roman Empire.

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

Clas 5111. Prehistoric Art and Archaeology of Greece. (3 cr; SP–Grad or 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; record of human habitation in the Aegean area. Archaeological evidence as a basis for historical reconstruction.

Clas 5112. Archaic and Classical Greek Art. (3 cr; SP–Jr, Clas/ArtH 5111)
Sculpture, painting, architecture and minor arts in Greek lands from the 9th through 5th centuries B.C. Examination of material remains of Greek culture; archaeological problems such as identifying and dating buildings; analysis of methods and techniques. Emphasis on work of Pheidias.

Clas 5120. Field Research in Archaeology. (3 cr; SP–#)
Field excavation, survey, and research at archaeological sites in the Mediterranean area. Techniques of excavation and exploration; interpretation of archaeological materials.

Clas 5145. Advanced Greek and Roman Mythology. (3 cr; SP–3145; 1042 or #)
Different theoretical approaches to Greek/Roman mythology.

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

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

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

Clas 5340. Practicum in Archaeological Field and Computer Technologies. (3 cr; SP–3340; CIVC major or ancient art and archaeology course or #)
Methods used for excavation of Old and New World sites. Meets at archaometry/computer lab for part of the semester and at a selected site in Minnesota for day-long sessions for 9 to 10 weeks. Meets with 3340.

Clas 5374. Introduction to Classical and Near Eastern Studies. (1 cr; SP–Grad major or minor or #; S-N only)
Introduction to core research materials and reference texts in the various disciplines which make up classical studies.

Clas 5390. Topics in Classical Literature. (3 cr; SP–#; S-N only)
Additional work for graduate credit. Topics specified in Class Schedule. Meets with 3940.

Clas 53950. Aspects of Classical Culture. (3 cr; SP–#)
Topics specified in Class Schedule. Meets with 3950.

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

Clas 5994. Directed Research. (1-12 cr; SP–#; A-F only)
Selected issues, with special attention to 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; max 60 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; max 50 cr; SP–Max 18 cr per semester or summer; 10 cr total required (Plan A only))

Clas 8888. Thesis Credits: Doctoral. (1-24 cr; max 100 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–#; A-F only)
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, biochem course; #; A-F only)
Lab diagnosis of viral, fungal, and parasitic infections.

CLC 5101. Principles of Diagnostic Microbiology. (4 cr; SP–Microbiology course with lab, biochem course; #; A-F only)

CLC 5120. Seminar: Clinical Laboratory Science. (1 cr; max [3 cr]; SP–#; S-N only)
Current literature, Presentation/discussion of research.

CLC 5121. Journal Presentations. (1 cr (max 2 cr); SP–#; A-F only)
Critical analysis, evaluation, discussion of current journal articles in student’s specialty area.

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

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

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

CLC 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.

CLC 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.

CLC 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–A-F only)
Observation, study, and practice in special problems, advanced techniques, and methodology.

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

CLS 5175. Advanced Clinical Chemistry. (3 cr; SP–A-F only)
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 microscopic identification of immature and abnormal cells. Clinical correlation of lab 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; biochem 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–One organic chem course with lab; one bio course, #; A-F only)
Application of clinical chemistry principles and laboratory techniques in the analysis of urine, plasma, and body fluids. Emphasis on laboratory tests to evaluate renal function, electrolytes, and acid-base balance. Introduction to principles and processes for managing test quality. Laboratory.

CLS 5320. Clinical Chemistry II: Lecture. (2 cr; SP–Organic chem course with lab; biochem 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, biochem course, 5310 or MedT 4310; A-F only)
Application of clinical chemistry principles and laboratory 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–A-F)
Practical experience collecting bone marrow from patients. Diagnosing hematological diseases by evaluating and interpreting cells from clinical specimens of bone marrow, peripheral blood, and, if applicable, lymph nodes.

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

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

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

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

CLS 8293. Educational Administration in Medical Technology. (2 cr A-F only)
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 [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**Cognitive Science (CgSc)**

Graduate School

CgSc 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.

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

CgSc 8360. Seminar: Topics in Cognitive Science. (1-3 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; SP–A-F only)

CDis 5501. Fluency Disorders. (3 cr; SP–A-F only; A-F only)
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; SP–A-F only; A-F only)
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; SP–A-F only; A-F only)
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; SP–A-F only; A-F only)
Normal and disordered aspects of swallowing. The nature, etiologies, evaluation, and management of swallowing disorders will be covered.

CDis 5602. Phonological Disorders. (3 cr; SP–A-F only; A-F only)
Theory and research related to the nature, assessment, and treatment of phonological disorders in children.

CDis 5603. Child Language Disorders: Assessment and Intervention. (4 cr; SP–A-F only; A-F only)
Language assessment, teaching procedures used with children/adolescents. Procedures apply to children who face language disabilities such as developmental delays, autism, learning disabilities.

CDis 5604. Language Assessment and Intervention: School Age Children. (3 cr; SP–A-F only)

CDis 5605. Language and Cognitive Disorders in Adults. (3 cr; SP–A-F only; A-F only)
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; SP–A-F only)
Description of the range of augmentative and alternative communication applications for persons with developmental and acquired disabilities.

CDis 5607. Electronic Communication Aids. (3 cr; SP–A-F only)
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. Troubleshoot common technical difficulties encountered by individuals using electronic communication aids.

CDis 5801. Audiologic Assessment I. (3 cr; SP–A-F only)
Basic audiometric battery including pure tones, speech, masking, and immittance in adults; industrial audiometry and ototoxic emissions.

CDis 5802. Hearing Aids I. (3 cr; SP–A-F only)
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; SP–A-F only)
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 care management with children and families.

CDis 5810. Laboratory Module in Audiology. (1 cr; SP–A-F only)
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. (3 cr; SP–A-F only)
Topics listed in Communication Disorders office.

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

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

CDIs 8410. Seminar: Research. (3 cr [max 12 cr])
Advanced study exploring experimental and quasi-experimental research designs used in single-subject and group research.

CDIs 8420. Seminar: Teaching. (3 cr [max 9 cr]; 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; SP–3305, 4501 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 8530. Seminar: Speech. (3 cr [max 12 cr])
Advanced study and analysis of research in speech science and speech pathology.

CDIs 8602. Traumatic Brain Injury. (3 cr; SP–3302, 4301, 4601 or #)
Survey of communicative/cognitive disorders in adults who have traumatic brain injuries. Demographics, neuropathologic substrates, assessment/diagnosis, clinical applications.

CDIs 8630. Seminar: Language. (3 cr [max 12 cr])
Advanced study and analysis of research in language acquisition, language science, and language disorders.

CDIs 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

CDIs 8720. Clinical Education in Speech-Language Pathology. (1-8 cr [max 24 cr]; SP–Grad com dis major; S-N only)
Clinical experience.

CDIs 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

CDIs 8801. Audiologic Assessment II. (3 cr; SP–5702; SP–5801 or #)
Auditory brainstorm 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; SP–5706; SP–5802 or #)
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; SP–5304, 5306, 5701; SP–3305, 3306, 4801 or #)
Introduction to electronics, digital signal processing, and calibration of instruments used to assess hearing. Lab sessions on such topics as sound-field calibration, earphone calibration, filters, spectra of transient signals, and use of an artificial mastoid.

CDIs 8804. Evoked Potentials. (3 cr; SP–8801)
Research and methods used in measurement and application of evoked potentials. Early, middle, and late auditory evoked potentials and electromyography.

CDIs 8820. Clinical Education in Audiology. (1-8 cr [max 24 cr]; SP–Grad com dis major; S-N only)
Clinical experience.

CDIs 8830. Seminar: Hearing. (3 cr [max 12 cr])
Advanced study and analysis of research in hearing science and audiology.

CDIs 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

CDIs 8894. Directed Research. (1-12 cr [max 18 cr]; SP–4)

Comparative Literature (CLit)

Comparative Literature (CLit)

**Department of Cultural Studies and Comparative Literature**

**College of Liberal Arts**

CLit 5331. Discourse of the Novel. (3 cr; SP–§CSCL 5331)
Comparative study of the novel (eighteenth century to present); its relation to ordinary language practices, emerging recent publics, technologies of cultural dissemination, problems of subjectivity; its role in articulating international cultural relations.

CLit 5555. Introduction to Semiotics. (3 cr; SP–§CSCL 5555)
Problems of the nature of the sign; sign function; sign production; signifying systems as articulated in philosophy, linguistics, anthropology, psychoanalysis, and art theory. Applying semiotics to various signifying practices (e.g., literature, cinema, daily life).

CLit 5751. Basic Concepts of Cinema. (4 cr; SP–§CSCL 5751, §CSDS 5751)
Cinema and related theoretical/historical analysis. Emphasizes concepts that have transformed scope/aim of film analysis since 1960s. Readings of filmic/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–4)
Guided individual reading and study.

CLit 8001. Basic Seminar in Comparative Literature I. (4 cr)
Key texts, positions, and problems 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 problems 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 [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

CLit 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

**Comparative Studies in Discourse and Society (CSDS)**

**Department of Cultural Studies and Comparative Literature**

**College of Liberal Arts**

CSDS 5301. Society, Ideology, and the Production of Art. (3 cr; SP–§CSCL 5302)
Recent critical theories of relation of arts to social/ideological forces. Selected artifacts from Western culture (e.g., Renaissance to 20th century; high, popular, mass culture). Music, visual art, literature.

CSDS 5302. Aesthetics and the Valuation of Art. (3 cr; SP–§CSCL 5302)
Society, ideology, aesthetic value in light of recent critical theories of visual art, music, literature. Mediations of place, social class, gender, ideology on aesthetic judgment in post-renaissance Western culture.

CSDS 5751. Basic Concepts of Cinema. (4 cr; SP–§CSCL 5751, §CSDS 5751)
Cinema as object of theoretical/historical analysis. Emphasizes concepts that have transformed scope/aim of film analysis since 1960s. Readings of filmic/theoretical texts.

CSDS 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.

CSDS 5993. Directed Study. (1-3 cr [max 9 cr]; SP–4)
Guided individual reading and study.

CSDS 8001. Basic Seminar in Comparative Studies in Discourse and Society I. (4 cr)
Key texts, positions, and problems in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, and disciplinary genealogies.

CSDS 8002. Basic Seminar in Comparative Studies in Discourse and Society II. (4 cr)
Key texts, positions, and problems in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, and disciplinary genealogies.

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

CSDS 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.

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

CSDS 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

CSDS 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)
CSci 5115. User Interface Design, Implementation and Evaluation. (3 cr; CP–3322; SP–4011 or #) Theory, design, programming, and evaluation of interactive application interfaces. Human capabilities and limitations, interface design and engineering, prototyping environments, user 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; CP–5107 or 5110; SP–5113 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, consistency). Course is built around implementation assignments and case studies of toolkits.


CSci 5321. Linear and Nonlinear Programming. (4 cr; CP–3201, some programming experience) Standard form for linear programming (LP), simplex method and geometry of LP, revised simplex method, duality theory and sensitivity, approximation of data by LP, interior methods, affine scaling algorithms, unconstrained optimization.

CSci 5403. Computational Complexity. (3 cr; CP–5400; SP–4041 or #) Computational models, complexity measures in each model, and related complexity classes.


CSci 5442. Computational Geometry and Applications. (3 cr; CP–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; CP–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 5511W. Artificial Intelligence II. (3 cr; CP–5511; SP–5511W; SP5511 or #) Advanced topics in AI for solving complex problems. Machine learning (symbolic/ neural networks approaches), genetic algorithms, reasoning with uncertainty, utility theory and decision theoretic methods, natural language processing, perception robotics, introduction to Prológ programming language.


Courses

Syntactic pattern recognition. Mathematical pattern recognition and artificial intelligence. Applications in information retrieval and WWW data mining.

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 micro-robotics.

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–5801; SP–5801) 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–5802; SP–5802) Introduction to software testing, software maturity models, cost specification models, bug estimation, software reliability models, software complexity, quality control, and experience report. Student groups specify, design, implement, and test partial software systems. Application of general software development methods and principles from 5801.

CSci 5980. Special Topics in Computer Science. (1-3 cr; max 9 cr; QP–5980; SP–5980) Lectures and informal discussions on current topics in computer science.

CSci 5991. Independent Study. (1-3 cr; max 9 cr; QP–5991; SP–5991) May be repeated for cr; may be repeated for cr. Independent study arranged with CS faculty member.

CSci 5994. Directed Research. (1-3 cr; max 9 cr; QP–5994; SP–5994) Directed research arranged with faculty member.

CSci 5996. Curricular Practical Training. (1 cr [max 3 cr; QP–5996; SP–5996] may be repeated for cr; may be repeated for cr; S-N only) Industrial work assignment involving advanced computer technology. Reviewed by faculty member. Grade based on final report covering work assignment.

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–5810; SP–5810 or #) Fundamental principles underlying design of distributed and multiprocessor operating systems. Foundations of distributed computing systems; shared multiprocessor systems.

CSci 8115. Human-Computer Interaction and User Interface Technologies. (3 cr; QP–5115 or #) Current research issues in human-computer interaction, user interface toolkits and frameworks, and related areas. Research techniques, model-based development, gesture-based interfaces, construction-based programming, event processing models, innovative systems, HCI in multimedia systems.

CSci 8161. Advanced Compiler Techniques. (3 cr; QP–5102; SP–5101 or #) Techniques for unprocessors and parallel computers. Fundamentals of program analysis instruments such as data flow analysis and data dependence analysis. Variety of code generation and transformation techniques.


CSci 8211. Advanced Computer Networks and Their Applications. (3 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 Design. (3 cr; QP–5201 or 5283; SP–5201 or 5283 or equiv or #) Open research problems in contemporary CAD for electronic design, approaches to their solution.

CSci 8314. Iterative Methods for Linear Systems. (3 cr; QP–5304; SP–5304 or #) Large sparse systems. Sparse systems; 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, adviser and DGS consent)

CSci 8353. Advanced Parallel Numerical Methods. (3 cr; QP–5301, 5151; SP–5301, 5451 or #) Parallel methods for 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 8404. Design and Analysis of Approximation Algorithms. (3 cr; QP–5400 or 5421; SP–5403 or 5421 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 methods for algorithm design. Network flow and matching, advanced dynamic programming, linear programming, cryptography, approximation algorithms, on-line algorithms, and randomized algorithms. Cutting-edge material provides enough background for students to pursue dissertation-level research.

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

CSci 8481. Parallel Algorithms for Numeric and Non-numeric Problems. (3 cr; QP–5404 or #) Parallel 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; max 60 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 (concurrency 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, efficiency), and new trends (e.g., spatial graphs).

CSci 8760. Plan B Project. (3 cr; SP–Comp sci M.S. student; may not be applied toward cr minimum in major; S-N only)

Project arranged between student and faculty.

CSci 8777. Thesis Credits: Master’s. (1-18 cr; max 50 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])
CSci 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 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–N) Lectures and informal discussions.

CSci 8991. Independent Study. (1-3 cr; SP–N)

CSci 8994. Directed Research in Computer Science. (1-3 cr [max 9 cr]; SP–N)

Conservation Biology (CBio)

Graduate School

CBio 8001. Conservation Biology Seminar. (1 cr [max 6 cr]; SP–; 6; S–N only)
Topics vary.

CBio 8004. Economic and Social Aspects of Conservation Biology. (3 cr; SP–CBio student or #)

CBio 8095. Contemporary Problems in Conservation Biology. (1 cr; SP–Grad student; 5001 or equiv; 5–N only)
Comprehensive review of conservation biology issues. Written exam.

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

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

CBio 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

CBio 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

CBio 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Cultural Studies and Comparative Literature (CSCL)

Department of Cultural Studies and Comparative Literature

College of Liberal Arts

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 5154W. 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.

CSCL 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 19th-century literature, and the various French initiatives associated with both Les Temps Modernes and Tel Quel.

Cultural Studies and Comparative Literature (CSCL)

Department of Cultural Studies and Comparative Literature

College of Liberal Arts

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 filmic 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–N)
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. (1-2 cr; A-F only)
Art concepts, skills, processes appropriate for elementary school. Methods of art instruction. Children’s production of responses to art.

CI 5045. Advanced Contemporary Crafts. (2 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. Topic varies.

CI 5050. Issues in Art Education. (1-4 cr [max 12 cr])
Issues/trends, current practices, recent research.

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 students; A-F only)
Representations of knowledge. Postmodern conditions of education and relationships to the influences of visual culture. Introduction to issues concerning the value and importance of visual imagery; influence of computer networking, mass communication, and other image sources.

CI 5065. Improving Art Programs in the Schools. (3 cr; SP–Initial lic students majoring in art; 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; social and cultural structures 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 student; A-F only)
Issues of culture in education; examination of various forms of art as representations of knowledge, belief, and cultural capital. Epistemology, the meaning of for definitions of course numbers and symbols, see inside back cover.

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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–Licenture student in art ed; S-N 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–Foundations of ed major or elem ed initial lic; A-F only)
Curriculum organization, instruction, management, assessment, 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 5123. 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 structure 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 multicultural and gender-fair curriculum; cultural issues inherent in curricular change; language, culture, sexual preference, special needs students, and the conflicts between culture and curriculum.

CI 5138. Multicultural and Moral Perspectives on Classroom Instruction. (3 cr; SP–M.Ed. or Ph.D. student)
Factors leading to effective communication in ethnically diverse classroom, preschool to adult. Communication techniques and classroom structures that have cultural and moral implications.

CI 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. (3-4 cr; SP–Teaching experience and one yr teaching exp)
Students develop their professional identities as educators by considering their world views and values in relation to their professional role and responsibilities in the context of a diverse society. Encourages reflective practice and critical review of research.

CI 5147. Language, Culture, and Education. (3 cr; SP–M.Ed or grad student; A-F only)
Applies current sociolinguistic and discourse theory/research to study of relationships between language and culture in educational settings: language curriculum and instruction, classroom language use; borders between school and home/community language use; and educational policies on literacy/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 [max 12 cr]; S-N only)
Special topics, current trends in curriculum. Subject integration, curriculum contexts, development, implementation, evaluation.

CI 5155. Contemporary Approaches to Instruction and Assessment. (3 cr; SP–Grad student; 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; 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 teaching exp or ED; A-F only)
Theory and practice in teaching students with learning difficulties across the curriculum.

CI 5177. Practical Research. (3 cr; SP–CI M.Ed student, or CI or EdPA teacher leadership M.Ed. 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, further investigating the topic, and writing a report on the project.

CI 5178. Project in Teacher Leadership. (3-6 cr; SP–CI or EdPA teacher leadership M.Ed. student)
Create, implement, evaluate, and present a leadership project designed to initiate positive change in educational environments. Review related literature, proposal development, project development, implementation/evaluation, critical reflection. Share learning outcomes.

CI 5181. Clinical Experience in Elementary School Teaching. (4-8 cr; Foundations of ed of elem and elem ed init lic only; S-N only)
Students spend full days in the elementary classroom gradually assuming responsibility for teaching the class. Students prepare a portfolio based on criteria given. One semester per week.

CI 5183. Applying Instructional Methods in the Elementary Classroom. (1-2 cr [max 8 cr]; SP–Foundations of ed major or elem ed init lic only; S-N only)
Supervised experience in elementary classrooms.

CI 5186. School-Related Projects. (1-4 cr; SP–M.Ed. student; A-F only)
Research or evaluation project related to teaching, curriculum, or other aspect of schooling. Approved and supervised by faculty advisor.

CI 5187. Practicum: Improvement of Teaching in Elementary or PreKindergarten Schools. (2-3 cr; SP–M.Ed. 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 student only)
Directs students to individual studies that focus on producing and evaluating curriculum materials; literature review of issues and problems; and assessing curriculum processes.

CI 5251. Social and Philosophical Foundations of Early Childhood Education. (3 cr; SP–M.Ed. student in ECE or ECSE) or (A-F only)
Surveys imagery, history, philosophy, and psychology of early childhood education. Analyzing/interpreting trends in early education, including diversity, special needs, legislation, public policy, and educationally appropriate practice.

CI 5252. Facilitating Social and Physical Learning in Early Childhood Education. (3 cr; SP–M.Ed. student in early childhood ed or in early childhood special ed)
Current theoretical/empirical literature and developmental knowledge as basis for planning, implementing, and evaluating social/physical growth/development of young children. For students obtaining ECE/ECSE licensure.

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

CI 5281. Student Teaching in Early Childhood Education. (3-6 cr; SP–Ed.Ed. student in early childhood ed or early childhood special ed; S-N only)
Application of theory/research relating to teaching preschool children. For individuals obtaining ECE license.

CI 5330. Topics in Instructional Systems and Technology. (1-3 cr)
Topics related to needs of in-service teachers. Topics, location, credits, and duration are 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. Planning for Multimedia Design and Development. (3 cr)
Theory, research, practice in instructional design. Generic components of instructional design process. Applying principles to design/development of computer-based instructional materials.

CI 5337. Planning for K-12 Technology Design and Integration. (3 cr; SP–Able to use various instructional computing tools)
Applying principles of instructional design to development of technology-enhanced teaching in K-12 schools. Students create proposal for program/course or lesson development, using basic design principles, technology.

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)
Examination of 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 5362. Introduction to Educational Multimedia. (3 cr; SP–Familiarity with basic computer operations)
CI 5354. 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)
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 teaching exper or #; A-F only)
Integration of skill and aesthetic activities in graded and non-graded primary classroom settings. Use national and state language arts standards and statewide assessment protocols to examine elementary literacy curricula.

CI 5416. Literacy Development in the Intermediate Grades. (3 cr; SP–Elem teaching exper or #; A-F only)
Theory and practice of integrated teaching of reading, literature, writing, and language.

CI 5418. Whole Language Teaching and Learning in the Elementary School: (3 cr; SP–M.S. or grad student, minimum one yr teaching exper; A-F only)
Theory, research, and politics of whole language teaching. Applications for developing an elementary school whole language curriculum.

CI 5422. Teaching Writing in the Elementary School. (3 cr; SP–Init lic or # or grad student; A-F only)
Theory of and research on the writing process. Applications to developing an elementary school writing curriculum.

CI 5424. Reading, Language Arts, and Literature: Primary. (3 cr; SP–Elem ed init lic only; A-F only)
Curricular and methodological issues of reading, 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. Teaching Literature in the Secondary School. (2-3 cr; SP–Fall, English 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 their responses.

CI 5442. Literature for Adolescents. (3 cr; A-F only)
Characteristics of literature written for adolescents; rationale for using adolescent literature; adolescents’ reading interests and attitudes; analysis of quality and appeal; individualized reading programs; methods of promoting reading; multicultural literature; developing teaching activities.

CI 5451. Teaching Reading in 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. Developments in Teaching English and Speech. (2 cr; SP–English init lic; A-F only)

CI 5482. Reading, Language Arts, and Literature: Intermediate. (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–Elem ed init lic students; A-F only; S-N only)
Student teaching/clinical experience for English post-baccalaureate students only.

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–5363; A-F only)
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 student in science ed; A-F only)
Methods of planning/teaching science to middle school students.

CI 5532. Teaching Secondary School Science. (4 cr; SP–Admission 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–M.Ed., init lic, grad student) or #; A-F only
Using curriculum standards to design science courses.

CI 5534. Studies in Science Education. (3 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–M.Ed., grad student) or #; A-F only
Analysis of present science teaching practices in light of historical and philosophical foundations of science education.

CI 5536. Advanced Methods of Teaching and Assessment in Science. (3 cr; SP–M.Ed. or grad student or #)
Development/teaching of extended science activities: structured controversies, field-based activities, service learning projects, computer-based investigations. Development of authentic assessments, students’ portfolios based on national/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 one method of 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)
Supervised clinical experience in middle school science teaching.

CI 5597. Clinical Experience in Secondary School Science Teaching. (4-8 cr; SP–Init lic or #; S-N 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; assessment of children’s language; child development: literacy, 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; process of planning, practice, and reflection.

CI 5632. Communication and Comprehension in Second Language Classrooms. (3 cr; SP–SLC init lic only; A–F only)

Comprehension and communication processes in a second language; focus on learning, speaking, reading, 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 instructional strategies; development of curricula; developing content-based language curriculum; traditional and alternative approaches to assessing cognitive-academic language proficiency; use of technology to enhance 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, cultural considerations, and integration of culturally and linguistically diverse learners in the classroom.

CI 5646. Understanding and Teaching English Grammar. (3 cr; SP–Ling 5001 or #)

English syntax from pedagogical perspective. Grammatical structures that challenge ESL learners. Analyzing learner errors. Issues/activities related to teaching grammar in ESL contexts.

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 comprehension and composing processes; relationship between reading and writing; relationship of culture to reading comprehension and writing; politics of literacy; assessment of second language reading comprehension and writing proficiency; using technology to enhance literacy instruction.

CI 5657. Speaking and Listening in a Second Language. (3 cr; A–F only)

Theories and methods in teaching language as communication in oral and aural modes; planning student interaction; classroom organization for oral language learning and acquisition; using technology to enhance interaction; assessment of listening comprehension and oral communication.

CI 5658. Second Language Testing and Assessment. (3 cr; A–F only)

Aligning second language classroom instruction and assessment; fundamental concepts in language assessment; testing; modern 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; tools of inquiry; national and state standards and implications for curriculum development; effects of technology on second language curriculum.

CI 5693. Directed Study in Second Languages and Cultures. (1–4 cr; 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–5619, adviser approval; credits cannot be counted on a graduate degree program for endorsement candidates) Teaching and learning experiences in Second Languages and Cultures at the elementary-school level. Requires students to work in a public school setting.

CI 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–Advisor 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 second language 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–5111 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 teaching exp 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–Secondary social studies init lic student; A–F only)

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 5761. Social Studies Education for the In-service Middle/Secondary Teacher. (3 cr)

Trends and issues in social studies education. Current developments and controversies in social studies pedagogy, curriculum, and assessment.

CI 5762. Developing Civic Discourse in the Social Studies. (3 cr; SP–M.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 newspaper in the classroom. Instructional strategies, curriculum development techniques, and teaching materials useful in teaching about newspaper in elementary/secondary classrooms.

CI 5782. Clinical Experiences in Teaching Social Studies. (1–8 cr; max 16 cr; SP–M.Ed. init lic student; 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–Educ grad student or #; A–F only)

Reports, evaluation of problems, and review of recent literature.

CI 8079. Research in Art Education. (3 cr; SP–Educ 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 educ major or #; Independent research under faculty guidance; may include advanced studio practice and educational issues requiring a research methodology.)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI 8111</td>
<td>Representations of Knowledge in Curriculum and Culture</td>
<td>1-3 cr</td>
<td>[max 3 cr]</td>
<td>SP–CI grad student or #</td>
</tr>
<tr>
<td>CI 8115</td>
<td>Curriculum and Achievement Outcomes in a Diverse Society</td>
<td>3 cr</td>
<td>SP–Doctoral student; A-F only</td>
<td>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.</td>
</tr>
<tr>
<td>CI 8121</td>
<td>Curriculum Change: Perspectives, Processes, and Participants</td>
<td>3 cr</td>
<td>SP–CI grad student or #</td>
<td>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.</td>
</tr>
<tr>
<td>CI 8127</td>
<td>Curriculum Theory and Research: Alternative Paradigms and Research Methods</td>
<td>3 cr</td>
<td>SP–CI grad student or #</td>
<td>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.</td>
</tr>
<tr>
<td>CI 8131</td>
<td>Curriculum and Instruction Core: Critical Examination of Curriculum in Context</td>
<td>3 cr</td>
<td>SP–CI Ph.D. student; A-F only</td>
<td>Central concepts, ideas, and debates in professional field of curriculum. Critical discussion about curriculum in general education to lay a foundation for student research and innovation in a particular school subject or related field.</td>
</tr>
<tr>
<td>CI 8132</td>
<td>Curriculum and Instruction Core: Teaching Theory and Research</td>
<td>3 cr</td>
<td>SP–CI Ph.D. student; A-F only</td>
<td>Overview of research on teaching: historical perspective, modern research and findings, and implications for practice and future research.</td>
</tr>
<tr>
<td>CI 8133</td>
<td>Research Methods in Curriculum and Instruction</td>
<td>3 cr</td>
<td>SP–CI Ph.D. student; A-F only</td>
<td>Survey of educational research methods and comparison of underlying assumptions and procedures.</td>
</tr>
<tr>
<td>CI 8148</td>
<td>Conducting Qualitative Studies in Educational Contexts</td>
<td>3 cr</td>
<td>SP–CI M.A. or Ph.D. student or #</td>
<td>Introduction to use of qualitative research methods. Ethnography, sociolinguistics, symbolic interactionism. Emphasizes observation.</td>
</tr>
<tr>
<td>CI 8161</td>
<td>Planning a Research Experience I</td>
<td>2 cr</td>
<td>SP–8133, CI Ph.D. student or #</td>
<td>Designing research questions, initiating literature reviews, and selecting a research methodology.</td>
</tr>
<tr>
<td>CI 8162</td>
<td>Planning a Research Experience II</td>
<td>2 cr</td>
<td>SP–8133, CI Ph.D. student or #</td>
<td>Development of research methodology, data collection devices, and processes for successful research.</td>
</tr>
<tr>
<td>CI 8181</td>
<td>Seminar in Teaching in Colleges of Education</td>
<td>3 cr</td>
<td>SP–CI Ph.D. student or #</td>
<td>Goals, instructional strategies, evaluation procedures, and professional considerations.</td>
</tr>
<tr>
<td>CI 8195</td>
<td>Problems: Improvement of Instruction</td>
<td>1-6 cr</td>
<td>[max 6 cr]</td>
<td>SP–4</td>
</tr>
<tr>
<td>CI 8196</td>
<td>Practicum in Teaching in Colleges of Education</td>
<td>1 cr</td>
<td>SP–8181</td>
<td>Supervised teaching in an education course at the University of Minnesota or other college or university.</td>
</tr>
<tr>
<td>CI 8197</td>
<td>Problems: Curriculum Studies</td>
<td>1-4 cr</td>
<td>[max 8 cr]</td>
<td>SP–MA, A-F only</td>
</tr>
<tr>
<td>CI 8198</td>
<td>Problems: Teacher Education</td>
<td>1-6 cr</td>
<td>[max 12 cr]</td>
<td>SP–#</td>
</tr>
<tr>
<td>CI 8361</td>
<td>Advanced Courseware and Design: Issues</td>
<td>3 cr</td>
<td>A-F only</td>
<td>Examination and critique of existing research. Students identify a research topic, write a literature review, plan a study, and present a research proposal.</td>
</tr>
<tr>
<td>CI 8391</td>
<td>Instructional Systems Seminar</td>
<td>1-3 cr</td>
<td>[max 6 cr]</td>
<td>SP–CI grad student or #</td>
</tr>
<tr>
<td>CI 8395</td>
<td>Problems: Instructional Systems</td>
<td>1-6 cr</td>
<td>[max 12 cr]</td>
<td>SP–#</td>
</tr>
<tr>
<td>CI 8400</td>
<td>Special Topics in Children's and Young Adult Literature</td>
<td>1-6 cr</td>
<td>[max 6 cr]</td>
<td>SP–Grad course in children's or young adult lit</td>
</tr>
<tr>
<td>CI 8410</td>
<td>Special Topics in Reading Research and Instruction</td>
<td>1-6 cr</td>
<td>[max 6 cr]</td>
<td>SP–#</td>
</tr>
<tr>
<td>CI 8412</td>
<td>Research in Reading</td>
<td>3 cr</td>
<td>SP–#</td>
<td>Significant literacy research; critical analysis of methodology and findings, appraising research methods, population limitations, and educational implications.</td>
</tr>
<tr>
<td>CI 8470</td>
<td>Special Topics on Literacy</td>
<td>1-6 cr</td>
<td>[max 6 cr]</td>
<td>SP–CI Ph.D. student or #</td>
</tr>
<tr>
<td>CI 8492</td>
<td>Readings in English Education and Reading</td>
<td>1-2 cr</td>
<td>[max 10 cr]</td>
<td>SP–#</td>
</tr>
<tr>
<td>CI 8495</td>
<td>Problems: Teaching English and Reading</td>
<td>1-6 cr</td>
<td>[max 6 cr]</td>
<td>SP–#; A-F only</td>
</tr>
<tr>
<td>CI 8511</td>
<td>Seminar: Research in Science Education</td>
<td>1 cr</td>
<td>[max 6 cr]</td>
<td>SP–CI grad student or #</td>
</tr>
<tr>
<td>CI 8570</td>
<td>Advanced Topics in Science Education</td>
<td>1-4 cr</td>
<td>[max 4 cr]</td>
<td>SP–CI grad student or #; A-F only</td>
</tr>
<tr>
<td>CI 8594</td>
<td>Conducting Research in Science Education</td>
<td>3 cr</td>
<td>SP–Sci educ research course</td>
<td>Application of research methodology to a specific science education issue.</td>
</tr>
<tr>
<td>CI 8595</td>
<td>Problems: Science Education</td>
<td>1-6 cr</td>
<td>[max 12 cr]</td>
<td>SP–CI grad student or #</td>
</tr>
<tr>
<td>CI 8631</td>
<td>Research Seminar I: Second Languages and Cultures Education</td>
<td>3 cr</td>
<td>SP–8133; A-F only</td>
<td>Students explore a research topic through readings, seminar discussions, conducting an actual study, and peer critique of work.</td>
</tr>
<tr>
<td>CI 8632</td>
<td>Research Seminar II: Second Languages and Cultures Education</td>
<td>3 cr</td>
<td>SP–8631; A-F only</td>
<td>Students complete data analyses and prepare written report on an original study as well as offer peer critique of work.</td>
</tr>
<tr>
<td>CI 8650</td>
<td>Seminar: Special Topics in Second Languages and Cultures Research</td>
<td>1-3 cr</td>
<td>[max 3 cr]</td>
<td>SP–CI grad student or #</td>
</tr>
<tr>
<td>CI 8695</td>
<td>Problems: Second Languages and Cultures Education</td>
<td>1-6 cr</td>
<td>[max 12 cr]</td>
<td>SP–#</td>
</tr>
<tr>
<td>CI 8742</td>
<td>Seminar: Research in Social Studies Education</td>
<td>2 cr</td>
<td>SP–CI grad student or #; A-F only</td>
<td>Critical review and analysis of seminal research studies; criteria for appraising research findings; educational implications.</td>
</tr>
<tr>
<td>CI 8795</td>
<td>Problems: Social Studies Education</td>
<td>1-6 cr</td>
<td>[max 12 cr]</td>
<td>SP–CI grad student or #</td>
</tr>
<tr>
<td>CI 8796</td>
<td>Research Internship in Social Studies Education</td>
<td>1-6 cr</td>
<td>[max 6 cr]</td>
<td>SP–CI grad student; A-F only</td>
</tr>
</tbody>
</table>

**Courses**

**Department of Theatre Arts and Dance**

**College of Liberal Arts**

- **Dnce 5010. Modern Dance Technique 7** | 2 cr (max 4 cr) | SP–A; audit registration not permitted | Continuation of technical development. Performance range/style. Students study with various guest artists. |
- **Dnce 5020. Modern Dance Technique 8** | 2 cr (max 4 cr) | SP–5010 or A; audit registration not permitted | Continuation 5010. Performance range/style. Students study with various guest artists. |
- **Dnce 5110. Ballet Technique 7** | 2 cr (max 4 cr) | SP–A; audit registration not permitted | Continuation of ballet technique. Musicalsity, performance, stylistic differences. Practical work conducted within context of choreographic/aesthetic development of ballet. |
- **Dnce 5120. Ballet Technique 8** | 2 cr (max 4 cr) | SP–5110 or A; audit registration not permitted | Continuation of 5110. Musicality, performance, stylistic differences. Practical work conducted within context of choreographic/aesthetic development of ballet. |
- **Dnce 5210. Jazz Technique 7** | 1 cr (max 2 cr) | SP–A; audit registration not permitted | Continuation of jazz technique. Syncopation, performance projection. Specific styles: swing, bebop, lyrical, funk, latin. |
- **Dnce 5220. Jazz Technique 8** | 1 cr (max 2 cr) | SP–5210 or A; audit registration not permitted | Continuation of 5210. Syncopation, performance projection. Specific styles: swing, bebop, lyrical, funk, latin. |
- **Dnce 5500. Topics in Dance** | 1-2 cr (max 10 cr) | Topics specified in course title. |
- **Dnce 5700. Performance** | 2 cr (max 18 cr) | SP–Technique course, A | Technique, improvisation, choreography, music, design, and technical production as they relate to dance performance. |
Courses

Dnce 5858. Teaching Dance. (4 cr; SP–1020, Δ or #)
Methods, principles, and techniques of teaching dance.

Dnce 5970. Directed Studies. (1-4 cr [max 10 cr]; SP–, Δ, J)
Guided individual study.

Dent 8009. Evidence-based Clinical Pediatric Dentistry. (2 cr; A-F only)
Selected pediatric dentistry topics. In-depth literature review, seminar discussion.

Dent 8091. Interdisciplinary Care of the Cleft Palate Patient. (1 cr; S-N 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 8101. Dental Implantology: A Multidisciplinary Approach. (2 cr)
Dental implant therapy from perspective of several dental disciplines.

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 DGS consent)

Dent 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Dermatology (Derm)

Department of Dermatology

Medical School

Derm 8225. Clinical Dermatology. (7 cr)

Derm 8226. Clinical Seminar. (1 cr)

Derm 8227. Histology of the Skin. (1 cr)

Derm 8230. Functional Biology of the Skin. (1 cr)

Derm 8232. Seminar: Dermatologic Histopathology and Mycology. (1 cr)

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-F only)
In-depth investigation of a single specific topic, announced in advance.

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, 2212 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, DHA major; SP–4334, [DHA major or grad student]; A-F only)
Integration of design with computer applications. Use of raster- or vector-based programs for illustration.

DHA 5382. Digital Sound and Video. (3 cr; QP–5334, DHA major; or #; SP–4334, [DHA major or grad student]; or #; A-F only)

DHA 5383. Modeling and Animation. (3 cr; QP–5334, DHA major; or #; SP–4334, [DHA major or grad student]; or #; A-F only)
Three-dimensional modeling/animation in electronic design communication.

DHA 5385. Internet-Based Media. (3 cr; QP–5334, DHA major; or #; SP–4334, [DHA major or grad student]; or #; A-F only)

DHA 5388. Design Planning, Analysis, and Evaluation. (3 cr; QP–3333, DHA major; or grad or #; SP–4345, DHA major; or grad or #; A-F only)
Preliminary research, including theoretical, applied, and legal aspects. Planning/developmental models. Design prototyping, testing, and analysis.

DHA 5399W. Theory of Electronic Design. (3 cr; QP–[DHA major, or] grad or #; SP–[DHA major, or] grad student or #; offered alternate yrs; A-F only)
Theories, methodologies, histories of electronic design, its impact on visual communications. Digital artifacts, processes, paradigms.

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 5467W. Housing and the Social Environment. (3 cr; QP–1400 or #; SP–2001; 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.

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 comparisons with urban housing issues are made.

DHA 8010. 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 8013. 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 8114. Design Studio II. (4 cr; SP–#; A-F only)
Advanced problem analysis, design solution.

DHA 8164. Innovation Theory and Analysis. (3 cr; A-F only)
Theories and factors that influence adoption and diffusion of designed products. 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 8181. Ethics and Research. (1 cr; SP–Grad student; S-N only)
Overview of ethical concerns/questions in conducting/ disseminating research. Mentoring relationships, use of human subjects, data handling, plagiarism, authorship, publishing, research funding, social responsibility of researchers, code of conduct.

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)
**Development Studies and Social Change (DSSC)**

**Graduate School**

DSSC 8111. Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change. (3 cr; SP–Grad DSSC minor or #; S–N only) Approaches practiced by physical, biological, and social scientists and humanities scholars. “Ways of knowing” in different cultures or in different groups within cultures. Team taught by faculty from biological and social sciences and the humanities.

DSSC 8211. Doctoral Research Workshop in Development Studies and Social Change. (1 cr; 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 8212. Doctoral Research Workshop in Development Studies and Social Change. (1 cr; 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. (2-3 cr; max 9 cr) (Grad DSSC minor or #) Offered in conjunction with the 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; max 9 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, F. Guided individual reading or study.

**East Asian Studies (EAS)**

**Institute of International Studies College of Liberal Arts**

EAS 5940. Topics in Asian History. (1-4 cr; max 16 cr) (Grad or #) Selected topics such as cultural, economic, intellectual, political, and social history.

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

EAS 8777. Thesis Credits: Master’s. (1-18 cr; max 50 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 3008. Forest Response to Quaternary Climate Change. (2 cr; QP–Bio 5041 or 5841; SP–Bio 3407, EEB 4631 or Geo 4631; FEB 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. Limiting the speed of response to rapid climate change.

EEB 5009. Quaternary Vegetation History and Climate. (2 cr; QP–5004 or Geo 5631 or #; SP–4631 or Geo 4631 or #) 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–Pbio 3201 or #; SP–Biol 3007, Pbio 4321 or #) 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 #; SP–Pbio 4321 or 4511 or #) Morphology of seeds, fruits, and other macroscopic remains likely to occur in Quaternary deposits, survey of fossils of major plant families, lab techniques.

EEB 5033. Population and Quantitative Genetics. (4 cr; QP–Biol 5003 or GCB 3022) course in biometry or statistics; SP–Biol 4003 or GCD 3022, intro statistics or #) Genetic basis of variation in populations and of evolutionary change. Allelic frequency dynamics; emphasizes natural selection, additive genetic variance, and heritability. Current topics related to consequences of artificial selection and of 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 5122W. Plant Interactions with Animals and Microbes. (4 cr; QP–Biol 3008, Biol 1106 or 1806 or 3011, Biol 1103 or Biol 3012 or 3812, 10 cr biol 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–Bio 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–Bio 3411 or Biol 3101 or NSC 3101 or Phil 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.
Courses

EEB 5327. Behavioral Ecology. (3 cr; QP–3111; SP–Biol 3411)
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 history, philosophy, or biology; SP–Advanced studies in history, philosophy or biology)
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–4; 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 of values 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 models in conservation biology. Introduces techniques, concepts, and software.

EEB 8010. Seminar in Paleocology. (1 cr [max 4 cr]; SP–; S-N only)
Reading and discussion of recent literature on Quaternary paleocology.

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 biometry course; SP–Stat or biometry course or #)
Overview of analytical methods in interpreting data collected from observational and experimental studies in ecology and related fields of evolution, behavior, and conservation biology. Univariate, bivariate, and multivariate methods including 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 [max 6 cr]; QP–5561 or Geo 5601 or equiv; SP–4601 or #; A-F only)
Selected topics, using current and classical literature. Seminar format. Term paper required.

EEB 8641. Spatial Ecology Seminar. (3 cr; SP–[5051, 2 sem calculus] or [3 sem calculus, course in statistics or probability]; #; S-N only)

EEB 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

EEB 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

EEB 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

EEB 8980. Seminar on Current Topics. (1-3 cr [max 6 cr]; SP–[1st yr or 3rd sem grad student; #; S-N only])
Current research in ecology, evolution, and behavior.

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)

Economics (Econ)

Department of Economics
College of Liberal Arts

(2 cr; SP–3101 or equiv, qtr calculus, qtr linear algebra, grad or #; SP–3101, 3102, or equiv; Math 1271 or equiv; Math 2243 or equiv; grad or #)
Decision-making by households and firms under conditions of perfect competition, monopoly, and monopolistic competition.

(2 cr; SP–3101, 3102 or equiv, qtr calculus, qtr linear algebra, grad or #; SP–3101, 3102 or equiv; Math 1271 or equiv; Math 2243 or equiv; grad or #)
Determinants of national income, employment, and price level; aggregate consumption, investment, and asset holding.

Econ 5312. Growth, Technology, and Development.
(3 cr; SP–3101, 3102 or equiv or #; SP–3101, 3102 or equiv or #)
Economics of research and development; technical change and productivity growth; impact of technology on institutions; science and technology policy.

Econ 5821. Public Economics. (3 cr; QP–53801, 3101, 3103 or equiv; SP–3101, 3102 or equiv) Competing views on the proper role of government in the economy. Effects of tax and spending policies, taking into account private agents’ response to government actions and the ways government officials may use their powers; optimal policies. Applications primarily to U.S. government.

Econ 8001. Microeconomic Analysis. (2 cr; QP–5151 or equiv; Math 3252, Math 3261 or equiv or Math 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.

Econ 8002. Microeconomic Analysis. (2 cr; QP–8001; QP–8001) Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics: externalities, economics of information and uncertainty, and game theory. This seven-week course meets with 4162.

Econ 8003. Microeconomic Analysis. (2 cr; QP–8002; QP–8002) Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics: externalities, economics of information and uncertainty, and game theory. This seven-week course meets with 4163.

Econ 8004. Microeconomic Analysis. (2 cr; QP–8003; QP–8003) Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics: externalities, economics of information and uncertainty, and game theory. This seven-week course meets with 4164.

Econ 8101. Microeconomic Theory. (2 cr; QP–5151 or equiv, Math 3261 or equiv, Math 5165 or #; SP–5151 or equiv, Math 2243 or equiv, Math 5165 or # or Math 8601, grad econ major or #)

Econ 8102. Microeconomic Theory. (2 cr; QP–8101, Math 5165; SP–8101, Math 5165 or # or Math 8602, grad econ major or #)

Econ 8103. Microeconomic Theory. (2 cr; QP–8101, Math 5165; SP–8101, Math 5165 or # or Math 8602 or comparable abstract math course, grad econ major or #)

Econ 8104. Microeconomic Theory. (2 cr; QP–8102, Math 5165; SP–8103, Math 5165 or # or Math 8602 or # comparable abstract math course, grad econ major or #)

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.


Courses

**Econ 8108. Macroeconomic Theory.** (2 cr; QP–8105; SP–8108 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 4186.

**Econ 8111. Introduction to Mathematical Economics.** (2 cr; QP–8110, Math 5261 or equiv; Math 5612 or equiv or #; Math 5242 recommended; SP–Math 2243 or equiv; Econ 8101, Math 5615 or equiv or #; Math 4242 recommended) Use of mathematical models in economic theory.

**Econ 8112. Introduction to Mathematical Economics.** (2 cr; QP–8111, Math 5613 or comparable abstract math course; SP–8111, 8102, 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, #102; 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 equiv; SP–8104, Math 5616 or equiv or #) Basics of cooperative game theory, emphasizing concepts used in economics. Games with and without transferable utility; the core, the value, and other solution concepts. Recent results, including potential, reduced games, consistency, and noncooperative implementation of cooperative solution concepts. Seven-week course.

**Econ 8124. History of Economic Thought.** (2 cr; QP–8103, 8106; SP–8104, 8108 or #) Selected topics, emphasizing development of theoretical topics. Seven-week course.

**Econ 8125. History of Economic Thought.** (2 cr; QP–8124; SP–8124 or #) Selected topics, emphasizing development of theoretical topics. Seven-week course.

**Econ 8181. Advanced Topics in Microeconomics.** (2 cr [max 4 cr]; QP–8103; SP–8110 or #; offered when feasible) Faculty and student presentations based on recent literature. Seven-week course.

**Econ 8182. Advanced Topics in Microeconomics.** (2 cr [max 4 cr]; QP–8106; SP–8108 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–8110 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–8108 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 #) Seven-week course.

**Econ 8192. Workshop in Mathematical Economics.** (1-3 cr [max 10 cr]; QP–8103; SP–8104 or #) Seven-week course.

**Econ 8201. Econometric Analysis.** (2 cr; QP–[3101 or equiv], Math 1261 or equiv; Stat 5122 or Stat 5133; SP–[3101 or equiv], Math 1272 or equiv, Stat 5102 or #) Basic linear regression model, its variants. Panel data, censored/truncated regression, discrete choice models. Time series, simultaneous equation models.


**Econ 8204. Econometric Analysis.** (2 cr; QP–8202; SP–8203) Basic linear regression model, its variants. Panel data, censored/truncated regression, discrete choice models. Time series, simultaneous equation models.

**Econ 8205. Applied Econometrics.** (2 cr; QP–Math 5242 or equiv; Econ 8101, Stat 5101; Math 5424 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, 8102, 8106, Stat 5101; Stat 8205, 8102, 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, 8103, 8107, Stat 5102; Stat 8206, 8103, 8107, 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 8208. Applied Econometrics.** (2 cr; QP–8206, 8104, 8108, Stat 5102; Stat 8207, 8104, 8108, 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 8209. Applied Econometrics.** (1 cr; SP–Master's student, adviser and DGS consent)

**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–8311; SP–8311 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 8313. Economic Growth and Development.** (2 cr; QP–8312; SP–8312 or #) Methods of analyzing dynamical systems; applying methods to new models of growth and development; deriving and evaluating models' quantitative implications in a number of countries. Seven-week course.

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

**Econ 8381. Advanced Topics in Economic Development.** (2 cr [max 4 cr]; QP–8312; SP–8312 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–8312 or #) 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]; #) Seven-week course.

**Econ 8392. Workshop in Economic Growth and Development.** (1-3 cr [max 10 cr]; #) 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. This is a seven-week course.

**Econ 8403. International Trade and Payments Theory.** (2 cr; QP–8402; SP–8402 or #) International business cycles; exchange rates; capital movements; international liquidity. This is a 7-week course.

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

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–#)

Econ 8492. Workshop in Trade and Development. (1-3 cr [max 10 cr]; SP–#)

Econ 8501. Wages and Employment. (2 cr; QP–8101, 8104; SP–8101, 8104 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 #)
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 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–8101; 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 #)
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 #)
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 [max 50 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Econ 8667. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Econ 8671. 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 8672. 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 8679. Workshop in Macroeconomics. (1-3 cr [max 10 cr]; SP–#)

Econ 8701. Monetary Economics. (2 cr; QP–8101, 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–8702, 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 8707. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; total required [Plan A only])

Econ 8711. 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 8722. 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 8781. Doctoral Thesis Credits. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Econ 8782. Doctoral Thesis Credits. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Econ 8801. Public Economics. (2 cr; QP–8801; SP–8801 or #)

Econ 8881. Advanced Topics in Public Economics. (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 8882. Advanced Topics in Public Economics. (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 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Education (Educ)

College of Education and Human Development

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

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

Edu 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Edu 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; total required [Plan A only])

Edu 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Education and Human Development (EdHD)

College of Education and Human Development

EdHD 5001. Learning, Cognition, and Assessment in the Schools. (3 cr; QP–M.Ed./init lic student or CLA music ed or preteaching major or #; psych course recommended; SP–M.Ed./init lic student or CLA music ed or preteaching major or #; psych course recommended; A-F only)
Principles of learning, cognition, cognitive development, classroom management, motivation, instruction, assessment. Approaches include behaviorism, cognitive and social constructivism, human information processing theory. Topics include intelligence, knowledge acquisition, reasoning skills, scholastic achievement, standardized testing, reliability, validity, student evaluation, performance assessment, portfolios, demonstrations. Applications to instruction and organization of curricular materials.

EdHD 5003. Developmental and Individual Differences in Educational Contexts. (3 cr; QP–M.Ed./init lic or CLA music ed or preteaching major or #; SP–M.Ed./init lic or CLA music ed or preteaching major or #; A-F only)
Overview of developmental and individual differences of children and adolescents in educational contexts; 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; OP—EdPA 5090; M.Ed./init lic or CLA music ed major or preteaching major or SP—EdPA 5090; M.Ed./init lic student or CLA music ed major or preteaching major or #; A-F only)
Readings in history, philosophy, social sciences, and law revealing diverse educational values in a pluralistic society. Multiple expectations of schools. Civil liberties, rights, community. Varying cultural backgrounds of students, family circumstances, exceptional needs.

EdHD 5007. Technology for Teaching and Learning. (1.5 cr; OP—F 5007 [sem version]; SCI 5300; [M.Ed./init lic or CLA music ed major or preteaching major or #]; Basic knowledge of Macintosh operating system and of a word processing program) SP—F 5007 [gr version]; SCI 5300; [M.Ed./init lic or CLA music ed major or preteaching major or #; Basic computer skills; A-F only]
Diverse educational technology in K-12 classrooms. Effective use of technology. Computer technologies used to stimulate personal productivity/communication and to enhance teaching/learning processes.

EdHD 5009. Human Relations: Applied Skills for School and Society. (1 cr; SP—M.Ed./init lic or CLA music ed or preteaching or #; A-F only)
Issues of prejudice/discrimination in terms of history, power, social perception. Knowledge/skills acquisition in cooperative learning, multicultural education, group dynamics, social influence, leadership, judgment/decision making, prejudice reduction, conflict resolution, teaching in diverse educational settings.

Courses

EdPA 5036. Ethics, Morality, and Values in Education. (3 cr)
Application to key issues of professional practice. Moral education, virtues, 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)
Introduction to cultural variables of leadership that influence functioning of cross-cultural groups. Lectures, case studies, discussion, problem-solving, simulations. Intensive workshop.

EdPA 5052. Ethnic Groups and Communities: Families, Children, and Youth. (3 cr)

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)
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 5080. Special Topics: Educational Policy and Administration. (1-3 cr [max 24 cr])
Shared responsibility of students/instructor in presentation of topics.

EdPA 5095. Problems: Educational Policy and Administration. (1-3 cr [max 24 cr])
Course or independent study on specific topic within department program emphasis.

EdPA 5096. Internship: Educational Policy and Administration. (1-9 cr [max 24 cr])
Internship in elementary, secondary, or postsecondary administration, or other approved field related setting.

EdPA 5101. International Education and Development Education, Contemporary Theories. (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)
Examination 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 5302. Educational Policy: Context, Inquiry, and Issues. (3 cr)
Review of social science concepts/research in considering educational policies/issues, process of inquiry (3 cr; M.Ed./init lic or preteaching or #; A-F only)
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 5303. Managing the Learning Organization. (3 cr; A-F only)
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 5304. Educational Leadership for Equity, Opportunity, and Outcome. (3 cr; OP—M.Ed./init lic or preteaching or #; A-F only)
Course or independent study on specific topic within department program emphasis.

EdPA 5321. The Principalship. (3 cr)
Role of the principal: qualifications, duties, and problems.

EdPA 5322. School Superintendency. (3 cr; OP—M.Ed./init lic or preteaching or #; A-F only)
Role/responsibility of superintendent in school district. Emphasizes real life experiences, leadership potential as CEO. Purposes, power, politics, practices of position. Interplay of internal school forces, external community forces analyzed in multiple contexts. Manifestations of leadership in public, high-profile appointment.
Courses

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 pursuing 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, M.Ed., or grad student; A-F only)
Political dimensions of policy formulation/implementation in education. Use of power/influence in shaping educational policies and in resolving conflicts over educational issues. Analysis of consequences/cross-impacts.

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 “futurize the present.”

EdPA 5356. Contemporary Services for Persons With Disabilities. (3 cr)
Policy, research, and current practices related to education, health, and social services that support children, youth, and adults with special needs, and that support their families. Federal, state, local perspectives.

EdPA 5361. Project in Teacher Leadership. (3-6 cr; SP–M.Ed. student in Teacher Leadership Program; S-N only)
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. Leadership for School Improvement. (3 cr; SP–M.Ed. student or K-A-F only)
Current research/practice on educational leadership focused on creating school cultures conducive to continuous improvement/change. Strategies for personal/organizational leadership in PK-12 settings.

EdPA 5368. Special Services Policy and Administration. (3 cr)
Legislative, procedural, executive, and judicial actions that affect services, families, and children with special needs at all levels of government: federal, state, and local. For administrators, supervisors, and other professionals responsible for managing general, special, 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, political system, environment, economy and work, welfare and religion; organizations, social movements, and subcultures; empirical research and cross-cultural perspectives.

EdPA 5374. Leadership for Staff Development. (4 cr; SP–Postbac.caurauree, at least 3 yrs teaching experience) Designing, implementing, evaluating staff development in PK-12 settings. Research-based standards for effective staff development. Need for embedded time for collaborative learning, evaluating staff/student outcomes.

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)

EdPA 5381. The Search for Children and Youth Policy in the U.S. (3 cr)
Review of contemporary policy issues affecting children and youth in the U.S. and South Africa; identify national standards, norms and principles of youth development; conflicting expectations facing policy-makers; and search for the critical content of youth policy.

EdPA 5384. Collaboration in Heterogeneous Classrooms and Schools. (3 cr; A-F only)
Policy, research, practice base for addressing range of student abilities/backgrounds in diverse schools. Collaborative approaches to curricular, instructional, social support.

EdPA 5396. Field Experience in PK-12 Educational Administration. (3 cr; max 6 cr; SP–4-S-N only)
Field experience or internship arranged for students seeking licensure as PK-12 principal/superintendent. Content/credit depend on licensure requirements specified in individual field experience agreement.

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 5521. Cost and Economic Analysis in Educational Evaluation. (3 cr; S-N only)
Use and application of cost-effectiveness, cost-benefit, cost-utility, and cost-feasibility in evaluation of educational programs. (3 cr and programs)

EdPA 5524. Evaluation Colloquium. (1 cr; max 24 cr; SP–P5240 or 5285 or EP4Y 5243; SP–5501 or EP4Y 5243; S-N only)
Informal seminar of faculty and advanced students interested in the issues and problems of program evaluation.

EdPA 5701. U.S. Higher Education. (3 cr)
U.S. higher/postsecondary education in historical/contemporary perspective. Emphasizes structure, history, and purposes of system as a whole.

EdPA 5704. Student and Faculty Issues in Higher Education. (3 cr; SP–5701)
College student development, curricular/extracurricular activities, faculty work/development, 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.

EdPA 5724. Leadership and Administration of Student Affairs. (3 cr)
Scope, administration, coordination, and evaluation of programs in college and university student affairs.

EdPA 5728. Two-Year Postsecondary Institutions. (3 cr)
Present status, development, functions, organization, curriculum, and trends in postsecondary, but nonbaccalaureate, institutions.

EdPA 5732. The Law and Postsecondary Institutions. (3 cr)
Analysis of court opinions and federal regulations affecting postsecondary educational institutions.

EdPA 8002. Critical Issues in Contemporary Education. (3 cr; SP–Ed.D. or Ph.D. 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–Ed.D. or Ed.D. student; S-N only)
Introduction/planning for individual program development, preliminary examination, and dissertation prospectus. May be taken only in current research in education, databases relating to education, recent writings on literature synthesis, key contributions to education literature.

EdPA 8012. Doctoral Research Seminar II. (1 cr; SP–Ed.D. or Ph.D. student; S-N only)
Introduction to quantitative/qualitative research approaches/methods. Nature of research, role of researcher, philosophical perspectives on research, ethical issues in conducting research.

EdPA 8013. Doctoral Research Seminar III. (1 cr; SP–Ed.D. or Ph.D. student; S-N only)
Introduction to most important quantitative/qualitative approaches employed in educational policy research.

EdPA 8014. Doctoral Research Seminar IV. (1 cr; SP–Ed.D. or Ph.D. 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 Analysis of Education. (3 cr)
Critical aspects of historical and contemporary systems philosophy, thinking, and analysis. Development of concepts and skills applicable to coping with evolutionary and chaotic environments. Modeling and simulation of learning systems in rapidly changing national and international contexts.

EdPA 8121. Doctoral Seminar: Comparative and International Development Education. (1-6 cr; SP–Ed.D. or Ph.D. candidate; S-N only)
Focuses on needs of students while writing the dissertation; general guidance in how to construct the thesis.

EdPA 8124. Classic Readings in Anthropology and Education. (3 cr; A-F only)
Major contributions to theory or working paradigms.

EdPA 8301. Contexts of Learning. (3 cr)
Study of long-term contextual understanding of education as a social institution. Development of perspective-driven explanation.

EdPA 8302. Educational Policy Perspectives. (3 cr)
EdPA 8303. Modeling the Learning Organization. (3 cr)

Comprehensive perspectives on learning organization used to study global education, human service organizations.

EdPA 8304. Leadership and Ethics. (3 cr)

Review of major leadership theories, their application to problems of practice in educational organizations. Studies of leadership behavior illustrate major emerging issues in educational management.

EdPA 8321. Data Analysis for Educational Management. (3 cr)

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: Master's. (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–5501 or EPsy 5243) Concepts, approaches, models, and theoretical frameworks for program evaluation that have developed since the 1960s.

EdPA 8595. Evaluation Problems. (1-6 cr [max 24 cr]; QP–5240 or 5285 or EPsy 5243; SP–5501 or EPsy 5243), # Independent study of an issue in theory or practice of program evaluation.

EdPA 8596. Evaluation Internship. (1-9 cr [max 24 cr]; QP–5240 or 5285 or EPsy 5243; SP–5501 or EPsy 5243), # Hands-on experience in conducting a program evaluation in a real-world setting under supervision of an evaluation professional.

EdPA 8666. Doctoral Pre-Thesis Credits. (1-18 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, management, and law.

EdPA 8703. Public Policy in Higher Education. (3 cr; QP–5201, 5250; SP–5001, 5701, A-F only) Theories, analytic methods, and critical issues in postsecondary education policy at national/state levels. Equality of educational opportunity, affirmative action, system planning/coordination, research funding, student financial aid, public accountability.

EdPA 8721. Instruction and Learning in Higher Education. (3 cr)


EdPA 8724. Strategic Planning in Higher Education. (3 cr; QP–8250 or 8258; SP–5701)

Strategic planning principles, their application to higher education, pitfalls encountered by planners in higher education. Selected tools of strategic planning/management, strategic planning case studies.

EdPA 8728. Economics of Higher Education. (3 cr; QP–8250 or 8258; SP–5701) Institutional responses to changing external economic factors; economic effects resulting from higher education’s output in teaching, research, and service; research on institutional and governmental policies.


EdPA 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; SP–5285 or per semester or summer; 10 cr total required [Plan A only])

EdPA 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–5285 or per semester or summer; 24 cr required)

Educational Psychology (EPsy)

Department of Educational Psychology
College of Education and Human Development

EPsy 5100. Colloquium Series: Research and Issues in Psychological Foundations of Education. (1 cr (max 3 cr); SP–Grad student in psychological foundations of education or 4-5 N only) Presentation/critique of faculty/student research.

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. (4 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 models of learning, problem-solving, intelligence, character education, motivation, diversity, special populations.

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/instruction. Emphasizes instructional design, learning theories, experience, individual differences, evaluation, tests/measurement, technology. Implications for curricular/instructional design in higher education, continuing education, professional/business related training.

EPsy 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; N only) Group dynamics, how to work with groups, small group leadership, judgment and decision-making, prejudice reduction, conflict resolution.

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 theories of conflict resolution. Emphasis on theoretical, research, and major figures in the field; factors influencing quality of conflict resolution are covered. The nature of conflict, the history of the field, and intrapersonal, interpersonal, 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 influence. 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; A-F only) 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 5221. Principles of Educational and Psychological Measurement. (4 cr; QP–5260 or equiv; SP–5261 or equiv) Concepts, principles, and methods in educational/psychological measurement. Reliability, validity, item analysis, scores, score reports (e.g., grades). Modern measurement theories, including item response theory and generalizability theory. Emphasizes construction, interpretation, use, and evaluation of assessments regarding achievement, aptitude, interests, attitudes, personality, and exceptionality.
Courses

EPsy 5231. Introductory Statistics and Measurement in Education. (6 cr; A-F only)
Students develop an understanding of basic statistics and measurement concepts and tools and apply them to the collection, analysis, and interpretation of data.

EPsy 5243. Principles and Methods of Evaluation. (3 cr)
Introductory course in program evaluation; planning an evaluation study, collecting and analyzing information, reporting results; overview of the field of program evaluation.

EPsy 5246. Evaluation Colloquium: Psychological Foundations. (1 cr; max 8 cr; QP–5240/EdPA 5285; SP–5242/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)

EPsy 5262. Intermediate Statistical Methods. (3 cr; SP–5261 or equi)

EPsy 5263. Statistics for Preprofessional Students. (3 cr)
Descriptive statistics for continuous variables, simple regression and correlation, inferences on means, introduction to analysis of variance and multiple regression, contingency tables, and computer analysis techniques.

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 5300. Special Topics in Educational Psychology. (1-9 cr; max 9 cr)
Current issues in educational psychology or related areas not normally available through regular curriculum offerings.

EPsy 5400. Special Topics in Counseling Psychology. (1-4 cr; max 6 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–A-F; SP–A-F)
Contemporary use of counselors as advocates for all students. Emphasizes prevention and systems intervention with counselors involved in the development 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; A-F only)
Theoretical, practical, administrative structure, and evaluation methods used in college/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 practices of group work for 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 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, HIR, IR, college student advising, and other related fields.

EPsy 5433. Counseling Women Over the Life Span. (3 cr; QP–Counseling or career development course; 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 systems 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, dropouts, 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 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, to the roles and responsibilities of teachers, and to 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.

EPsy 5604. Transition from School to Work and Community Living for Persons With Special Needs. (2 cr)
Design of training programs to promote independent living. Vocational and community adjustment for persons with disabilities and who are at-risk. Curriculum materials, methods, and organizational strategies for adults, families, and community service providers.

EPsy 5609. Family-Centered Services. (2 cr; A-F only)
Methods for collaborating with families in the education of children with disabilities. Focus on family-centered approach to design of educational plans and procedures with a special emphasis on the multidisciplinary perspectives of family life and expectations for children.

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. (1.5 cr; QP–Child development course, 5601 or equi; SP–Child development course, 5601 or equi; 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, 5613; 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 5616. Behavior Analysis and Classroom Management. (3 cr)
Introduction to assumptions, principles, and procedures of behavioral analysis as applied to analyzing behavior and programs for classroom management. Emphasis on specifying problems, conducting observations, intervening, and evaluating behavioral change.

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–5116; SP–5616)
Emphasis on developing programs and curricula for students with moderate, severe, and profound developmental 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. (2 cr; A-F only)

EPsy 5625. Education of Infants, Toddlers, and Preschool Children With Disabilities: Introduction. (2 cr; A-F only)
Overview of the issues, problems, and practical applications in designing and delivering intervention services for young children with disabilities and their families.

EPsy 5626. Seminar: Developmental Disabilities and Instructional Management. (3 cr; QP–5116; 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, natural and 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. (2 cr; QP–#; SP–5613, 5614; A-F only) 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 educ methods in tchg reading and writing skills, or #) Gain knowledge and skills to assess, plan, and implement instruction for children and youth with hearing loss. Emphasis is placed on research, theoretical, and programmatic issues in developing reading and writing skills, curricular adaptations, and effective instructional approaches.

EPsy 5647. Aural and Speech Programming for Persons Who Are Deaf/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 and Hard of Hearing Students. (3 cr; QP–5644 or #; SP–5644, 5644 or #) Design/development of portfolios for various models of educational service delivery systems for individuals with hearing loss. Emphasizes consultation skills, curriculum management/modifications, material/technology applications, and support service adaptations.

EPsy 5656. Social and Interpersonal Characteristics of Students With Disabilities. (3 cr; A-F 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–5116, 5656; SP–5616, 5656; A-F only) Developing comprehensive behavioral programs for students with social and emotional disabilities. Instruction of students with social and emotional disabilities.

EPsy 5671. Literacy 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 daily living skills in pre-cane techniques, orientation to learning environments, and adaptations for activities of daily living and independence. Introduction to mobility maps, considerations of cane, guide dog, and telescopic aids to mobility.

EPsy 5675. Structure and Function of the Eye: Educational Implications. (3 cr; A-F only) Anatomy and physiology of the eye and its relation to visual perceptions and educational considerations for students with low vision studied in relation to ophthalmological and optometric evaluations and functional vision assessment.

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 5701. Practicum: Field Experience in Special Education. (1-6 cr [max 12 cr]; SP–[5626 grad or SpEd licensure program or Foundations of Educ Program, [(5613 or 5615, 5614 or 5616)] or equiv] or #; A-F only) Observations, supervised support of teaching practice in schools or other agencies serving children with disabilities in integrated programs.

EPsy 5720. Special Topics: Special Education. (1-4 cr [max 12 cr]; SP–#) Lab and fieldwork approach, often assuming a product orientation, e.g., creation of an action plan, generating test results of observation field notes, collecting data in some form. Provides opportunities for educational personnel to study specific problems and possibilities related to special education.

EPsy 5740. Special Topics: Interventions and Practices in Educational and Human Service Programs. (1-4 cr [max 8 cr]; QP–#; SP–#) Concepts, issues, and practices related to the community inclusion of children, youth, and adults with disabilities through weekly seminar and extensive supervised experience working with individuals within the community.

EPsy 5751. Student Teaching: Deaf/Hard of Hearing. (1-6 cr [max 10 cr]; QP–#; SP–#) Students participate in educational programming for infants, children, and youth who are deaf or hard of hearing, as well as in onsite, directed experiences under supervision of master teachers of deaf and hard of hearing.

EPsy 5752. 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 5753. Student Teaching: Early Childhood Special Education. (1-6 cr [max 8 cr]; QP–#; SP–#; completion of all course requirements for license in ECSE; S-N only) Supervised experience in teaching or related work in schools, agencies, or home settings for infants, toddlers, and preschoolers with disabilities and their families.

EPsy 5754. Student Teaching: Social and Emotional Disabilities. (1-6 cr [max 8 cr]; QP–Completion of licensure courses for social and emotional disorders; #; SP–Completion of licensure 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 skill competencies.

EPsy 5755. Student Teaching: Developmental Disabilities—Secondary. (1-6 cr [max 6 cr]; QP–Completion of all licensure coursework; #; SP–Completion of all licensure 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 5756. Student Teaching: Developmental Disabilities—Elementary. (1-6 cr [max 6 cr]; QP–Completion of all licensure coursework; #; SP–Completion of all licensure 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 5757. Student Teaching: Physical and Health Related Disabilities. (1-6 cr [max 8 cr]; QP–#; SP–#; A-F only) Supervised student teaching and related work (direct instruction and consultation) in schools or other agencies serving children and adolescents who have physical disabilities.

EPsy 5758. Student Teaching: Visual Impairments. (1-6 cr [max 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 5800. Special Topics in School Psychology. (1-9 cr [max 9 cr]) Current issues in school psychology or areas not normally available through regular curriculum offerings.

EPsy 5801. Assessment and Decision Making in School and Community Settings. (3 cr; A-F 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. (3 cr) Introduction to assessment principles and practices, including observation, 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.
Courses

EPsy 5851. Collaborative Family-School Relationships. (2 cr; OP–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 educational personnel to address National Educational goal 8.

EPsy 5852. Prevention and Early Intervention. (3 cr) Theory/research base for school-based primary/secondary programs to promote academic/social competence of children/ (birth to grade 12).

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. (1-8 cr [max 20 cr]; QP–A; SP–A; F; 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 8111. Seminar: Knowledge and Skill. (3 cr; SP–Learning and cognition courses; A-F only) Analysis of 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; design of educational environments.


EPsy 8115. 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 8132. Personality Development and Socialization. (3 cr; SP–Personality or child psych course) Major research and theoretical work. Developmental and educational influences on personality.

EPsy 8216. Seminar: Research Processes in Psychological Foundations of Education. (3 cr; SP–[5216, admitted to doctoral program in psych foundations] or 5216; A-F only) Advanced examination of research processes in educational psychology. Invited faculty discuss specific research designs. Students refine/implement research projects and present them in class.

EPsy 8221. Psychological Scaling. (3 cr; SP–5221 or equiv; 8261-8262 or equiv) Elementary and advanced topics in unidimensional and multidimensional scaling: measurement theory and statistics, rating scales and other category scaling methods, magnitude estimation, paired comparisons, multi-attribute scaling, and multidimensional scaling.

EPsy 8222. Advanced Measurement: Theory and Application. (3 cr; SP–5221 or equiv; 8261-8262 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–5260 or equiv; SP–[5261 or equiv], grad student) Advanced theory, derivations of quantitative statistics. Descriptive statistics, probability, normal distribution. One- and two-sample tests, confidence intervals. Chi square tests. One-way analysis of variance, follow up tests.

EPsy 8262. Statistical Methods II: Regression and the General Linear Model. (3 cr; QP–[8260, 8261] or equiv; SP–8261 or equiv) Analysis of various design (two-three-way), repeated measures, correlation, simple/multiple regression methods, non-parametric procedures, multivariate analyses.

EPsy 8263. Design and Analysis of Experiments. (3 cr; QP–8260, 8261, 8262 or equiv; SP–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–8260, 8262, regression and ANOVA course, familiarity with a statistical analysis package; SP–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 and standardized regression, stepwise solutions, analysis of variance, weighted least squares, and logistic regression.


EPsy 8266. Statistical Analysis Using Structural Equation Methods. (3 cr; QP–8263 or 8264; SP–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–5260 or equiv; 5281 or 5262 or equiv; SP–5261 or equiv; SP–5262 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–9) Students formulate research designs. Learning and cognition, social psychology, measurement, and statistics.

EPsy 8295. Problems: Evaluation. (1-6 cr [max 6 cr]; QP–5240 or EdPsy 5258; SP–5243 or EdPsy 5501; SP–EdPsy 5501) 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–5240 or EdPsy 5258; SP–5243 or EdPsy 5501, SP–EdPsy 5501) 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 M.A. or Ph.D. student with CSPP subprog or #; A-F only) Theories, research, and procedures of group counseling and of groups such as psychocultural educational groups. Applications to various settings and populations. Ethical issues in group work. Practice of group skills and techniques, including group participation and observation.


EPsy 8411. Advanced Counseling Research. (4 cr; SP–Ed Psy Ph.D. 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 Ph.D. 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, DSM-IV, and integration of this content in written assessment reports.

EPsy 8431. Master’s Research Seminar: CSPP. (4 cr; QP–5260 or equiv; 5221 or equiv; SP–5261 or equiv; 5221 or equiv; ed psy M.A. student with CSPP subprog or #; A-F only) Survey of research methods, data-based decision making, basic research design skills, and research supervision.

EPsy 8435. Integrative Seminar: School Counseling. (3-6 cr [max 6 cr]; SP–CSPP grad student in school counselor licensure prog; not open to M.Ed. students) Integrates previous work in counseling, career development, consultation, and multicultural issues with school counseling practicum/internship. Semester 1: New roles of the counselor and developing and managing guidance program. Semester 2: Ways guidance program addresses developmental and cultural issues.

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

EPsy 8452. Psychological Aspects of Counseling Supervision. (3 cr; SP–Ed Psy Ph.D. student with CSPP subprog or #) Theories, review of relevant research, demonstration, and in-class practice of supervision skills.

EPsy 8501. Counseling Pre-Practicum. (3 cr; QP–ICSPP or genetic counseling) grad student; SP–ICSPP or genetic counseling) grad student; A-F only) Overview of basic helping skills through demonstration, in-class practice.

EPsy 8502. Field Placement in Counseling and Student Practicum. (2 cr; QP–8501; SP–8501 or #; S-N only) Students participate under supervision in practitioner activities within a counseling work environment.
Courses

EPsy 8503. Counseling Practicum I. (1-4 cr; SP–8502 or F; 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 F; A-F only)
Intermediate supervised practice in counseling with individuals and groups; emphasizes ethical issues and systematic evaluation of student’s practice through direct observations, video, and audio tapes.

EPsy 8509. Supervision Practicum: CSPS. (2 cr; SP–[Ed psy Ph.D. student with CSPSP subprog] or #)
Students involved in counseling supervision of beginning courses.

EPsy 8512. Internship: CSPS. (1-6 cr [max 12 cr]; SP–Ed psy M.A. or Ph.D. student with CSPS subprog; A-F only)
Supervised internship in counseling, counseling psychology, or student personnel psychology at sites approved by CSPSP program.

EPsy 8513. University Counseling Practicum I. (4 cr; SP–Ed psy M.A. or Ph.D. student with CSPS 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; SP–Ed psy M.A. or Ph.D. student with CSPS 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 8521. Practicum in Student Affairs and Student Development. (1-4 cr [max 8 cr]; SP–Ed psy M.A. or Ph.D. student with CSPSP sub prog or #; A-F only)
Supervised practicum in university and college student development offices.

EPsy 8522. Counseling Practicum: Advanced. (3 cr [max 9 cr]; SP–[Grad ed psy major with CSPSP subprog] or #)
Advanced skills practicum in counseling, counseling psychology, or student development.

EPsy 8600. Special Topics: Special Education Issues. (1-3 cr [max 9 cr])
Current trends (e.g., schoolwide discipline, models of collaboration, and diversity) investigated by formulating research projects. Students write a media piece describing an issue and its impact on the community.

EPsy 8612. Seminar: Students With Academic Difficulties. (3 cr; A-F 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 [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral 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 I. (3 cr [max 6 cr]; SP–Ed psy Ph.D. student with spec ed sub prog 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 II. (3 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 different disciplines related to education of infants, toddlers, and preschool children with disabilities and their families. Discusses practical application of this research.

EPsy 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; 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; SP–Grad ed psy major with school psy sub prog or #; A-F only)
Theories and models of psychoeducational assessment of children and adolescents within home, school, and community. Conceptual and empirical foundations of eco-behavioral assessment that lead to efficient but comprehensive assessment of children presented from problem-solving perspective.

EPsy 8812. Assessment in School Psychology II: Intellectual and Social-Emotional Domains. (3 cr; SP–Grad ed psy major with school psy sub prog 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 8812; SP–8821, grad ed psy major with school psy sub prog or #; 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. Systemic Intervention and Consultation. (3 cr; A-F only)
Principles/models of consultation/interventions for social-emotional problems exhibited by school-aged children. Emphasizes universal intervention, competence enhancement approaches. All interventions presented from a system-level perspective.

EPsy 8816. Individual Intervention and Consultation. (3 cr; A-F only)
In-depth study/analysis of instructional interventions/ procedures necessary to work with school personnel in developing schoolwide, classroom, individual instructional interventions. Practice in developing/ applying interventions with individual students.

EPsy 8818. Intervention Practicum in School Psychology. (1 cr [max 2 cr]; QP–¶8815 or 8816; SP–Grad ed psy major with school psy sub prog, ¶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 sub prog; A-F only)
Introduction to school psychology as a professional field of specialization. Students learn about how school systems work, 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 sub prog; A-F 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.

EPsy 8831. Practicum: School Psychological Services. (1-3 cr [max 6 cr]; SP–Grad ed psy major with school psy sub prog)
Field placements in schools. Experiences may include consultation, assessment, direct service to individuals or groups, and report writing. Supervised on-site as well as by University through required participation in seminar.

EPsy 8832. Clinical/Community Practice in School Psychology. (1-3 cr [max 6 cr]; SP–Grad ed psy major with school psy sub prog)
Required for students focusing on communication/language/academics.

EPsy 8841. Practicum: Instruction and Supervision in School Psychology. (2 cr [max 4 cr]; SP–Grad ed psy major with school psy sub prog 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.

EPsy 8842. Internship: School Psychological Services. (1-10 cr; SP–Grad ed psy major with school psy sub prog, ¶-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. (1-24 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Critical issues in learning and cognition, statistics and measurement, counseling, school psychology, social psychology of education, and special education.

EPsy 8893. Directed Study: Educational Psychology. (1-10 cr [max 20 cr]; SP–A-F only)
EPsy 8894. Research Problems: Educational Psychology. (1-16 cr [max 18 cr]; SP–A-F only)
Research methodology and techniques; examination of literature: participation in formulating and executing research proposal.

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

Electrical Engineering (EE)
Department of Electrical and Computer Engineering
Institute of Technology

EE 5141. Integrated Sensors and Transducers. (4 cr; GP–3063, 3111; SP–3161, 3601)
Microelectromechanical systems composed of microsensors, microactuators, and electronics integrated onto common substrate. Design, fabrication, and operation principles. Labs on micromachining, photolithography, etching, thin film deposition, metallization, packaging, and device characterization.

EE 5163. Semiconductor Properties and Devices I. (3 cr; GP–3063, 3111 or #; SP–3161, 3601 or #)

EE 5164. Semiconductor Properties and Devices II. (3 cr; GP–5661 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; GP–IT sr or grad; SP–IT sr or grad)
Fabrication of microelectronic devices: silicon integrated circuits, GaAs devices; lithography, oxidation, diffusion; process integration of various technologies, including CMOS, double poly bipolar, and GaAs MESFET.

EE 5173. Basic Microelectronics Laboratory. (1 cr; GP–5670; 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. In-process measurement results are compared with final electrical test results. Simple circuits are used to estimate technology performance.

EE 5231. Linear Systems and Optimal Control. (3 cr; GP–IT grad; Math 5242, Math 5243 or #; SP–IT grad, 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; GP–IT grad, Math 5243 or Math 5243 or #; SP–IT grad, 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. VLSI Design Automation I. (3 cr; GP–3351 or #; SP–2301 or #)

EE 5302. VLSI Design Automation II. (3 cr; GP–5874; SP–5301 or #)

EE 5323. VLSI Design I. (3 cr; GP–3351, 3062 or #; SP–2201, 3115 or #)
Combinational static CMOS circuits. Transmission gate networks. Clocking strategies, sequential circuits. CMOS process flows, design rules, structured layout techniques. Dynamic circuits, including Domino CMOS and DCVS. Performance analysis, design optimization, device sizing.

EE 5324. VLSI Design II. (3 cr; GP–5571 or #; SP–5323 or #)
CMOS arithmetic logic units, high-speed carry chains, fast CMOS multipliers. High-speed performance parallel shifters. CMOS memory cells, array structures, readout circuits. Design for testability, including scan design and built-in self test. VLSI case studies.

EE 5327. VLSI Design Laboratory. (3 cr; GP–[5358, 5572] or #; SP–[4301, 5323 or #5323] or #)
Complete design of an integrated circuit. Designs evaluated by computer simulation.

EE 5329. VLSI Digital Signal Processing Systems. (3 cr; GP–5572 or #; SP–5323 or #)

EE 5333. Analog Integrated Circuit Design. (3 cr; GP–(3062, grad student or #; SP–3115, grad student or #)
Fundamental circuits for analog signal processing. Design issues associated with MOS/BiMOS devices. Design/testing of selected topics (e.g., modeling of basic IC components, design of operational amplifiers or comparator) and analog sampled-data circuit filters.

EE 5361. Computer Architecture and Machine Organization. (3 cr; GP–3351, 3352; SP–2301, 2361; SCI 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 5371. Computer Systems Performance Measurement and Evaluation. (3 cr; GP–3582 or #; SP–5361 or #)
Tools and techniques for analyzing computer hardware, software, and system performance. Benchmark programs, measurement tools, performance metrics. Deterministic and probabilistic simulation techniques, random number generation and testing. Bottleneck analysis.

EE 5381. Telecommunications Networks. (3 cr; GP–[5203, 5702] or #; SP–[4051, 5531] or #)
Fundamental concepts of modern telecommunications networks, mathematical tools required for their performance analysis. Layered network architecture, point-to-point processor models, delay models, multiaccess communication/routing.

EE 5391. Computing With Neural Networks. (3 cr; GP–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 prediction; unsupervised networks for data reduction; associative recognition and retrieval, optimization, time series prediction and knowledge extraction.

EE 5501. Digital Communication. (3 cr; GP–[5203, 5021, 5025], nr grad or #; SP–4051, 3025, nr grad or # 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 5505. Wireless Communication. (3 cr; GP–5203; SP–4051, IT grad student or #; #5051 recommended)

EE 5531. Probability and Stochastic Processes. (3 cr; GP–3021, grad in IT major or #; SP–3025, grad in IT major or #)

EE 5542. Adaptive Digital Signal Processing. (3 cr; GP–[5511, 5702] or #; SP–[4541, 5531] or #)

EE 5545. Real-Time Digital Signal Processing Laboratory. (2 cr; GP–3352, 5511, EE sr or grad in IT major or # 5541)
Lab. 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; I/O handling.

EE 5549. Digital Signal Processing Structures for VLSI. (3 cr; GP–[5511, 5541, 5551] or #)
 Pipelining: 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; GP–[5511, 5702, grad in IT major or #; SP–5541, 5531, grad in IT major or #)
Multirate discrete-time systems. Bases, frames; continuous wavelet transform; scaling equations; discrete wavelet transform; applications in signal and image processing.

EE 5581. Information Theory and Coding. (3 cr; GP–5702 or #; SP–5531 or #)
Source and channel models, codes for sources and channels. Entropy, mutual information, capacity, rate-distortion functions. Coding theorems.

EE 5585. Data Compression. (3 cr; GP–IT sr or grad or #; SP–IT sr or grad or #)
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/Microwave Engineering. (3 cr; GP–3111, IT sr grad in IT major; #5401, IT sr grad or #)

EE 5602. RF/Microwave Circuit Design. (3 cr; GP–5604; SP–5601 or equiv)
Transmission lines, network analysis concepts. CAD tool for passive/active designs. Diode based circuit designs (detectors, frequency multipliers, mixers). Transistor based circuit design (amplifiers, oscillators, mixer/doubler).

EE 5611. Plasma-Aided Manufacturing. (4 cr; GP–Grad or upper div IT, ME 3301, ME 3303, SP–Grad or upper div IT, ME 3321, ME 3322 or equiv, UMC 5361)
Manufacturing using plasma processes; plasma properties as a processing medium; plasma spraying and microelectronics processing; process control and system design; industrial speakers; a cross-disciplinary experience between heat transfer design issues and manufacturing technology.
Courses

Emphasizes CMOS and RF. Where appropriate, mention is made of bipolar circuits and applications to other communications areas.

EE 8360. Computer Systems Seminar. (1 cr; max 3 cr; S-N only)
Current literature, individual assignments.

EE 8365. Advanced Computer Architecture. (3 cr; QP–5853 or Csci 5201; SP–5852 8203; 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–8362 or Csci 8203; SP–4Csci 8203; 8365 or Csci 8203)
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 cr; max 3 cr; S-N only)
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–5531 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 cr; max 3 cr; S-N only)
Current literature, individual assignments.

EE 8611. Plasma Physics. (3 cr; SP–)

EE 8660. Seminar: Magnetics. (1 cr [max 3 cr]; S-N only)
Current literature, individual assignments.

EE 8666. Doctoral Pre-Thesis Credits. (1-18 cr; max 60 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

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–4747; 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: Master’s. (1-18 cr; max 50 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

EE 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

EE 8940. Special Readings. (1-3 cr; SP–May be repeated for cr; #)
Courses of approved theoretical or experimental topics.

EE 8950. Advanced Topics in Electrical and Computer Engineering. (1-3 cr; SP–Cr ar, 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 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 Ph.D.)
Project topics(s) arranged between student and adviser. Written report(s).

EE 8963. Plan B Project II. (1-2 cr; SP–EE grad student; may be taken 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 Ph.D.)
Project topics(s) arranged between student and adviser. Written report(s).

EE 8970. Graduate Seminar I. (1 cr [max 3 cr]; QP–Grad student or staff; SP–Grad student; S-N only)
Recent developments in electrical engineering, related disciplines.

EE 8980. Graduate Seminar II. (1 cr [max 3 cr]; QP–Grad student or staff; S-N only)
Recent developments in electrical engineering, related disciplines.

English: Creative and Professional Writing (EngW)

Department of English Language and Literature
College of Liberal Arts

EngW 5102. Advanced Fiction Writing. (4 cr [max 8 cr]; SP–)
Advanced workshop for graduate students with considerable experience in writing fiction.

EngW 5103. Advanced Fiction Writing. (4 cr [max 8 cr]; SP–)
Advanced workshop for students with considerable experience in writing fiction.

EngW 5104. Advanced Poetry Writing. (4 cr [max 8 cr]; SP–)
Advanced workshop for graduate students with considerable experience in writing poetry. An opportunity to explore new poetic possibilities and to read widely in contemporary poetry and poets.

EngW 5105. Advanced Poetry Writing. (4 cr [max 8 cr]; SP–)
Advanced workshop for students with considerable experience in writing poetry. An opportunity to explore new poetic possibilities and to read widely in contemporary poetry and poets.

EngW 5106. Advanced Literary Nonfiction Writing. (4 cr [max 8 cr]; SP–)
Advanced workshop for graduate students with considerable experience in writing literary nonfiction.

EngW 5107. Advanced Nonfiction Writing. (4 cr [max 16 cr]; SP–)
Advanced workshop for students with considerable experience in writing literary nonfiction.

EngW 5110. Topics in Advanced Fiction Writing. (4 cr [max 16 cr]; SP–)
Special topics in fiction writing. Topics specified in Class Schedule.

EngW 5120. Topics in Advanced Poetry. (4 cr [max 16 cr]; SP–)
Special topics in poetry writing. Topics specified in Class Schedule.

EngW 5130. Topics in Advanced Creative Writing. (4 cr [max 16 cr]; SP–)
Workshop. Might include work in more than one genre.

EngW 5201. Journal and Memoir Writing. (3 cr)
Using memory in writing, from brainstorming to drafting to revising, in several genres (poems, traditional memoir essays, fiction). How diverse cultures shape memory differently.

EngW 5202. Journal and Memoir Writing. (3 cr; A-F only)
Using memory in writing, from brainstorming to drafting to revision, in several genres (poems, traditional memoir essays, fiction). How diverse cultures shape memory differently.

EngW 5204. Playwriting. (4 cr [max 8 cr]; SP–)
Advanced workshop. Contact creative writing program for specific description.

EngW 5205. Screenwriting. (4 cr; SP–)
Advanced workshop. Contact creative writing program for specific description.

EngW 5210. Topics in Advanced Literary Nonfiction. (4 cr [max 16 cr]; SP–)
Special topics in essay writing (e.g., arts reviewing, writing about public affairs, writing in personal voice). Topics specified in Class Schedule.

EngW 5310. Reading as Writers. (4 cr [max 8 cr]; SP–)
Special topics in reading fiction, literary nonfiction, poetry. Topics specified in Class Schedule.

EngW 5501. Minnesota Writing Project Selective Institute. (3 cr [max 3 cr]; SP–Competitive selection for 20 educators [K-college])
Emphasizes participants’ teaching each other best practices in writing instruction. Participants attend a retreat before beginning.

EngW 5502. Minnesota Writing Project Open Institute. (2 cr; SP–Teacher [K-college], [school district sponsorship or MWP approval])
Summer workshop to refine skills in writing instruction.

EngW 5570. Minnesota Writing Project Directed Studies. (1-3 cr [max 3 cr]; A-F only)
Current theories of writing and writing pedagogy. Topics vary. Workshop.

EngW 5566. Literary Aspects of Journalism. (3 cr; SP–Journal 5566; A-F only)
Literary aspects of journalism as exemplified in and influenced by works of English/American writers past/present. Lectures, discussions, weekly papers.

EngW 5993. Directed Study in Writing. (1-4 cr [max 18 cr]; SP–)
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 M.F.A. student, A-S-N only)
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–)
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 [max 8 cr]; SP–)
Focuses on exploration and practice of various styles. Assignments in common and individual project.

EngW 8130. Seminar: Writing of Literary Nonfiction. (4 cr [max 8 cr]; SP–)
Advanced workshop. Assignments in common and individual projects.

EngW 8140. Fiction: Manuscript Preparation. (4 cr [max 8 cr]; SP–8110, creative writing M.F.A. student, #)
For students working on their creative project.

EngW 8150. Poetry: Manuscript Preparation. (4 cr [max 8 cr]; SP–8120, creative writing M.F.A. student, #)
For students working on their creative project.
**English: Literature (EngL)**

**Department of English Language and Literature**

**College of Liberal Arts**

**EngL 5001. Introduction to Methods in Literary Studies.** (3 cr; SP–Grad or #)

Ends/methods of literary research, including professional literary criticism, analytical bibliography, and textual criticism.

**EngL 5002. Introduction to Literary and Cultural Theory.** (3 cr; SP–Grad or #)

Approaches to practical/theoretical problems of literary history/genre.

**EngL 5100. Readings in Special Subjects.** (3 cr; max 9 cr; SP–Grad student or #)

General background preparation for advanced study. Diverse selections of literatures written in English, usually bridging national cultures and time periods. Readings specified in Class Schedule.

**EngL 5120. Reading in American Literature.** (3 cr; max 9 cr; SP–Grad or #)

General background/preparation for advanced graduate study. Readings cover either a wide historical range (e.g., 19th century), a genre (e.g., the novel), or a major literary movement (e.g., Modernism).

**EngL 5130. Readings in American Minority Literature.** (3 cr; max 9 cr; SP–Grad or #)

Contextual readings of 19th-/20th-century American minority writers. Topics specified in Class Schedule.

**EngL 5140. Post-Colonial Literatures.** (3 cr; max 9 cr; SP–Grad or #)

Selected readings in post-colonial literatures. Topics specified in Class Schedule.

**EngL 5150. Readings in Criticism and Theory.** (3 cr; max 9 cr; SP–Grad or #)

Major works of classical criticism in the English critical tradition from Renaissance to 1920. Leading theories of criticism from 1920 to present. Theories of fiction, narratology, Feminist criticism, Marxist criticism, Psychoanalytic criticisms. Theories of postmodernism.

**EngL 5210. Middle English Literature and Culture.** (3 cr; max 9 cr; SP–Grad student or #)

Wide reading in literature of period. Relevant scholarship/criticism. Topics vary. See Class Schedule.

**EngL 5230. Early Modern Literature and Culture.** (3 cr; max 9 cr; SP–Grad student or #)

Topical readings in early modern poetry, prose, fiction, and drama. Attention to relevant scholarship or criticism. Prepares graduate students for work in other courses or seminars.

**EngL 5250. 19th-Century Literature and Culture.** (3 cr; max 9 cr; SP–Grad student or #)

19th-century British, American, and post-Colonial literatures. Topics may include British Romantic or Victorian literatures, 19th-century American literature, important writers from a particular literary school, or a genre (e.g., the novel). Readings.

**EngL 5270. 20th-Century Literature and Culture.** (3 cr; max 9 cr; SP–Grad student or #)

20th-century British, Irish, or American literatures, or topics involving literatures of two nations. Focus either on a few important writers from a particular literary school or on a genre (e.g., drama). Topics specified in Class Schedule.

**EngL 5291. Contemporary Literature and Culture.** (3 cr)


**EngL 5330. Topics in Drama.** (3 cr; max 9 cr; SP–Grad student or #)

Wide reading in literature of a given period or subject. Prepares students for work in other courses/seminars. Relevant scholarship/criticism. Topics specified in Class Schedule.

**EngL 5401. Introduction to Editing.** (4 cr)

Editor-writer relationship, manuscript reading, author querying, rewriting, style. Some discussion of copy editing. Students develop editing skills by working on varied writing samples.

**EngL 5402. Advanced Editing.** (4 cr; SP–5401, #)

Editing long text. Fiction, children’s literature, translations, indexes, Workshop/seminar.

**EngL 5581. Folklore I.** (3 cr; SP–Grad student or #)

Folklore genres such as proverbs, oral prose narratives (tales/legends), foodways, and games. Manner in which folklore is transmitted/changed. Focus on how folklore functions in literature, the mass media, and everyday life.

**EngL 5582. Folklore II.** (3 cr; SP–5581, grad student or #)

Training in collection of folklore materials.

**EngL 5602. Gender and the English Language.** (3 cr; SP–Grad student or #)

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/men’s speech in specific social contexts. Gender and writing. Sociolinguistics and sexual orientation.

**EngL 5603. Varieties of World English.** (3 cr; SP–Grad student or #)

Historical background, psychosocial significance, and linguistic characteristics of diverging varieties of English spoken around the world, especially in postcolonial contexts (Caribbean, Africa, Asia). Development of local standards/vernaculars. Sociolinguistic methods of analysis.

**EngL 5605. Social Variation in American English.** (3 cr; SP–Grad student or #)

Description/analysis of English language variation from sociohistorical perspective in the United States and the Caribbean. Social history of voluntary/enslaved humans leading to development of regional/rural dialects, pidgins, creoles, and urban varieties.

**EngL 5611. History of the English Language.** (3 cr; SP–Grad student or #)

Development of English language from Old English (mid-5th century) to Middle English (around 1100) to Early Modern English (about 1500).

**EngL 5612. Old English.** (3 cr; SP–3612; grad student or #)

Introduction to the language through A.D. 1150. Anglo-Saxon culture. Selected readings in prose/poetry.

**EngL 5613. Old English II.** (3 cr; SP–3613; [3612 or 5612], grad student or #)

Critical reading of texts. Introduction to versification. Reading of Beowulf.

**EngL 5621. Irish Language I.** (4 cr; QP–Grad student or #; SP–Undergrad English major or #)


**EngL 5622. Irish Language II.** (4 cr; SP–5621)


**EngL 5630. Theories of Writing and Instruction.** (3 cr; SP–Grad student or #)

Introduction to major theories that inform teaching of writing in college and upper-level high school curriculums. Topics specified in Class Schedule.

**EngL 5631. History of Rhetoric and Writing.** (3 cr; SP–Grad student or #)

Assumptions of classical/contemporary rhetorical theory, especially as they influence interdisciplinary field of composition studies.

**EngL 5632. Electronic Text.** (3 cr; SP–5632; grad student or #)

Status/function of text in electronic networking. Related questions as reframed by electronic text.

**EngL 5640. Research Methods in Rhetoric, Composition, and Language.** (3 cr; SP–Grad student or #)

Research paradigms, methodologies, and procedures (e.g., ethnographic, case-study, historical, critical, quantitative, text-analytical, survey-based). Emphasizes reading/analyzing existing research studies and preparing original research. Topics specified in Class Schedule.

**EngL 5650. Topics in Rhetoric, Composition, and Language.** (3 cr; SP–Grad student or #)

Topics specified in Class Schedule.

**EngL 5690. Minnesota Writing Project: Directed Studies.** (1-3 cr; max 30 cr)

Workshops. Theories of writing and writing pedagogy. Writing for publication. Research topics in applied literacy.

**EngL 5800. Practicum in the Teaching of English.** (2 cr; max 9 cr; SP–Grad student, #; S–N only)

Discussion of and practice in recitation, lecture, small groups, tutoring, individual conferences, and evaluation of writing/reading. Emphasizes theory informing effective course design/teaching for different disciplinary goals. Topics vary. See Class Schedule.

**EngL 5992. Directed Readings/Study/Research.** (1-15 cr; max 15 cr; SP–Grad student or #; A–D; A–F only)

Guided individual reading.

**EngL 8110. Studies in Medieval Literature and Culture.** (3 cr; max 12 cr)

Sample topics: Chaucer; “Piers Plowman”; Middle English literature, 1300-1475; medieval literary theory; literature/class in 14th-century; texts/heresies in late Middle Ages.

**EngL 8120. 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 Woolf.

**EngL 8150. Shakespeare.** (3 cr; max 9 cr; SP–# for grad non-major)

Perspectives and works vary with offering and instructor’s emphasis; 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 8180. Twentieth-Century British Studies. (3 cr [max 12 cr]; SP–Grad student or #; A-F only) Advanced study in 20th-century British literature/culture. Sample topics: modernism, Bloomsbury Group, working-class/immigrant literature. Topics specified in Class Schedule.

EngL 8190. 20th-Century Anglophone Literatures and Cultures. (3 cr [max 12 cr]; SP–Grad student 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 #) American literary history. Recent topics: first American novels, film, contemporary short stories and poetry, American Renaissance, Cold War fiction, history of the book. Topics specified in Class Schedule.

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 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–Grad student in English or #) Developments within critical theory that have affected literary criticism, either by altering conceptions of its object (“literature”) or by challenging conceptions 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 8600. Seminar in Rhetoric, Composition, and Literacy Studies. (3 cr [max 9 cr]; SP–Grad student) Students read/conduct research on theories/literature relevant to cross-disciplinary fields committed to writing and to teaching writing.


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 [max 60 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–Grad student in English or #) Folklore methodology. Application to topics such as fieldwork in folklore, horror in oral tradition, writing, and film; liminality/tradition; folklore or literatures; folklore of the uncanny; tradition, alterity, and liminality.

EngL 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 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–, A)

English: Writing, Rhetoric, and Language (EngC)

Department of English Language and Literature

College of Liberal Arts

EngC 5051. Graduate Research Writing Practice for Non-native Speakers of English. (3 cr; SP–Grad student) Graduate-level writing techniques/formats for summaries, critiques, research, and abstracts. Persuasion, documentation, structure, grammar, vocabulary, field-specific requirements. Writing through several drafts, using mentor in specific field of study. Revising/editing to meet graduate standards. Discussions.

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.

Entomology (Ent)

Department of Entomology

College of Agricultural, Food, and Environmental Sciences

Ent 5011. Insect Structure and Function. (4 cr; SP–Biol 1009 or #; 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 5041. Insect Ecology. (3 cr; QP–Biol 5041 or EBB 5122 or #; offered fall 1998 and alt yrs; QP–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 #; A-F only) Prevention or suppression of injurious insects by integrating multiple control tactics, e.g., chemical, biological, cultural. Strategies to optimize 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; QP–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/lab populations. Statistical distributions/techniques for detecting/coping with aggregation. Randomization, required sample size, optimal allocation for common probability design. Sequential plans for making decisions.

Ent 5321. Ecology of Agricultural Systems. (3 cr; QP–Agr 5321; [3xxx or above] course in [Agr or AnSc or Hort]; [3xxx or above] course in [Ent or PiPa or SoIl] or #; A-F only) 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. Safety considerations.

Ent 5341. Biological Control of Insects and Weeds. (3-4 cr; QP–Biol 1009, EEB 3001 grad or #; SP–3001, Biol 1009, EEB 3001 or grad; 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 5361. Aquatic Insects (4 cr; QP–1005 or #; SP–A-F only) Taxonomy, natural history of aquatic insects including their importance in aquatic ecology, water resource management, recreation, and conservation. Emphasizes family-level identification of immature/adults. Field trips scheduled to local aquatic habitats. A collection is required.

Ent 5371. Principles of Systematics. (3 cr; QP–A-F only; offered alt yrs; SP–A-F only) Theoretical/practical procedures of biological systematics. Phylogeny reconstruction, including computer-assisted analyses, morphological/molecular approaches, species concepts, speciation, comparative methods, classification, historical biogeography, nomenclature. Use/value of museums.
Experimental and Clinical Pharmacology (ECP)

College of Pharmacy

ECP 8100. Seminar. (1 cr; max 8 cr) SP–SACP grad major in ECP track or #. Selected topics in experimental and clinical pharmacology.

ECP 8200. Research Problems. (1-16 cr; max 16 cr) SP–Grad SAPC major (ECP Track) or #. Individually designed research experience directed at contemporary problems related to drug use.

ECP 8210. Clinical Therapeutics. (3 cr; SP–SACP grad major in ECP track or #). Topics in clinical pharmacology that illustrate continuum of pathophysiology of a disease state, its contemporary treatment, problems or controversial issues with treatment approaches, strategies to advance therapy. Lectures, readings.

ECP 8220. Experimental and Clinical Pharmacology. (3 cr; SP–SACP grad major (ECP track) or #). Theory of advanced methodologies, applications, and evaluation techniques used to determine efficacy/toxicity of new drug therapies. Techniques for collecting/evaluating data.

ECP 8290. Clinical Clerkship. (2 cr; SP–Grad SAPC major in ECP track or #). Supervised study of pharmaceutical services at Fairview–University Medical Center or affiliated institutions.

ECP 8400. Pharmacometrics. (3 cr; SP–SACP grad major in ECP track or #). Theory/application of contemporary methods for analysis of concentration–time data and exposure–response relationships.

ECP 8410. Population Pharmacokinetic Modeling. (2 cr; A-F only). Theoretical background for using mixed effects model in population analysis. Building fixed/random effects into a pharmacostatistical model. Project allows students to become familiar with a contemporary population pharmacokinetic analysis program.

ECP 8420. Clinical Trial Simulation. (2 cr; SP–SACP grad major in ECP track or #). Theory/application of contemporary methods of using simulations to design more efficient/informative clinical trials.

ECP 8900. Advanced Topics in Experimental and Clinical Pharmacology. (1-4 cr; max 8 cr; SP–SACP grad major in ECP track or #). Topic varies depending on faculty teaching course.

ECP 8992. Directed Readings in Experimental and Clinical Pharmacology. (1-4 cr; max 4 cr).

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 20 cr). Topics either not covered in available courses or not covered in sufficient breadth/depth to meet student needs/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.

FE 5202. Sexuality Education. (3 cr; SP–Human sexual behavior course, family ed course; A-F only). Preparation to develop, deliver, and evaluate sexuality education. Strategies to help children and adults acquire information, form values, develop interpersonal skills, and exercise personal responsibility in the sexual dimensions of individual and family life.

FE 5203. Family 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 or A). 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; SP–5320, SP–5702 or A). 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 9 cr; 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.
Courses

FE 5996. Internship in Family Education. (1-6 cr [max 6 cr]; SP–A,S,N only)
Practical experience working focusing on educational competency 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,S,N 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, 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–#3346, #)
Identifying/developing course goals. Developing course, teacher, learner evaluations.

FPCH 5346. Curriculum Design and Teaching Strategies for Medical Education II. (1 cr; SP–#3455, #)
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]; SP–M.D. or D.O. degree)
Knowledge, skills, and attitudes in biomedical and behavioral sciences that form foundation for academic discipline of family medicine; medical decision making, common problems and procedures, family theory and assessment, clinical pharmacy, human sexuality.

FPCH 5570. Practicum in Counseling. (1 cr; SP–Completion of first-yr residency)
Short-term counseling techniques. Lectures, classroom exercises, and actual counseling contact.

FPCH 5582. Practice Management Workshop. (1 cr; SP–Completion of first-yr residency or #)
Practical counseling and information on day-to-day management of medical clinics (including economic and legal aspects, community and hospital relations, and human relations) and 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 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 sci grad students or health sci 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 sci grad programs in CSPH, Psy, 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–#)

FPCH 5953. Practicum in Sexual Counseling II. (2-4 cr; SP–#)

FPCH 5955. Directed Study. (1-10 cr; SP–#; qualified students may arrange for work on a tutorial basis.)
Studies on special topics as arranged between student and faculty.

FPCH 5956. Human Sexuality for the Primary Care Physician. (2 cr; SP–College-level human sexuality intro course or #)
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 primary care physician.

FPCH 5958. Small Group Process. (2 cr; SP–#)
Group dynamics; current models of group process and therapy. Experiential and cognitive methods.

FPCH 5960. Basic Research Methods in Family Practice. (3 cr; SP–#)

FPCH 5962. Clinical Hypnosis Workshop. (1-2 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 a 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 prac 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 prac 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 prac resident or #)
Monthly conference on medical topics.

FPCH 8212. Clinical Psychiatry Rounds. (1 cr [max 9 cr]; SP–1st-yr fam prac 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 1st-yr fam prac 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 8242. Economics of Healthcare Delivery Systems. (2 cr; SP–Grad FPCH major or #)

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–Intro course in psych, soc; SP–#5102 grad student)
Family systems and other family theories focusing on the dynamics and processes relevant to family life. Diversity issues related to gender, ethnicity, sexual orientation, and disability. Issues related to divorce, single parenthood, and remarriage are covered. Family strengths and family problems are integrated.

FSoS 5193. Directed Study in Family Social Science. (1-6 cr [max 6 cr]; SP–FSoS or grad student in related field)

FSoS 8001. Conceptual Frameworks in the Family. (3 cr; SP–Family course or #)
Major theoretical models about families, emphasizing sociohistorical context.
Courses

FSoS 8013. Qualitative Family Research Methods. (3 cr)
Approaches to qualitative family research evaluation. Phenomenological, feminist, grounded theory, content analytic, etnemethodological, ethnographic, program evaluation. Theory, research examples, student projects.

FSoS 8014. Quantitative Family Research Methods. (3 cr; SP–8001 or equiv, 2 stat courses or #)
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 fam 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.

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; QP–FSoS 8214 or #; SP–FSoS 8032 or #)
For marriage and family therapists who want to become supervisors, this course is designed to meet didactic and interactional 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 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 qualitative and quantitative.

FSoS 8037. Ethical, Legal, and Professional Issues in Mental Health Practice: Issues with Couples and Families. (21-20 cr [max 10 cr]; SP–8032, practicum or internship exp] or [grad student in cooperating mental health practice prog who has completed 1 course on therapy with clients and issues of families, practicum or internship exp] or [#; A-F only])
Boundaries and triangles, gender inequities, family law, confidentiality and reporting requirements, dual roles, client diversity, and value clashes.

FSoS 8039. Clinical Interventions for Couples. (3 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 Ph.D. 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 appropriate 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. Giving and receiving of constructive criticism and support in integrating theories, methods, and applications in order to create a totality that is logically coherent and conceptually and methodologically sound.

FSoS 8101. Family Stress, Coping, and Adaptation. (3 cr; SP–8001 or equiv, research methods course)
Helping families become more resilient to stress by decreasing vulnerability to crises and traumatic stress disorders. Students develop research or intervention proposal on family stress, coping, adaptation, crisis, trauma, or resilience.

FSoS 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 #)
Seminar integrates conceptual and methodological perspectives of family social science with economic approaches to studying families. Family investments in human and social capital; diversities in families; interface of public policies and family economic well-being.

FSoS 8107. Family Values Research: Questions and Methodological Criticals. (3 cr; SP–8013 or equiv; 8014 or equiv or #; WCET 8920 recommended)
Interdisciplinary seminar on critical modes of inquiry in the family domain that require designing studies using normative theories, examining values as units of observation, and solving practical problems by collaborative strategies designed to encourage change.

FSoS 8150. Topics in Family Social Science. (1-6 cr; max 6 cr; QP–Graduate student or #; SP–Graduate 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–Doctoral student in FSoS or related field)
Directed study.

FSoS 8200. Process Seminar for Family. (1 cr; SP–4; S-N only)
Required of all first-year family social science students (orientation to graduate program); not open to other students.

FSoS 8201. 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 core course. Improvement of teaching and evaluation methods, and conceptualization and presentation of research-based course in family studies.

FSoS 8202. Teaching Family Courses in Higher Education II. (3 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–4; 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 [max 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 8297. Supervision of Internship. (1-3 cr [max 12 cr]; QP–#; SP–MFT student; S-N only)
Hands-on practicum to gain AMFT-approved supervisor status.

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

FSoS 8444. FTE: 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 Ph.D. student; A-F only)
Special seminars on topics suited to student needs.

FSoS 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

FSoS 8735. Master’s Paper: Plan B Project. (1-6 cr [max 6 cr]; SP–FSoS M.S. student; S-N only)
Graduate faculty work with students on research for Plan B paper.

FSoS 8777. Thesis Credits: Master’s. (1-18 cr [max 50 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)

FSoS 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

For definitions of course numbers and symbols, see inside back cover. 205
Courses

Finance (Fina)

Department of Finance
Curtis L. Carlson School of Management
Fina 8801. Theory of Capital Markets. (4 cr; QP–Econ 8101; SP–Econ 8101, Econ 8102, business admin Ph.D. 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; SP–Econ 8103, Econ 8104, business admin Ph.D. 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 8892. Independent Study in Finance. (1-8 cr; max 16 cr): SP–Business admin Ph.D. 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 Ph.D. 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 5003. Human Dimensions of Biological Conservation. (3 cr; QP–[Biol 1201 or 1009], Biol 3008; SP–[Biol 1001 or 1009], Biol 3407) Survey social, psychological, economic, policy aspects of managing/conserving wildlife, fisheries, and related resources.

FW 5051. Analysis of Populations. (3-4 cr; QP–[Biol 1009 or 1201], [Stat 3011 or 5021] or #; SP–[Biol 1001 or 1009], [FW 4001 or Stat 3011 or 5021]) or #) Factors involved in regulation, growth, general dynamics of populations. Data needed to describe populations, population growth, population models, regulatory mechanisms.

FW 5411. Aquatic Toxicology. (3 cr; QP–Biol 3008 or EEB 5401; SP–Biol 3407 or EEB 4601) Pollution assessment approaches, biological effects, fate/flow of contaminants in aquatic systems, major types of pollutants.


FW 5571. Avian Conservation and Management. (3 cr; QP–EEB 5134 or grad or #; SP–EEB 4134 or grad or #) Current problems in avian conservation/management. Nongame, wetland, game birds.

FW 5601. Fisheries Population Analysis. (3 cr; QP–[Biol 3008, Math 1251, Stat 3012 or 5021], SP–[Eco 4001 or Stat 5021], Biol 3407, [Math 1192 or 1271]; A-F only) Introduction to theory/methods for estimating vital statistics of fish populations. Using microcomputers/statistical software, model attributes of fish populations. Case studies from literature of marine/freshwater fisheries management.

FW 5603W. Habitats and Regulation of Wildlife. (3 cr; QP–Biol 3008; SP–Biol 3407; A-F only) Environmental interactions of wildlife at population/community level. Environmental threats from human activities. Habitat management practices. Objectives, polices, regulations in population management.


FW 5621. Geographic Information Systems for Fisheries, Wildlife, and Biology Conservation. (3 cr) Hands-on experience with GIS as tool for understanding, analyzing, managing ecological systems. ARC-INFOR; how to apply it to problems in fisheries, wildlife, and biological conservation.

FW 5625. Wildlife Handling and Immobilization for Research and Management. (2 cr; QP–General biology, [grad student or vet med student or FW sr]; SP–General biology, [grad student or vet med student or FW sr]; A-S-N only) Practical techniques to maximize human/animal safety and encourage effective operations. Preparation procedures, legal responsibilities, capture/drugs/purines, delivery systems, safety measures, ethical issues, basic veterinary procedures for handling wildlife. Field course. Uses live animals.

FW 8200. Seminar. (1-4 cr; max 5 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) Directed research.

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

FW 8488. Fishery Science. (3 cr; SP–Grad student [in fisheries or wildlife conserv or conserv biol or ecology] or #; A-S-N only) Applying ecological theory to study/manipulation of fish populations. Dynamics of growth, mortality, and yield of fish stocks. Field assessment methodology. Simulation applied to management problems. Web-assisted course. Students produce a publishable (print or electronic) project.

FW 8452. Conservation Biology. (3 cr; A-F only) Seminar examining population- to system-level biological issues (genetics; demographic processes; community, ecosystem, and landscape scale interaction; restoration ecology; ex situ strategies for restoration and recovery) and societal issues (social, economic, cultural perspectives; sustainable development strategies; roles of institutions; international and U.S. policies).

FW 8459. Stream and River Ecology. (3 cr; QP–Limbology course; SP–Limbology course or #) Structure/dynamics of running waters from ecosystem perspective. Historical perspective, basic hydrology; fluvial geomorphology, lotic-oligotrophic interactions, detrital dynamics, metabolism, drift, trophic relations, biotic/abiotic interactions, ecosystem experiments and natural alterations, stability/succession, ecosystem dynamics in rivers.

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/behavior that shape fish community structure in specific north temperate habitats. Techniques and planning procedures for restoring lakes/streams.

FW 8494. Research in Wildlife. (1-4 cr; SP–#) Directed research.


FW 8666. Doctoral Pre-Thesis Credits. (1-18 cr or max 60 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

FW 8777. Thesis Credits: Master’s. (1-18 cr or max 50 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

FW 8888. Thesis Credits: Doctoral. (1-24 cr or max 100 cr; SP–Max 18 cr per semester or summer; 24 cr required)

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) Genetic tools as applied to food biotechnology. Improvement of microbes used in food production by modern biotechnological approaches. Discuss 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, 5315; 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.
Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FScN 5511</td>
<td>Meat, Poultry, and Seafood Protein Processing</td>
<td>(2 cr; QP=1102, Chem 3305; SP=1102, Chem 2302) Industry processing of meat, poultry, and seafood products with emphasis on protein systems: comminuted products, metamuscle products, thermal processing optimization, pasteurization, least cost analysis, and color stability.</td>
</tr>
<tr>
<td>FScN 5531</td>
<td>Grains: Introduction to Cereal Chemistry and Technology</td>
<td>(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).</td>
</tr>
<tr>
<td>FScN 5621W</td>
<td>Nutrition and Metabolism</td>
<td>(4 cr; QP=3612, BioC 3021, Phsl 3051; SP=4612, BioC 3021, Phsl 3051) Carbohydrate, lipid, and protein metabolism. Uses &quot;systems&quot; or &quot;holistic&quot; approach to emphasize how metabolic pathways interrelate.</td>
</tr>
<tr>
<td>FScN 5622</td>
<td>Vitamin and Mineral Biochemistry</td>
<td>(3 cr; QP=3612, BioC 3021, Phsl 3051; SP=4612, BioC 3021, Phsl 3051) Nutritional, biochemical, and physiological aspects of vitamins/essential minerals in humans/experimental-animal models.</td>
</tr>
<tr>
<td>FScN 5623</td>
<td>Regulation of Energy Balance</td>
<td>(2 cr; QP=5620; SP=5621 or £5621) Regulation of energy balance in humans, including regulation of food intake and of energy expenditure.</td>
</tr>
<tr>
<td>FScN 8211</td>
<td>Risk Analysis in Food Science and Nutrition</td>
<td>(2 cr) Risks and benefits in various areas of the field (e.g., food preservatives and supplements).</td>
</tr>
<tr>
<td>FScN 8212</td>
<td>Advances in Nutrition: Nutrition and Exercise Metabolism</td>
<td>(2 cr) Seminar examines topics related to effects of diet on exercise metabolism.</td>
</tr>
<tr>
<td>FScN 8213</td>
<td>Food Lipids: Biological and Toxicological Aspects</td>
<td>(2 cr; QP=5110; SP=1122, 4111) Lipids, including triglycerides, phospholipids, sphingolipids, and sterols. Topics include structure, function, synthesis, degradation, and biological properties.</td>
</tr>
<tr>
<td>FScN 8344</td>
<td>FTE: Doctoral</td>
<td>(1 cr; SP—Doctoral student, adviser and DGS consent)</td>
</tr>
<tr>
<td>FScN 8337</td>
<td>Flavor Chemistry</td>
<td>(2 cr; QP=5110; SP=4111) Chemistry involved in formation, analysis, and release of flavoring materials in foods, including natural and artificial sources.</td>
</tr>
<tr>
<td>FScN 8391</td>
<td>Independent Study: Food Science</td>
<td>(1-4 cr [max 6 cr]; SP=—Includes written reports.</td>
</tr>
<tr>
<td>FScN 8666</td>
<td>Doctoral Pre-Thesis Credits</td>
<td>(1-18 cr [max 60 cr]; SP—Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)</td>
</tr>
<tr>
<td>FScN 8777</td>
<td>Thesis Credits: Master’s</td>
<td>(1-18 cr [max 50 cr]; SP—Max 18 cr per semester or summer; 10 cr total required (Plan A only))</td>
</tr>
<tr>
<td>FScN 8888</td>
<td>Thesis Credits: Doctoral</td>
<td>(1-24 cr [max 100 cr]; SP—Max 18 cr per semester or summer; 24 cr required)</td>
</tr>
<tr>
<td>FR 5104</td>
<td>Forest Ecology</td>
<td>(4 cr; QP=—Bioc course, chem course, grad student or #; SP=5104 [bioc course, chem course, grad student or #; A-F only]) Forest ecology, including ecosystem structure, function, and dynamics. Topics include forest stands, forest communities, and the interactions among these components.</td>
</tr>
<tr>
<td>FR 5142</td>
<td>Tropical Forest Ecology</td>
<td>(3-4 cr; QP=3xx or above ecology course; SP=3xx or above ecology course) Ecological principles related to forest formation, function, development of wet/dry tropical forests at organismal, community, ecosystem scales. Succession, productivity, biodiversity, sustainability, agroforestry, management alternatives. National and international forest policies.</td>
</tr>
<tr>
<td>FR 5146</td>
<td>Dynamics of Global Change</td>
<td>(3-4 cr; QP=3xx or above ecology course; SP=3xx or above ecology course) Implications of global change upon wild/cultivated vegetation, including forests, grasslands, agricultural ecosystems. Responses to ecosystem function, community, organismal, physiological scales. Potential climate change. Elevated atmospheric concentrations of carbon dioxide, ozone, other trace gases. Acid deposition. Other pollutants.</td>
</tr>
<tr>
<td>FR 5153</td>
<td>Forest and Wetland Hydrology</td>
<td>(3 cr; QP=5114 or #; SP=Basic hydrology course or #) Current topics, problems, methods associated with forest/wetland hydrology. Hydrologic role of forest vegetation in snow/ rainfall regimes. Analytical methods/models to evaluate effects of vegetation management in uplands/wetlands on amount/timing of water flow.</td>
</tr>
<tr>
<td>FR 5161</td>
<td>Forest Biology and Measurements: Field Experience</td>
<td>(2 cr; QP=—A-F; #; A-F only) Forest plant identification, forest community description/dynamics, mapping forests, tree/stand measurement. Taught at Itasca State Park.</td>
</tr>
<tr>
<td>FR 5228</td>
<td>Advanced Topics in Assessment and Modeling of Forests</td>
<td>(3 cr; QP=5218 or equiv; NRES 5210 or equiv; SP=4218, Math 1272, Stat 5201; A-F only) Recently developed mathematics, computer science, and statistics methodologies applied to forest resource functioning, management, and use problems.</td>
</tr>
<tr>
<td>FR 5251</td>
<td>Role of Renewable Natural Resources in Developing Countries</td>
<td>(1 cr; QP=5r or grad or #; SP=35251 or grad or #; A-F only) International perspectives on resource issues. Integration of natural resource, social, economic considerations. Overviews of issues, case studies.</td>
</tr>
<tr>
<td>FR 5264</td>
<td>Advanced Forest Management Planning</td>
<td>(2 cr; QP=5270 or #; SP=4471 or #) Strengths/weaknesses of modeling tools used in forest planning. Emphasizes problem sets and applications, from stand-level management to regional timber supply analyses and landscape-level planning. Review of recent literature. Practical problems with implementation.</td>
</tr>
<tr>
<td>FR 5403</td>
<td>Fundamentals of Natural Resource Education</td>
<td>(1-2 cr; SP—Elementary teacher or #) The forest community, tools used by foresters, forest management practices. Forestry-related indoor/ outdoor activities that can be translated for classroom use.</td>
</tr>
<tr>
<td>FR 5412</td>
<td>Advanced Remote Sensing</td>
<td>(3 cr; QP=5262 or #; SP=4262) Biophysical-quantitative remote sensing, its applications to monitoring environmental/natural resources. Experience working with digital remote sensing data, models, image processing.</td>
</tr>
<tr>
<td>FR 5700</td>
<td>Colloquium in Natural Resources</td>
<td>(1-3 cr; QP—Varies with topic; SP—Varies with topic) Colloquium in specialized topics in natural resources.</td>
</tr>
<tr>
<td>FR 8101</td>
<td>Research Problems: Forest-Tree Physiology</td>
<td>(1-5 cr) Independent research under faculty guidance.</td>
</tr>
<tr>
<td>FR 8102</td>
<td>Research Problems: Forest-Tree Genetics</td>
<td>(1-5 cr) Independent research under faculty guidance.</td>
</tr>
<tr>
<td>FR 8103</td>
<td>Research Problems: Forest Hydrology</td>
<td>(1-5 cr) Independent research under faculty guidance.</td>
</tr>
<tr>
<td>FR 8104</td>
<td>Research Problems: Forest Ecology</td>
<td>(1-5 cr) Independent research under faculty guidance.</td>
</tr>
<tr>
<td>FR 8105</td>
<td>Research Problems: Silviculture</td>
<td>(1-5 cr) Independent research under faculty guidance.</td>
</tr>
<tr>
<td>FR 8106</td>
<td>Research Problems: Urban Forestry—Biology and Management</td>
<td>(1-5 cr) Independent research under faculty guidance.</td>
</tr>
<tr>
<td>FR 8107</td>
<td>Seminar: Forest Resources</td>
<td>(1 cr) Assigned topics, problem analyses, and research reports.</td>
</tr>
<tr>
<td>FR 8112</td>
<td>Research Problems: Physiological Ecology</td>
<td>(1-5 cr) Interaction between plants and their environment. Focuses on mechanisms that affect whole plant, community, and ecosystem processes.</td>
</tr>
<tr>
<td>FR 8201</td>
<td>Research Problems: Forest Economics</td>
<td>(1-5 cr) Independent research under faculty guidance.</td>
</tr>
<tr>
<td>FR 8202</td>
<td>Research Problems: Forest Biometry and Measurements</td>
<td>(1-5 cr) Independent research under faculty guidance.</td>
</tr>
<tr>
<td>FR 8203</td>
<td>Research Problems: Forest Recreation</td>
<td>(1-5 cr) Independent research under faculty guidance.</td>
</tr>
<tr>
<td>FR 8204</td>
<td>Research Problems: Forest Policy</td>
<td>(1-5 cr) Independent research under faculty guidance.</td>
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</tbody>
</table>
Courses

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 8666, Doctoral Pre-Thesis Credits. (1-18 cr [max 60 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 [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])
Fors 8888, Thesis Credits: Doctoral. (1-24 cr [max 100 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 undergraduates) 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 5350. Topics in Literature and Culture. (3 cr [max 12 cr]; SP–3101 or equiv) Problem, period, author, or topic of interest. See Class Schedule.
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–5301, 5302) Introduction to phonology of contemporary French.
Fren 5502. Structure of French: Morphology and Syntax. (3 cr; SP–5302, 5301 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–5331]; Ling 3001 or 5001, grad) Explores variations in the use of French associated with factors such as medium (oral/written), style (formal/informal), region, social and economic groups.
Fren 5995. Directed Teaching. (1-6 cr [max 24 cr]; SP–#) Directed teaching.
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 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 “courtly 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.
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 Ancien Regime. (3 cr) Major authors and their works.
Fren 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent)
Fren 8401. Seminar in Quebecois Literature. (3 cr) Taught in French.
Fren 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)
Fren 8994. Directed Research. (1-5 cr [max 25 cr]; SP–#) Directed research.

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 5850. Topics in French and Italian Cinema. (3 cr [max 9 cr]) Taught in French.
Courses

Geocities, Cellular, and Developmental Biology (GCD)

Department of Genetics, Cell Biology, and Developmental Biology
College of Biological Sciences

GCD 5036. Molecular Cell Biology. (3 cr; QP–Biol 5004 or #; SP–Biol 4004 or #; [se or grad student recommended]) Modern, integrative approaches combining molecular biology, biochemistry, and genetics to investigate cell organization/function. Membranes, signal transduction, matrix, secretion, endocytosis, cytoskeleton, nucleus. Analysis of scientific papers to illustrate new concepts in and experimental approaches to cell organization/function.

GCD 8073. Advanced Human Genetics. (3 cr; QP–8132; SP–Biol 8121 or #) Application of molecular, biochemical, chromosomal, and population genetics to human variation and disease. Abnormal chromosome number and structure; abnormal gene function on structural protein, receptor and transport; analysis of inheritance patterns; behavioral genetics; genetic basis of common disease. Current research articles in human genetics.

GCD 8121. Advanced Molecular Genetics. (3 cr; QP–Biol 5003, BioC 3021 or 5331; SP–Bio 4003, BioC 3021 or 4331) Action of gene in molecular, cellular, and organismal development. Mechanisms of information transfer and regulation of these processes in various biological systems; examination of original research.

GCD 8131. Advanced Genetics. (3 cr; QP–3022 or Biol 5003, BioC 3021 or 5331; SP–3022 or Biol 4003, BioC 3021 or 4331 or #) Literature-based course covering modern genetic analysis, including mutant screens, characterization of multiple alleles, gene mapping and cloning, genome sequencing, intergenic interactions, transposable elements, genetic mosaics, and molecular mechanisms of recombination.


GCD 8151. Advanced Cell Biology. (3 cr; QP–5034 or 8132 or BioC 8002, Biol 5004 or #; SP–Biol 4004, GB 5034 or 8121 or BioC 8002 or #) Eukaryotic systems with emphasis on structure, function, and chemistry of cell organelles; selected specialized cells. Membranes, secretion, trafficking, cytoskeleton, cell motility, cell cycle, nucleus, and compartmentalization.

GCD 8161. Advanced Developmental Biology. (3 cr; QP–Biol 5004, [BioC 5031, GCB 5034 or GB 8132 or Biol 8002; SP–Biol 4004, GB 5131 or Biol 4003], GB 5034 or 8121 or BioC 8002 or #) Current concepts of and experimental approaches taken to understand basic mechanisms of development. Model organisms. Embryology, cell fate determination, differentiation, pattern formation, polarity, cell migration, and cell interactions. Analysis of original research articles.

GCD 8171. Literature Analysis. (2 cr; SP–Grad MCDG major; AF only) Critical reading and evaluation of current literature. May include evaluation of both excellent and flawed papers. Intensive and in-depth discussions of selected papers in molecular biology, genetics, cell biology, and developmental biology.

GCD 8212. Selected Topics in Cell and Developmental Biology. (3 cr; QP–8132 or BioC 8002 or #; SP–8149, [GCB 5024 or 5061]; SP–[8121 or Biol 8002], GCB 8151, [GCB 4161 or 8161 or #]) Reading and discussion of papers from current literature. Topics selected from research areas of cell biology and developmental biology and experimental approaches taken in these fields. Topics vary annually.

GCD 8213. Selected Topics in Molecular Biology. (4 cr; QP–8132 or BioC 8002 or MdBc 8002; SP–BioC 8213; 8121 or Biol 8002 or #) Sample topics: DNA replication, recombination and gene conversion, regulation of gene expression in prokaryotes, regulation of gene expression in eucaryotes, chromosome structure and transcription, organelle gene expression. Lectures, readings, discussions.

GCD 8900. Seminar. (1 cr or max 4 cr; SP–Grad MCDG major or AF; S–N only) Current scientific research.

GCD 8910. Journal Club. (1 cr or max 4 cr; SP–Grad MCDG major or AF; S–N only) Critical evaluation of selected current literature.

GCD 8912. Genetic Counseling in Practice. (4 cr; SP–MCDG M.S. student with genetic counseling specialization or AF; F only) Practical genetic counseling, communicating genetics and medical information to the family, helping families with decision making.

GCD 8913. Psychosocial Issues in Genetic Counseling. (3 cr; SP–MCDG M.S. student with genetic counseling specialization or AF; F only) Interviewing skills, supportive counseling, and case-study analysis specific to genetic counseling.

GCD 8914. Ethical and Legal Issues in Genetic Counseling. (3 cr; SP–MCDG M.S. student with genetic counseling specialization or AF; F only) Professional ethics; ethical and legal concerns with new genetic technologies.

GCD 8920. Special Topics. (1-4 cr; max 8 cr; SP–Grad MCDG major or AF) Special topics.

GCD 8993. Directed Studies. (1-5 cr (max 15 cr); SP–#) Directed studies.

GCD 8994. Research. (1-5 cr (max 20 cr); SP–AF; S–N only) Independent research determined by student’s interests, in consultation with faculty mentor.

Geographic Information Science (GIS)

Department of Geography
College of Liberal Arts

GIS 5571. Introduction to Arc/Info. (3 cr; SP–Geog 5561 or equiv, status in MGIS program, familiarity with computer operating systems or #) Introductory overview of the Arc/Info system. Topics include data capture, geographic transformations and map projections, topology, editing systems, database management and map production.

GIS 5572. Advanced Arc/Info. (3 cr; SP–GCD 5571, Geog 5561 or equiv, status in MGIS program or #) Advanced course in Arc/Info providing in-depth exploration of the topics emphasized in GIS 5571 as well as advanced topics including dynamic segmentation, address matching, and macro language programming.

GIS 5573. Desktop Mapping. (1.5 cr; SP–Geog 5561 or equiv; Geog 3511 or equiv, status in MGIS program or #) Introduction to desktop mapping systems such as ArcView, MapInfo and Maptitude. Emphasizes the application of these systems to the display and analysis of geographic data.

GIS 5574. GIS and the Internet. (1.5 cr; SP–Geog 5561 or equiv, status in MGIS program or #) The role of the Internet in GIS applications. Topics include GIS data sources on the Internet, the role of the Internet in information dissemination, Internet capabilities for interactive mapping and issues surrounding the development of GIS-related Web sites.

GIS 5575. Surveying and the Global Positioning System (GPS). (2 cr; SP–Geog 5561 or equiv, status in MGIS program or #) Introduction to GPS (Global Positioning System) and other surveying techniques of use to GIS professionals. Topics include geodesy, data adjustment, datums, ellipsoids, coordinate systems, and transformations.

GIS 5576. Raster-Based GIS. (1.5 cr; SP–Geog 5561 or equiv, status in MGIS program or #) Introduction to raster-based geographic information systems. Focuses on raster data sets and the use of grid-based models. Practical experience is offered using a widely-available raster GIS package.

GIS 5577. Spatial Data Administration. (2 cr; SP–Geog 5561, Geog 5563 or equiv, status in MGIS program, familiarity with computer operating systems or #) Theory and application for the administration of geographic databases including the topics of quality assurance, development planning and management, maintenance, access and distribution, and documentation.

GIS 5590. Special Topics in GIS. (1-3 cr (max 6 cr); SP–#) Special topics in geographic information science (GIS). Topics vary according to student needs, technological developments in field.

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

GIS 8990. MGIS Capstone Project. (2-6 cr (max 6 cr); SP–MGIS, AF; F only) Project of sufficient scope/complexity to document student’s ability to analyze issues and address them. Written summary of work. Done under supervision of faculty member and, where appropriate, workplace supervisor.

Geography (Geog)

Department of Geography
College of Liberal Arts

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–AF/Nro 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–5211, SEAS 5211) 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 5211.

Geog 5215. Geography of China. (3 cr; SP–5215) 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 5215.

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

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Courses


Geog 5371W. American Cities I: Population and Housing. (4 cr; SP—FPA 5201) 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 5374W. The City in Film. (4 cr; SP—FPA 3374; grad student or #) Cinematic portrayal of changes in 20th-century cities worldwide. Social/cultural conflict, political/economic processes, changing gender relationships, rural versus urban areas, population development issues (especially as they affect women/children). Meets concurrently with 3374. Additional weekly meeting discussion of films, readings. Project on a topic selected in consultation with instructor.

Geog 5385. Political Economy of Development. (4 cr; SP—Sr or grad or #) 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. (4 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 5411W. Geography of Health and Health Care. (3 cr; SP—3411) Application of human ecology, spatial analysis, political economy, and other geographical approaches to analyze problems of health and health care. Topics include distribution, accessibility, and utilization of health practitioners and facilities.

Geog 5421. Introduction to Atmospheric Science. (3 cr; SP—4511) Familiarity with fundamentals of physics, calculus, and statistics, including differential and integral calculus and basic differential equations and basic thermodynamics, mechanics, and the electromagnetic spectrum. Calculus-based introduction to atmospheric dynamics, radiation, thermodynamics, chemical composition, and cloud processes. Applications to climate, meteorology, the hydrologic cycle, air quality, and biogeochemical cycles.

Geog 5423. Climate Models and Modeling. (3 cr; SP—3401 or #) Survey of development and research with simple and complex (three-dimensional) climate models. Environmental processes and their numerical representation in climate models; evaluation of model sensitivity and accuracy; coupling between atmosphere, biosphere, cryosphere, and ocean; assessment of model predictions for climate change.

Geog 5426. Climatic Variations. (3 cr; SP—1425 or 3401 or #) Theories of climatic fluctuations and change at decadal to centuries time scales; analysis of temporal and spatial fluctuations especially during the period of instrumental record.

Geog 5441. Quaternary Landscape Evolution. (3 cr; SP—3401 or #) 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—J WRS 5101; 1402 or 3401 or grad or #) 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—3511 or #) 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—3511 or 3531 or #) 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; SP—J 5-N only) Provides intensive hands-on experience in contemporary map production and design, ranging from GIS applications to digital press. Strong computer skills essential.

Geog 5561. Principles of Geographic Information Science. (4 cr; SP—Grad) Introduction to the study of geographic information systems (GIS) for geography and non-geography students. Topics include GIS application domains, database 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—3561 or 5561 and 3511; or #) 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 5563. Advanced Geographic Information Science. (3 cr; SP—J letter in 3561 or 5561 or #) Advanced study of geographic information systems (GIS). Topics include spatial data models, topology, data encoding, data quality, database management, spatial analysis tools and visualization techniques. Hands-on experience using an advanced vector GIS package.

Geog 5564. Urban Geographic Information Science and Analysis. (3 cr; SP—3561 or 5561) 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—3561 or 5561 or FR 4131 or LA 5573 or one intro GIS course or grad or #) 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, hydroospheric, geomorphic, pedologic, biological, and human land use systems.

Geog 5588. Multimedia Cartography. (3 cr; SP—Minimum of three geo 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 5605V. Honors: Geographical Perspectives on Planning. (4 cr; SP—3605V; honors or grad student) Role of planning in reshaping 19th-20th-century cities in Europe and North America, selected Third World countries. History of planning. Societal change, interest groups, power relations in planning process. Citizen participation/practice in planning. Meets with 3605V. Includes additional weekly seminar-style meeting, bibliography project on topic selected in consultation with instructor.

Geog 5605W. Geographical Perspectives on Planning. (4 cr; SP—3605S) 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 3605S.

Geog 5701. Field Research. (3 cr; SP—J 9 or grad or #) Field investigation in physical, cultural, and economic geography; techniques of analysis and presentation; reconstruction of environments.

Geog 5724. Meanings of Place. (3 cr; SP—J or grad or #) 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—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; J max 9 cr; SP—Sr or grad, #) 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—Grad) 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—Grad) Introduction to conceptual research and empirical studies.

Geog 8004. Proseminar: Physical Geography. (3 cr; SP—Grad) 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—Grad) Conceptual literature and empirical studies on fertility, mortality, and migrations in different parts of the world.
Courses

Geog 8006. ProSeminar: Research Methods in Geography. (3 cr; SP–#) 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–#) 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–#) 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–#) Contemporary research. Advanced topics, which vary with interests of faculty offering course.

Geog 8120. Seminar: Historical Geography. (3 cr; SP–#) Contemporary research. Advanced topics, which vary with interests of faculty offering course.

Geog 8140. Seminar: Africa. (3 cr; SP–#) Advanced topics, which vary with interests of faculty offering course.

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–#; S-N only) Analysis of organization and presentation of geographic writing. Critiques of selected examples of geographic writing.

Geog 8302. Research Development. (3 cr; SP–#; S-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–#; S-N only) Aspects of place analysis/place description from variety of analytical and perceptual perspectives.

Geog 8330. Seminar: Rural Geography. (3 cr; SP–#; S-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–#) Geographic inquiry concerning selected problems of health and healthcare.

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, change, 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 8666. Doctoral Pre-Thesis Credits. (1-18 cr | max 60 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Geog 8777. Thesis Credits: Master’s. (1-18 cr | max 50 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. (1-24 cr | max 100 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 | max 15 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 Geomechanics. (3 cr; CP–IT upper div or grad student, 5603; 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 testing. Material behavior: experiments on anisotropic, damaged, and field-filled solids.

GeoE 5321. Geomechanics. (3 cr; CP–CE 3300, 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; CP–CE 3300; SP–IT upper division or grad student, 4301 or 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 5421. Wave Methods for Nondestructive Testing. (4 cr; CP–CE 3301, AEM 3036 or #; SP–IT upper division or grad student, 4301 or #; A-F only) Introduction to contemporary methods for nondestructive characterization of objects of civil infrastructure (e.g., highways, bridges, geotechnical sites). Imaging techniques based on propagation of elastic waves: ultrasonic and resonant frequency methods, seismic surveys, acoustic emission monitoring. Lecture, lab.

GeoE 8300. Seminar: Geomechanics. (1 cr | max 4 cr; SP–#) Presentations on various topics.


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

Courses

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 8452; SP–CE 4451, 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 doublet, line dipole, 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 4525; SP–4531 or CE 4531, 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 and geological engineering. Formulating engineering model fitting problems; comparing and selecting various fit criteria; implementing numerical algorithms; analyzing and interpreting results using both statistical and qualitative tools; designing future measurement plans.

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

GeoE 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

GeoE 8877. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

GeoE 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Geology and Geophysics (Geo)

Department of Geology and Geophysics
Institute of Technology

Geo 5001. Earth Systems Science for Teachers. (3 cr; QP–§1001; [one qtr chem or physics], ed degree; SP–§1001; ed degree) Solid Earth, hydrosphere, atmosphere, biosphere, their interconnections in natural cycles of material/energy. Consequences of natural cycles for land-water-atmosphere-life environments/Earth’s habitability. Human impact on natural cycles. Evidence for global environmental changes. Required project.

Geo 5002. Earth History for Teachers. (4 cr; QP–§5102, ed degree; SP–§5102, ed degree) Evolution of life on Earth. Interrelationships of plate tectonics, climate change, and organic evolution leading to present form of Earth system. 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 5003. Dinosaur Evolution for Teachers. (3 cr; QP–§5103, ed degree; SP–§5103, ed degree) Dinosaurs and Mesozoic Earth used to introduce evolution, plate tectonics, climate change, and Earth systems. History of theories about dinosaurs illustrates principles and social aspects of scientific investigation. Required project designed to enhance ability to teach dinosaur evolution to K-12 students.

Geo 5006. Oceanography for Teachers. (3 cr; QP–§5106, 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 majors; core curriculum through 4501 or #; nonmajors; 1001 or #) Human impact on geological environment and effect of geology/geologic processes on human life from an ecosystems and biogeochemical cycles perspective. Geologic limits to resources and carrying capacity of Earth. Land use planning, environmental impact assessment, ecologetic world models. Field project and trip.

Geo 5201. Time-Series Analysis of Geologic Phenomena. (3 cr; QP–Math 3221 or #; SP–Math 2263 or #; A-F only) Time-series analysis of linear and nonlinear geological and geophysical phenomena. Examples drawn from ice age cycles, earthquakes, climatic fluctuations, volcanic eruptions, atmospheric phenomena, thermal convection and other time-dependent natural phenomena. Modern concepts of nonlinear dynamics and complexity theory applied to geological phenomena.

Geo 5202. Geological Thermomechanical Modeling. (3 cr; QP–Math 3201 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 Environmental Geochemistry. (3 cr; QP–Chem 5501 or #; SP–Chem 3501 or #) General principles of solution chemistry applied to groundwater. Geochemistry of hydrothermal fluids. 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 states of stress and strain in rocks and of evolution of these with time. Deformation mechanisms. Extensive reading in journal literature. Field trips.

Geo 5560. Advanced Sedimentology. (4 cr; QP–5563 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 eustatic interpretations, paleocurrent analysis, diagenetic effects on subsurface fluid flow, and volcanic sedimentation.

Geo 5602. Depositional Mechanics. (3 cr; QP–5561, Math 5261 or #; SP–4602, Math 2243 or #) Elementary mechanics of sediment transport applied to quantitative interpretation of sedimentary rocks.


Geo 5703. Regional Geomorphology. (2 cr [max 6 cr]; QP–5201 or #; SP–4501 or #) Geology of a particular region of the country, emphasizing its geomorphology. One-week field trip to the area is taken during spring break. May be taken for credit more than once if regions are different.

Geo 5704. Glaciology. (3-4 cr; QP–Math 3261 or #; SP–Math 2263 or #) Theories of glacier flow. Internal structures and heat flow in glaciers and ice sheets. Geomorphic features produced by glaciers. Reading assignments and problems.

Geo 5705. Limnology and Paleoclimate. (3-4 cr; QP–5261 or EE 5601; SP–1001, 4601 or #) Systems study of modern and ancient lakes of the world as archives of environmental history, as natural resources, as biogeochemical and physical process models, and as bases in geographic history. Includes many case studies and examines aquatic signatures for interpreting paleoclimate.

Geo 5713. Tracers and Karst Hydrogeology. (3 cr; QP–5641, #; SP–5701, #) Karst hydrogeology and application of tracers to determine source, age, and mixing parameters of water in various natural reservoirs. Physical and chemical principles and processes operating in karst hydrogeology; use of natural and synthetic chemical and isotopic labels or tracers to follow movement and mixing of water through hydrologic cycle.

Geo 5802. Scientific Visualization. (3 cr; QP–CSci 3101 or 3102 or 3113 or #; SP–CSci 1107 or 1113 or #) Visualization hardware and software, three-dimensional graphics, representation of scientific data, modeling, user interface techniques, output, commonly used algorithms, animation, case studies and examples.

Geo 8243. Principles of Rock Magnetism. (1-3 cr; QP–5541, SP–4204 or #) Remanent magnetizations, their classification and origins. Fundamentals of fine particle magnetism; magnetic minerals; separation of multidomain magnetization; effects of chemical change on magnetization; magnetic proxies of climatic and environmental change; biomagnetism.

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

Geo 8351. Geochemical Modeling of Aquifer Systems. (3 cr; QP–5313; SP–5301 or #) Using mass transfer reaction path models to assess chemical evolution of natural fluids, hydrothermal alteration processes, and formation of hydrothermal ore deposits.

Principles of homogeneous and heterogeneous equilibria and their application to problems in petrology. Emphasis on derivations from first principles and formulation of algebraic and graphical methods essential to multicomponent systems.

Geo 8354. Igneous Petrology. (3 cr; QP–5452; SP–4301 or #)

Igneous rocks and processes, emphasizing geochemistry of melts and minerals. Content varies with instructor and student interest.

Geo 8355. Metamorphic Petrology. (3 cr; QP–8453; SP–8353)

Metamorphic processes; relation of theory and observation to current problems. Relation of fundamental concepts and techniques to progressive development of mineral assemblages. Term paper required.

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

Geo 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Geo 8712. Transport Phenomena and Analytical Geohydrology. (3 cr; QP–Math 3261, CE 3400 or Chem 5520 or equiv; SP–5701 or CE 3502 or #)

Microscopic flow parameters, momentum, mass and energy transport through porous media. Geologic factors in aquifer performance, equations for groundwater flow, and analysis of pump tests.

Geo 8718. Numerical Methods in Hydrogeology. (4 cr; SP–5701, CSci 1107 or #; A-F only)

Introduction to finite difference and finite element methods in hydrogeology. Students develop one- and two-dimensional models of diffusion and advection-dispersion equations.

Geo 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Geo 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Geo 8970. Seminar: Current Topics in Geology and Geophysics. (1-4 cr [max 30 cr]; SP–; A-F only)

Geo 8980. Seminar: Current Topics in Geology and Geophysics. (1-4 cr [max 30 cr]; SP–; S-N only)

Geo 8994. Research in Geology and Geophysics. (1-4 cr [max 30 cr]; SP–#)

Independent research under faculty supervision.

German (Ger)

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 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 5001 or #)

Phonology, morphology, and syntax of standard German.

Ger 5410. Topics in German Literature. (3 cr [max 9 cr]; SP–3104 or equiv)

Topics may focus on a specific author, group of authors, genre, period, subject matter or subject matter in German literature, ca. 800-1450.

Ger 6210. 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 each semester.

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 Proseminar I: Bibliography. (3 cr; A-F only)

Introduction to bibliography emphasizing Germanic medieval languages and literatures and medieval Latin. See Scan 8702.

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 [max 9 cr])

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–5701)

Continuation of study of the oldest extant Germanic language and the prehistory of Germanic group of languages.

Ger 8795. Medieval Text Editing. (3 cr)

Introduction to techniques of historical text-critical editing of medieval Germanic and Latin manuscripts.

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, hermeneutics, reception theory.

Ger 8994. Directed Research. (1-3 cr [max 12 cr]; SP–#; A-F only)

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 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser approval, #)
Courses

GSD 8444. FTE: Doctoral. (1 cr; SP—Doctoral student, adviser approval, A)

GSD 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr; SP—Doctoral student who has not passed prelim oral])

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—completion of doctoral prelin exams; S-N only)


GSD 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr])

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 5110. Biology of Aging. (3 cr; A/F only)

Biological changes that occur with aging. Methods for studying aging, descriptions of population aging, theories on how/why we age. Process of aging in each body system, variation between individuals/populations. Clinical implications of biological changes with age. Guest lecturers from different disciplines.

Gero 8020. Seminar in Gerontology. (2 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.

Global Studies (GloS)

Institute of International Studies
College of Liberal Arts

GloS 5103. Colonialism and Modernity. (3 cr; SP—3101, Area 3144 or #; A—F only)

How modern world has been constituted by colonial encounter. Role of colonialism in construction of the west. Images of non-western societies. Modernity in encounter. Role of colonialism in construction of the modern world, but many. Colonialism, consumption, diasporic conditions, global media, nationalism, supra-national governance. How globalization is experienced/contested locally/specifically.

GloS 5602. Other Worlds: Globality and Culture. (3 cr; SP—3101, Area 3144, grad student; or #; A—F only)

Interconnectedness of world. Considering not one world, but many. Colonialism, consumption, diasporic conditions, global media, nationalism, supra-national governance. How globalization is experienced/contested locally/specifically.

GloS 5603. Socialist/Post-socialist Transformations. (3 cr; A/F only)

Transformations underway in post-socialist societies of Eastern Europe, former Soviet Union. Ramifications of abandonment of state socialism, introduction of market relations. Effect of former system, new market system on cultural institutions/identities.

GloS 5900. Topics in Global Studies. (1-3 cr)

Proseminar. Selected issues in global studies. Topics specified in Class Schedule.

GloS 5910. Topics in East Asian Studies. (1-3 cr)

Description varies with topic title.

GloS 5920. Topics in European Studies. (3 cr)

Description varies with topic title.

GloS 5930. Topics in Latin American Studies. (3 cr)

Description varies with topic title.

GloS 5940. Topics in Middle Eastern Studies. (3 cr)

Description varies with topic title.

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

Description varies with topic title.

GloS 5960. Topics in South Asian Studies. (3 cr)

Description varies with topic title.

GloS 5993. Directed Studies. (1-4 cr [max 12 cr]; QP—#, A—F)

Guided individual reading or study. Open to qualified students for one or more semesters.

GloS 5994. Directed Research. (1-4 cr [max 12 cr]; QP—#, A—F)

Guided individual reading or study. Open to qualified students for one or more semesters.

GloS 8001. 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.

Graduate School (Grad)

Graduate School

Grad 8101. Teaching in Higher Education. (3 cr; SP—#)

Teaching methods/techniques. Focus on active learning, critical thinking, practice teaching, and preparation of a portfolio to document and reflect upon teaching. Readings, discussion, peer teaching, e-mail dialog, reflective writing, co-facilitation of course.

Grad 8102. Practicum for Future Faculty. (3 cr; QP—8100 or equival; SP—8101 or equival; S—N only)

Collegiate support for teaching, faculty mentorship at regional college or university, investigation of faculty role at variety of institutions, classroom observation/feedback, preparation for academic job search. Non-native English speakers must pass University requirements for international teaching assistants.

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—Grk 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. Literature: Religious Texts. (3 cr [max 9 cr])

Reading and discussion of religious texts from Greek antiquity, such as the Homeric Hymns, Hellenistic poetry, 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., Chionas, 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—#, A, #)

Guided individual reading or study.
Health Informatics (HInf)

Department of Laboratory Medicine and Pathology
Medical School

HInf 5430. Health Informatics I. (3 cr; A-F only)

HInf 5431. Health Informatics II. (3 cr)

HInf 5436. Seminar. (1 cr; S-N only)
Presentation and discussion of research problems, current literature and topics of interest in Health Informatics.

HInf 5494. Directed Instruction. (1-12 cr; A-F)
Supervised original research on topic chosen by student.

HInf 8434. Medical Decision Support Techniques. (3 cr; SP–HInf 5432 or 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 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

HInf 8446. Professional Studies in Health Informatics. (1-2 cr; SP–S431; Pub H Inf 5452 or #, grad hlth inf major; A-F only)
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–A-F only)
Directed readings in topics of current or theoretical interest in medical informatics.

HInf 8494. Research in Health Informatics. (1-6 cr; SP–A-F only)
Directed research under faculty guidance.

HInf 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–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 M.S. student; #; no cor toward Ph.D.; A-F only)
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)

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

Hebrew (Hebr)

Department of Classical and Near Eastern Studies
College of Liberal Arts

Hebr 5992. Directed Readings. (1-4 cr; SP–#)
Guided individual reading or study.

Hindi (Hndi)

Department of Asian 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–#)

Hndi 5993. Directed Readings. (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 of 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 of science course recommended for undergrads)
A comparative history of the medical professions in the United States and in select northern European nations. Analyze the process of professionalization and the role the profession has played in western industrial societies since 1800.

Hist 5111. Proseminar in the History of Medieval Europe. (3 cr; SP–Advanced undergrads of exceptional ability or grad; 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 5155. 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 5251. Socialist/Post-socialist Transformations. (3 cr; A-F only)
Transformations underway in post-socialist societies of Eastern Europe, former Soviet Union. Ramifications of abandonment of state socialism, introduction of market relations. Effect of former system, new market system on cultural institutions/identities.

Hist 5264. Imperial Russia: Formation and Expansion of the Russian Empire in the 18th and 19th Centuries. (3-4 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.
Courses

Hist 5325. 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 5301. U.S. Women’s Legal History. (3 cr) Women’s legal status in U.S. history, 1648 to present. Changes in women’s legal status in marriage, divorce, and child custody; reproductive/sexual autonomy; and economic/educational equality. Differences among women based on race, class, and ethnicity.

Hist 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. (3-4 cr [max 4 cr]; SP–1301) A case study and seminar approach to historical research and interpretation. It offers teachers and other scholars a chance to survey a particular topic in Minnesota history and to write their own historical narrative based on primary source research.

Hist 5421. Gender in Latin American History. (3 cr) Women’s history/masculinity. Gender/colonialism, marriage, sexuality, nationalism, labor, political movements, feminism.

Hist 5436. Social History of African Women: 1850 to the Present. (3 cr; SP–# for undergraduates) 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 5438. Seminar: The African American Experience in South Africa. (3 cr; SP–# for 5919) Ideological, political, religious, and cultural ties that have informed African American and black South African relations from late 18th century to present.

Hist 5446. Problems in West African History. (3 cr; SP–# for undergraduates) 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–5464; EAS 5464) China during the Song (976–1279), 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–5465; EAS 5465) Political/social history of China from 1600 until end of Qing dynasty in 1911. Ethnicity, daily life, legal structures, city life, peasantry.

Hist 5467. State and Revolution in Modern China. (3 cr; SP–5467; EAS 5467) 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–5468) 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–5473) 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 5505. Survey of the Middle East. (3 cr; SP–Grd or #) Peoples, lands, cultures of the Middle East, from earliest civilizations to present.

Hist 5520. Topics in Chinese History. (3 cr; SP–#) A critical study of major writings about Chinese history during the Tudor and Stuart periods.


Hist 5611. Proseminar: Modern Britain. (3 cr; SP–4; A-F only) Critical study of major writings in British history, 1760-1945, and preparation for research in field.

Hist 5720. Society and Politics in Modern Europe. (3 cr [max 6 cr]; SP–#; A-F only) Introduction to current historical research on European women’s history, 1450-1750. Topics include gender roles and forms of family structure, women’s participation in religious movements, legal status of women.

Hist 5721. Readings in European Women’s History: 1450-1750. (3 cr; SP–#; A-F only) Introduction to current historical research on European women’s history, 1450-1750. Topics include gender roles and forms of family structure, women’s participation in religious movements, legal status of women.

Hist 5721. Readings in European Women’s History: 1450-1750. (3 cr; SP–#; A-F only) Critical study of major writings in British history, 1760-1945, and preparation for research in field.

Hist 5721. Contemporary Europe From the Late 19th Century to the Beginning of the Cold War: 1890-1950. (3 cr; SP–5373; previous coursework in 19th- and/or 20th-century Europe) The historical literature and debates surrounding major issues in the social, political, cultural, and economic development of Europe from the turn of the century through the impact of WWII. Topics include the development of imperialism, national rivalries, social and political conflict, the rise of fascism and communism, and the origins of war.


Hist 5740. Topics in Modern German History. (3 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 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–5761, knowledge of Russian or German or French)
Western and Russian historiography on crucial issues of 20th-century Russia. The nature of revolutions, debate over the evolution of the Soviet regime, the collapse of empires, new interpretations.

Hist 5777. Proseminar in Habsburg Central Europe. (3 cr; 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 5821. American History in the Twentieth Century. (4 cr; SP–Grad student; A-F only)
Intensive readings seminar.

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 labor, 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–Grd or [advanced undergrad student 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–Grd or [advanced undergrad student 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 [max 16 cr]; SP–Grd or #)
Focuses on the experiences of Africans in their workplaces, households and communities. Detailed treatment of selected historical themes. Topics vary by semester.

Hist 5930. Topics in Ancient History. (1-4 cr [max 16 cr]; SP–Grd or #)
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 [max 16 cr]; SP–Grad student or #; A-F only)
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 5934. Comparative History and Social Theory. (4 cr; A-F only)
Focuses on works of history/sociology that are broadly comparative/theoretical and speak to issues of state formation, social movements, social structure, and economic development.

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-18th century to the present. Topics vary yearly.

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 or [advanced undergrad with #])
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 proseminar 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 5971. Proseminar: Editing and Publishing. (3 cr; A-F only)

Hist 5980. Topics in Comparative Women’s History. (3 cr)
Cross-cultural/thematic explorations in history of women. Topics vary. May include gender and colonialism, women and class formation; women and religion; sexuality; medical construction of gender; women’s narratives as historical sources; gender and politics.

Hist 5993. Directed Study. (1-16 cr [max 16 cr]; SP–#, A-
Qualified senior and graduate students may register for work on a tutorial basis. Guided individual reading or study.

Hist 5994. Directed Research. (1-16 cr [max 16 cr]; SP–#, A-
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–8; 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–8; 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–5890 or Aimin 5890 cr 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 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)
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 [max 60 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–715)
Research techniques for completing a major research paper based on primary sources.

Hist 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Hist 8857. Seminar: Research in the History of American Women. (3 cr; SP–857; 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 conduct research in primary and secondary sources, write a 25 to 35-page scholarly article, and read and comment upon each other’s drafts.

Hist 8858. Research in Early American History. (3 cr; SP–8581 or A; 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. (1-24 cr [max 100 cr]; SP–Max 18 cr 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 explains 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 8987. Directed Study. (1-16 cr; SP–A-F only)

Hist 8994. Directed Research. (1-16 cr; SP–A-F only)

Hist 5002. Public Health Issues in Historical Perspective. (3 cr)
Introduction to the evolution of major recurring problems and issues in public health including environment and health, food customs and nutrition, control of alcohol and drugs, venereal diseases and public policy, human resources regulation, and relationship of science to promotion of health.

Hist 5035. The Germ Theory and Modern Medicine. (3 cr)
Analysis of the formulation of the germ theory of disease and of its consequences for medical procedures (therapeutics, surgery, management of hospitals), public health programs, and the structure and prestige of the medical profession.

Hist 5045. Modern Medical Profession. (3 cr)
Historical analysis of American medical profession in 19th/20th centuries. Role of institutions, influence of social/moral values. Consequences of specialization, scientific innovation.

Hist 5055. Women, Health, and History. (3 cr; SP–Grad student or Jr or Sr with prev coursework in hist or #)
Women’s historical roles as healers, patients, research subjects, health activists. Biological determinism, reproduction, mental health, nursing, women physicians, public health reformers, alternative practitioners. Gender disparities in diagnosis, treatment, research, careers. Assignments allow students to explore individual interests.

Hist 5056. Social Science Approaches to Medical History. (3 cr)
Comparative reception of Darwinism in different countries/cultures.

Hist 5057. Medical School.

HMed 5002. Public Health Issues in Historical Perspective. (3 cr)
Introduction to the evolution of major recurring problems and issues in public health including environment and health, food customs and nutrition, control of alcohol and drugs, venereal diseases and public policy, human resources regulation, and relationship of science to promotion of health.

HMed 5035. The Germ Theory and Modern Medicine. (3 cr)
Analysis of the formulation of the germ theory of disease and of its consequences for medical procedures (therapeutics, surgery, management of hospitals), public health programs, and the structure and prestige of the medical profession.

HMed 5045. Modern Medical Profession. (3 cr)
Historical analysis of American medical profession in 19th/20th centuries. Role of institutions, influence of social/moral values. Consequences of specialization, scientific innovation.

HMed 5055. Women, Health, and History. (3 cr; SP–Grad student or Jr or Sr with prev coursework in hist or #)
Women’s historical roles as healers, patients, research subjects, health activists. Biological determinism, reproduction, mental health, nursing, women physicians, public health reformers, alternative practitioners. Gender disparities in diagnosis, treatment, research, careers. Assignments allow students to explore individual interests.

History of Science and Technology (HSci)

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; SP–5242)
HSci 5332. Science and American Culture. (3 cr; QP–53332; SP–53332)
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–54041)
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–8; SP–#)
Guided individual reading or study.

HSci 5994. Directed Research. (1-15 cr [max 15 cr]; QP–8; SP–#)

Horticultural 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 development 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 5018. Landscape Operations. (3 cr; QP–1036 or 1010 or #)
Demonstration/hands-on experiences with landscape operations. Planting, mulching, staking, pruning, fertilizing, large tree care, seeding, sodding, aerifying, calibrating, irrigating, surveying. Written report on special project or experiment. Discussion/laboratory.
Tea m taught by faculty, staff, and industry professionals.

Hort 5021. Landscape Design, Implementation, and Management I. (3 cr; QP–5041 or #; SP–50421)
Residential, commercial, and recreational sites. Architectural/graphic techniques, plan drawings, sections elevations, perspectives, working drawings. Grading and site manipulation, including surveying, irrigation, and drainage. Development of business/grounds management plans. Landscape estimating/bidding.

Hort 5022. Topics in Plant Science for Teachers. (1-4 cr; QP–Biol 1103 or equiv or ed course; no cr for Hort major or grad student; SP–Biol 2012 or equiv or ed course; no cr for Hort major or grad student)
Demonstration/hands-on experiences with landscape operations. Planting, mulching, staking, pruning, fertilizing, large tree care, seeding, sodding, aerifying, calibrating, irrigating, surveying. Written report on special project or experiment. Discussion/laboratory.

Hort 5023. Public Garden Management. (2 cr; SP–#)
Areas of operations (e.g., planning; educational programming; plant conservation/curation; public relations; garden, personnel, and business management). Overview of knowledge/skills necessary for public garden management.

Hort 5024. Landscape Development. (1 cr; QP–5021 or #; SP–8)
Hands-on experience in landscape development. Plan takeoffs, site evaluation/preparation, planting, installation/construction, equipment operation, hard-good/plant handling.

Hort 5031. Sustainable Fruit Production Systems. (2 cr; QP–1036 or #; SP–1001, 3005; A-F only)
Principles of fruit production. Emphasizes temperature fruit crops. Integrated management of fruit cropping systems, including site selection, cultural management practices, taxonomic classification, physiological/environmental control of plant development. Integration of writing into understanding various fruit cropping systems.

Hort 5032. Sustainable Commercial Vegetable Production Systems. (3 cr; QP–3005 or #; SP–1001, 3005; Soil 2125 or #; A-F only)
Principles of commercial vegetable production. Integrated management of vegetable cropping systems: site selection/environments, seed/stand establishment, cultural management practices, commodity use, handling from harvest to market. Perspectives on types of vegetable cultivars. Origin, historical significance/improvement through breeding, nutrition/medicinal aspects, physiological/environmental control of development.

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 5042. Nursery Operations. (1 cr; QP–5046, 5047 or #; SP–5041 or #)
Hands-on experience in nursery production. Propagating, growing, and harvesting plants. Operating the equipment commonly used in nurseries.

Hort 5051. Bedding Plant and Specialty Annual/Perennial Crop Production. (4 cr; QP–1022, 1036, 3002; SP–1001, 1011, 3002; A-F only)

Hort 5052. Cut Flower Production. (3 cr; QP–1036, 1022, 3002; SP–1001, 1011, 3002; A-F only)

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 situations 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, 5041, Ecol 3001 or equiv or #; SP–Biol 2022 or 3002, Biol 1001 or 3407 or equiv or #)
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–8 cr upper div Hort courses; #; SP–8 cr upper div Hort courses, #)
In-depth exploration of concepts, technology, applications, or programs in specific area to expand professional competency and self-confidence. Planning, organizing, implementing, and evaluating knowledge obtained from formal education and from experience.

Hort 5183. Water, Minerals, and Translocation. (3 cr; QP–Soil 3125 or equiv; PPIH 1xxx or #; SP–Soil 2125 or equiv; PPIH 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–8; SP–8)
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.
Human Factors (HumF)

Graduate School
HumF 5001. Foundations of Human Factors/ Ergonomics. (3 cr; SP—Enrollment in good standing, grad HumF minor; A-F only)
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 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, 5201 or 5301; 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—2 core courses in HRD; A-F only)
Frameworks and strategies for developing effective team work. 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 discussions 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.
Human Resources and Industrial Relations (HRIR)

Industrial Relations Center
Curtis L. Carlson School of Management

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 5022. Managing Diversity. (2 cr; SP–[At least 50 sem cr or 75 qtr cr], 2.00 GPA) or student or A
Growing body of laws and their application to workplace: human rights, equal employment, compensation/benefit, employee protection, labor relations. Special issues (e.g., wrongful discharge, sexual harassment, defamation) discussed in context of statute, case law, and their application to work setting.

HRIR 5024. Employee Performance: Appraisal and Management. (2 cr; SP–[At least 50 sem cr or 75 qtr cr], 2.00 GPA) or student or A
How employee performance is organized, appraised, and managed to achieve organizational/individual performance goals. Job design standards, employee appraisal systems, worker satisfaction.

HRIR 5025. Comparative and International Human Resources and Industrial Relations. (2 cr; SP–Grad majors must register A-F)

HRIR 5054. Public Policy and Employee Benefits. (2 cr; QP–RHIR grad majors must register A-F)
Survey of federal/state-mandated employee benefits: worker compensation, unemployment insurance, temporary disability insurance, social security. Effects of providing benefits on workers’ incentives in regard to performance, augmentation of human capital, mobility, and risk sharing.

HRIR 5061. Public Policies on Work and Pay. (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–A or F)
Individual readings or research topics.

HRIR 8000. Graduate Topics in Human Resources and Industrial Relations. (1-8 cr [max 8 cr]; QP–8002; SP–HRIR M.A. student or Sch Mgmt approval; grad majors must register A-F)

HRIR 8011. Quantitative Methods in Human Resources and Industrial Relations. (4 cr; QP–Grad HRIR major or A; grad majors must register A-F)
Applications of descriptive and inferential statistics, including probability, hypothesis testing, confidence intervals, analysis of variance, and regression. Computers used in case studies and homework exercises.

HRIR 8012. Applied Quantitative Methods in Human Resources and Industrial Relations. (2 cr; QP–8001; SP–[8001, grad HRIR major or A; grad majors must register A-F)
Evaluation of applied statistical research in human resources and industrial relations. Appropriate statistical inferences/applications. Sampling issues, multiple regression, advanced topics.

HRIR 8013. Research Methods in Social and Labor Policy. (3 cr; QP–8001; SP–[8001, grad HRIR major or A; grad majors must register A-F)
Application of social science research methods to public policy issues.

HRIR 8014. Human Resource Information Systems. (2 cr; QP–IR core; SP–Grad HRIR major or A; 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 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 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 8011 under quarters.

HRIR 8021. Introduction to Human Resources and Industrial Relations. (3 cr; QP–Econ 1101, 1102, Psy 1001; SP–[8011, 8031, 8041, 8051, 8061, 8071, grad HRIR major) or A; grad 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; grad majors must register A-F)
Teams formulate and execute study of actual business problem faced by business, non-profit, or governmental organization, generally in Twin Cities.

HRIR 8023. International Human Resource Management. (2 cr; QP–8002 or MBA 8015; SP–MBA 6215 or grad HRIR major or A; 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 8031. Staffing, Training, and Development. (4 cr; QP–8002; SP–Psy 1001, grad HRIR major or A; grad majors must register A-F)
Introduction to staffing processes (recruitment, selection, promotion, transfer, dismissal, layoff, retirement); training development theory and techniques as mechanisms for influencing individual and organizational outcomes; job satisfaction, and climate.

HRIR 8032. Staffing and Selection: Strategic and Operational Concerns. (2 cr; QP–8003; SP–[8031, HRIR grad student) or A; HRIR grad students must register A-F)
Theory/practice related to staffing decisions (recruitment, selection, promotion, transfer, dismissal, layoff, retirement) in organizations. Legal environment in which staffing decisions are made. Staffing from strategic/organizational perspectives.

HRIR 8033. Employee Training: Creating a Learning Organization. (2 cr; QP–8002; SP–[8031, HRIR grad student) or A; HRIR grad students must register A-F)
Theory, research, practice related to design/implement employee training programs. Instructional design, training techniques, transfer of training, program evaluation/costing. Role of employees, firm policies/practices in training.

HRIR 8034. Employee Development: Creating a Competitive Advantage. (2 cr; QP–8003; SP–[8031 or 8032, grad HRIR major or A; grad majors must register A-F)
Career development plans for employees and management development techniques, and organizational and employee concerns related to mobility, job balance, working family, obsolescence and plateauing, and cross-cultural assignments.
Courses

HRIR 8041. Design and Management of Organizational Structures. (4 cr; QP–8002; SP–Econ 1101, Econ 1102, Psy 1001 or #, grad HRIR major or #; grad majors must register A-F)

Introduction to micro through macro organizational issues at individual, group, organizational, and environmental levels; their implications for organizational design, control, coordination, and development.

HRIR 8042. Organizational Structure and Performance. (2 cr; QP–8004; SP–8041 or #, grad HRIR major or #; grad majors must register A-F)

How different organizational practices (e.g., employee empowerment, job enrichment, profit sharing, employee stock ownership, individual incentives, information sharing, integration mechanisms) affect organizations in their competitiveness, profitability, workplace safety, employment stability, and wages. Coherence of system of organizational practices.

HRIR 8043. Comparative Organizations and HRM. (2 cr; QP–8004; SP–8041 or #, grad HRIR major or #; grad majors must register A-F)

Variations in organizational practices related to variations in ownership (profit, nonprofit, government, cooperative), economic systems (e.g., capitalism, socialism, market structure, etc.); Organizational practices: employee empowerment, job enrichment, profit sharing, employee stock ownership, individual incentives, information sharing, integration mechanisms, and international comparisons.

HRIR 8044. Motivation and Work Behavior in Contemporary Organizations. (2 cr; QP–8004; SP–8041 or #, grad HRIR major or #; 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–8002; SP–Econ 1101, Econ 1102, Psy 1001 or #, grad HRIR major or #; grad majors must register A-F)


HRIR 8052. Compensation Theory and Applications. (2 cr; QP–8003; SP–8051 or #, grad HRIR major or #; 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. Mathematical analysis applied to pay program design and administration. Global pay variations. Current pay issues and controversies.

HRIR 8053. Employer-Sponsored Employee Benefit Programs. (2 cr; 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, pensions, profit sharing plans, disability, and other employee benefits. Effects of providing benefits on workers’ incentives with regard to performance, acquisition and maintenance of human capital, mobility, and risk sharing.

HRIR 8061. Introduction to Labor Market Analysis. (4 cr; QP–8002; SP–Econ 1101, Econ 1102 or #, grad HRIR major or #; 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; role of unions in wage determination.

HRIR 8062. Human Resource Strategy and Planning. (2 cr; QP–8006; SP–8061 or #, grad HRIR major or #; grad majors must register A-F)

Concepts and tools to diagnose strategy.

HRIR 8063. Human Resources and Organizational Performance. (2 cr; QP–8006; SP–8061 or #, grad HRIR major or #; grad majors must register A-F)

Impact of human resource policies and practices on organizational productivity and effectiveness. Role of government in establishing and regulating the private sector institutions on organizational effectiveness.

HRIR 8064. Topics in Micro Labor Market Analysis. (2-4 cr; QP–8006; SP–8061 or #, HRIR Ph.D. student or #; 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. (2-4 cr; QP–8006; SP–8061 or #, HRIR Ph.D. student or #; grad majors must register A-F)

May include theories of unemployment based on sectoral shocks, theories of wage rigidity, efficiency wage theories, interindustry wage structure, role of labor market in resource allocation, and effects of government intervention in labor market.

HRIR 8071. Labor Relations and Collective Bargaining. (4 cr; QP–8002; SP–Econ 1101, Econ 1102 or #, grad HRIR major or #; grad majors must register A-F)

Evolution of U.S. labor organizations and public policy; collective bargaining environment and structure, goals and negotiations, contract administration and results. 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 #; grad majors must register A-F)

Labor movement philosophies. Critical evaluation of labor movement growth and adjustment to environmental change. 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 #; grad majors must register A-F)

Arbitration to resolve grievances and impasses arising out of the collective bargaining agreement’s administration and negotiation. Arbitration law and legal issues, procedures and practices, case presentation, management rights, discipline and discharge, evidence, contract language interpretation, and remedies. Newly emerging approaches.

HRIR 8074. Labor-Management Negotiations. (2 cr; QP–8007; SP–8071 or #, grad HRIR major or #; 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 [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has passed prelim oral)

HRIR 8777. Thesis Credits: Master’s. (1-18 cr [max 50 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. (2-4 cr; QP–IR core; SP–HRIR core or #; HRIR Ph.D. student or #; 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; panel collection models; hazard models. Emphasizes application to human resources and industrial relations.

HRIR 8812. Seminar: Human Resources and Industrial Relations Research Methodology. (2-4 cr [max 8 cr]; SP–HRIR Ph.D. student or #; grad majors must register A-F)

Application in research projects.

HRIR 8821. Seminar: Human Resources and Industrial Relations Systems. (1-4 cr [max 8 cr]; SP–HRIR core or #; HRIR Ph.D. student or #; 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. (1-4 cr [max 8 cr]; SP–8003; SP–8031 or #, HRIR Ph.D. student or #; grad majors must register A-F)

Concepts, problems, and research.

HRIR 8840. Seminar: Organization Theory and Behavior. (1-4 cr [max 8 cr]; SP–8004; SP–8041 or #, HRIR Ph.D. student or #; grad majors must register A-F)

Application in human resources and industrial relations research/practice.

HRIR 8850. Seminar: Compensation and Reward. (1-6 cr [max 8 cr]; SP–8005; SP–8051 or #, HRIR Ph.D. student or #; 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. (1-4 cr [max 8 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

HRIR 8891. Independent Study in Human Resources and Industrial Relations. (1-8 cr [max 8 cr]; SP–; A-F only)

Individual readings and/or research projects.

Industrial Engineering (IE)

Department of Mechanical Engineering

Institute of Technology

IE 5080. Topics in Industrial Engineering. (4 cr; QP–Upper div or grad student; SP–Upper div or grad student)

Topics vary each semester.

IE 5541. Engineering Cost Accounting, Analysis, and Control. (4 cr; QP–IT upper div or grad student; A-F only)


IE 5511. Human Factors and Work Analysis. (4 cr; QP–Upper div it or grad student or public health major; SP–Upper div it or grad student; A-F only)

Human factors engineering (ergonomics), methods engineering, and work measurement. Human-machine interface, displays, controls, instrument layout, and supervisory control. Anthropometry, work physiology and biomechanics. Work environmental factors: noise, illumination, toxicology. Methods engineering, including operations analysis, motion study, and time standards.

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IE 5512. Applied Ergonomics. (4 cr; QP–IEOR 5010 or 5020; SP–Upper div IT or grad student, 5513; A-F only) Small groups of students work on practical ergonomic problems in local industrial firms. Projects cover a variety of ergonomic issues: workstation design, equipment and tools, back injuries and material handling, cumulative trauma disorders, illumination and noise, and safety.

IE 5513. Engineering Safety. (4 cr; QP–IT or grad student; SP–Upper div IT or grad student; A-F only) Occupational, health, and product safety. Standards, laws, and regulations. Hazards and their engineering control, including general principles, tools and machines, mechanics and structures, electrical safety, materials handling, fire safety, and chemicals. Human behavior and safety. Procedures and training, warnings and instructions.

IE 5522. Quality Engineering and Reliability. (4 cr; QP–IT or grad student; SP–[4521 or equiv], Upper div or grad student or CNR) Quality engineering/manufacturing, economics of quality, statistical process control design of experiments, reliability, maintainability, availability.

IE 5531. Engineering Optimization I. (4 cr; QP–Math 1261, IT or grad student; SP–Upper div or grad student or CNR) Linear programming, simplex method, duality theory, sensitivity analysis, interior point methods, integer programming, branch/bound/dynamic programming. Emphasizes applications in production/logistics, including resource allocation, transportation, facility location, networks/flows, scheduling, production planning.

IE 5541. Project Management. (4 cr; QP–IT or grad student; SP–Upper div or grad student) Project screening/selection, multiple-criteria methods for project evaluation, project structuring/work breakdown, project teams, project scheduling, resource management, life-cycle costing, project control, project termination, research/development projects, computer support for project management.

IE 5551. Production Planning and Control. (4 cr; QP–IT or grad student; IEOR 5040, ME 1900; SP–Upper div or grad student or CNR) Inventory control, supply chain management, demand forecasting, aggregate planning, capacity planning, material requirement planning, just-in-time manufacturing, cellular manufacturing, production scheduling, line balancing, shop floor control.

IE 5552. Design and Analysis of Manufacturing Systems. (4 cr; QP–IT or grad student; 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 or CNR) Discrete event simulation. Using integrated simulation/animation environment to create, analyze, and evaluate realistic models for various manufacturing, assembly, and material handling systems. Experimental design for simulation. Random number generation, selecting input distributions, evaluating simulation output.

IE 5554. Facility Planning. (4 cr; QP–IT or grad student; SP–Upper div or grad student or CNR) Design/planning of manufacturing/service facilities. Warehousing/storage, facility layout/location, material handling, 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 8532. Stochastic Processes and Queuing Systems. (4 cr; QP–5441; SP–[4521 or equiv]) Introduction to stochastic modeling and processes. Random variables, discrete and continuous Markov chains, renewal processes, queueing systems, Brownian motion, and elements of reliability and stochastic simulation. Applications to design, planning, and control of manufacturing and production systems.


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 process planning, computer-aided manufacturing, real time shop floor control, automated material handling and robotics, and computer-aided quality and inspection.


IE 8666. Doctoral Pre-Thesis Credits. (1-18 cr; max 60; 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; SP–8773; S-N only) Recent developments.

IE 8777. Thesis Credits: Master’s. (1-18 cr; max 50 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. (1-24 cr; max 100 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.

IDSc 8511. Conceptual Topics and Research Methods in Information and Decision Sciences. (4 cr; SP–Business admin Ph.D. student or #; 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. (2 cr; SP–Business admin Ph.D. student or #; offered alt yrs) Why it is hard to develop efficient/effective information systems, what can be done to improve situation. Defining efficiency/effectiveness in development process and in systems. Producing/evaluating artifacts (constructs, models, methods, tools) that enable more efficient/effective information systems to be developed.

IDSc 8711. Cognitive Science. (4 cr; SP–Business admin Ph.D. student or #; 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, anthropopolgy, and philosophy. Implications for understanding of knowledge work.


IDSc 8722. Heuristic Decision Making. (2 cr; SP–Business admin Ph.D. student or #; offered alt yrs) How decisions are made, how knowledge is stored/used, how knowledge of variability/influence influences decisions. Decisions at strategic, operational, individual level. Exceptional performance, pathologies of decision making. Basis for “best practice.” How knowledge is managed in decisions, decision failure. Folly, normal accidents, decision problems in which individuals manipulate information to influence/deceive others.

IDSc 8800. Research Seminar in Information and Decision Sciences. (4 cr; max 20 cr; SP–Business admin Ph.D. student or #) Topics, which vary by semester, are selected from new areas of research, research methods, and significant issues.

IDSc 8801. Research Seminar in Information and Decision Sciences. (2-3 cr; max 20 cr) New areas of research, research methods, issues.

IDSc 8802. Research Seminar in IDSc. (3 cr; max 15 cr; SP–Ph.D. student or #; A-F only) Topics selected from new areas of research, research methods and significant issues in information and decision sciences.

IDSc 8892. Readings in Information and Decision Sciences. (1-8 cr; max 16 cr; SP–Business admin Ph.D. student or #) Readings useful to a student’s individual program and objectives that are not available through regular courses.

IDSc 8894. Graduate Research in Information and Decision Sciences. (1-8 cr; max 16 cr; SP–Business admin Ph.D. student or #) Individual research on an approved topic appropriate to student’s program and objectives.
Courses

Infrastructure Systems Engineering (ISE)

Center for Development of Technological Leadership
Institute of Technology

ISE 5104. Construction Estimating. (1 cr; SP–ISE grad student; A-F only)

ISE 5105. Computer Applications I. (1 cr; SP–ISE grad student; A-F only)

ISE 5112. Infrastructure Systems Engineering Management. (2 cr; SP–ISE grad student; A-F only)
Managing a public works infrastructure. Case studies of decision making in an environment of conflicting interests.

ISE 5113. Computer Applications in Infrastructure Systems Engineering. (2 cr; SP–ISE grad student; A-F only)

ISE 5114. Pavement Management, Maintenance, and Rehabilitation. (3 cr; SP–ISE grad student; A-F only)

ISE 5201. Pavement Management Maintenance and Rehabilitation. (3 cr; SP–ISE grad student; A-F only)

ISE 5202. Traffic Engineering Management. (2 cr; SP–ISE student; A-F only)

ISE 5301. Bridge Management Maintenance and Rehabilitation. (2 cr; SP–ISE grad student; A-F only)

ISE 5401. Water Distribution Systems. (1 cr; SP–ISE grad student; A-F only)

ISE 5402. Sewage Collection Systems. (1 cr; SP–ISE grad student; A-F only)

ISE 5403. Water Treatment Systems. (2 cr; SP–ISE student; A-F only)
Components/design of water treatment systems. Evaluation/methods maintenance. Rehabilitation techniques.

ISE 5500. Public Interactions. (1 cr [max 3 cr]; A-F only)
Techniques for effective public communication. How to run a public hearing. Resources for publishing public notices. Sequence course, in three parts.

ISE 5501. Geographic Information Systems. (1 cr; SP–ISE student; A-F only)
Introduction to geographic Information Systems (GIS) for infrastructure. GIS application domains, data models/sources, analysis methods, and output techniques. Lectures, readings, hands-on experience with GIS software.

ISE 5503. Financial Management in Public Organizations. (2 cr; SP–ISE student; A-F only)

ISE 8105. Capstone Project. (3 cr; SP–ISE student; A-F only)
Integrates knowledge from courses in Master’s program with job experience. Students prepare proposal, conduct project, and report results in written and oral form. Project involves aspect of design, management, or operation of some feature of infrastructure.

ISE 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser approval, DGS approval)

Insurance (Ins)

Department of 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–5100 or HRR 3021 or #)
Design/administration of employee benefit plans and pension programs: health insurance, disability plans, salary reduction/deferred compensation programs—from social insurance to executive benefits. Multiple employer trusts. Alternative funding methods, including self-insurance. Ethical issues, legal liability, 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–5200)

Interdisciplinary Archeological Studies (InAr)

College of Liberal Arts

InAr 5100. Topics in Interdisciplinary Archaeological Studies. (3 cr; SP–InAr grad major or #; A-F only)
Topics specified in the Class Schedule.

InAr 8004. Method and Theory in Archaeology. (3 cr; SP–Grad InAr major or #; A-F only)
Survey and evaluation of archaeological approaches to non-literate, material evidence for past human activities and societies.

InAr 8100. Interdisciplinary Seminar. (3 cr; SP–Grad InAr major or #; A-F only)
Review and evaluation of approaches to interdisciplinary research; themes vary. Leadership and research shared by staff, visitors, and students.

InAr 8200. Directed Readings. (1-7 cr; SP–Grad InAr major or #; A-F only)

InAr 8300. Directed Research. (1-7 cr; SP–Grad InAr major or #; A-F only)

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

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

InAr 8666. Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

InAr 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

InAr 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)

Interpersonal Relationships Research (IRel)

Graduate School

IRel 8001. Proseminar in Interpersonal Relationships Research. (1 cr [max 2 cr]; SP–Grad IRel minor; S-N only)
Survey of major topics, including theoretical assumptions, methods, and samples of current research.

IRel 8021. Seminar: Statistical and Methodological Issues in Research on Dyadic Relationships. (2 cr; SP–Grad IRel minor; S-N only)
Survey of topics in design and analysis of research on behavior in two-person interactions.

IRel 8360. Seminar: Topics in Interpersonal Relationships Research. (2 cr [max 6 cr]; SP–Grad IRel minor or #; A-F only)

Intensive study of topics.
Ital 5321, Italian Renaissance Epic. (4 cr; SP–3015, 3201 or #) Study of the narrative poems of Boiardo, Ariosto, and Tasso in the context of the fashioning of early modern Europe.

Ital 5337, Nation and Narration: Writings in the 19th Century. (4 cr; SP–3015) Introduces the construction of modern Italian national identity by examining the role that literature plays in this process. Works by Manzoni, Foscolo, Leopardi, Gioia, Verga, Serao, and De Ledda studied in the context of a range of sociopolitical and cultural issues.

Ital 5401, Mondo di Dante. (4 cr; SP–3015, 3201 or #) Intensive reading of Dante’s Inferno, Purgatorio, and Vita Nuova with emphasis on Dante’s linguistic and cultural contributions.

Ital 5609, World of Dante. (4 cr [max 8 cr]) Taught in English. Intensive reading of Dante’s Inferno, Purgatorio, and Vita Nuova with emphasis on Dante’s linguistic and cultural contributions.

Ital 5970, Directed Readings. (1-4 cr; SP–#) Meets unique requirements decided on by faculty member and student. Individual contracts list contact hours, number of credits, written and other work required.

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

Ital 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Ital 8992, Directed Readings. (1-4 cr; SP–#)

Japanese (Jpn)

Department of Asian Languages and Literatures
College of Liberal Arts

Jpn 5071, Communicative Competence for Japan-Oriented Careers. (4 cr; SP–4001 or 4042 or #) Effective communication using spoken and written Japanese in contexts likely to be encountered by a career-oriented professional in Japan.

Jpn 5072, Communicative Competence for Japan-Oriented Careers. (4 cr; SP–5071 or #) Effective communication using spoken and written Japanese in contexts likely to be encountered by a career-oriented professional in Japan.

Jpn 5160, Topics in Japanese Literature. (4 cr [max 8 cr]) Literary, historical, or cultural study of selected Japanese literature.

Jpn 5161, Women’s Writing in Premodern Japan. (4 cr; SP–3162, 4061 or # when readings are in Japanese; 3162 or # when in translation; A-F only) Works by women in premodern Japan including Genji monogatari, a lengthy narrative, Makura no soshu, a collection of vignettes, and poetry. Concerns include

gendered writing system/authorship, narrative techniques, sexuality and the figure of the author, and strategies of fictionality.

Jpn 5162, Tale Literature in Premodern Japan. (4 cr; SP–3162, course from classical Japanese language sequence or #; A-F only) Tale literature, both Buddhist and secular, presents the world of the middle- to lower-class people. Religious and religion, fiction and history, gender and sexuality, the role of the supernatural/fantastic, and re-tellings of earlier texts.

Jpn 5163, Premodern Historical Narratives. (4 cr; SP–3162, course from classical Japanese language sequence or #; A-F only) Narratives rooted in history. Issues include the problematization of reality, the formation of national identity, the idea of divine Imperial power, oral storytelling and its relationship to written texts, and the popularization of historical writings.

Jpn 5164, Readings in Early Modern Japanese Literature. (4 cr; SP–Third-year Japanese or #; SP–3032 when readings are in Japanese or #; A-F only) An examination of the stylistic and ideological aspects of the prose fiction, poetry, and non-fiction of the period 1863 to 1945. Offered in a rotating format alternating between readings in the original language and readings in English translation.

Jpn 5165, Readings in Postwar and Contemporary Japanese Literature. (4 cr; SP–Third-year Japanese or #; SP–3032 when offered in Japanese or #; A-F only) Literary and historical exploration of selected works published between 1945 and the present. Focus may be on a writer, a period, or a theme. Offered in a rotating format alternating between readings in the original language and readings in English translation.

Jpn 5166, Literature by 20th-Century Japanese Women. (4 cr; SP–3032 or #) Literary and historical exploration of selected works by Japanese women writers in a variety of genres. All literary texts read in Japanese; critical readings may be in English.

Jpn 5171, Women’s Writing in Premodern Japan in Translation. (4 cr; SP–3162 or #; A-F only) Genjii monogatari, a lengthy narrative, Makura no soshu, a collection of vignettes, and poetry. Gendered writing system/authorship, narrative techniques, sexuality and the figure of the author, and strategies of fictionality.

Jpn 5176, Literature by 20th-Century Japanese Women in Translation. (4 cr) Literary and historical exploration of selected works by Japanese women writers in a variety of genres. All literary texts read in English.

Jpn 5251, History of the Japanese Language. (4 cr; SP–3032, 5451 or #) Development of Japanese grammar from classical to the modern language.


Jpn 5452, Structure of Japanese: Phonology/ Morphology. (4 cr; SP–3032, Ling 3001 or #) Generative and nongenerative approaches to Japanese sound and word structure.


Jpn 5650, Proseminar: Japanese Linguistics. (4 cr [max 12 cr]; SP–5451 or #) Selected topics in Japanese linguistics and/or comparative analysis of Japanese and English with attention to contributions from Eastern and Western linguistic traditions.


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

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

Jpn 8630, Seminar in Premodern Japanese Literature. (4 cr [max 12 cr]; SP–#; A-F only) Selected topic in Japanese literature from 8th century to 1860’s; theoretical tools used to analyze modern Japanese literature.

Jpn 8631, Premodern Poetry. (4 cr; SP–3162, course from classical Japanese language sequence or #; A-F only) Presentation of poetry in four genres: imperial anthologies, narratives centered around poetry, personal collections, and noh plays. Implications of anthologizing/collecting, relationships between prose and poetry, and construction of an authorial figure.

Jpn 8632, Marginalized Literatures of Premodern Japan. (4 cr; SP–3162, course from classical Japanese language sequence preferably both courses or #; A-F only) Texts located at fringes of premodern Japanese literary canons. Ranges from collections of songs sung by women entertainers/prostitutes to texts from Ryukyu islands. Power, canon, and center/margin relationship.

Jpn 8633, Premodern Urban Literature. (4 cr [max 12 cr]; SP–#) Selected topic in Japanese literature from 1800s to the present, including analytical styles and strategies used in Japanese literary criticism.

Jpn 8650, Seminar: Japanese Linguistics. (4 cr [max 12 cr]; SP–5451, 5452, 5453 or #) Research on selected topic in Japanese linguistics; emphasizes collecting and analyzing primary data.

Jpn 8666, Doctoral Pre-Thesis Credits. (1-18 cr [max 60 cr]; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Jpn 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Jpn 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; SP–Max 18 cr per semester or summer; 24 cr required)
Jour 5251. Psychology of Advertising. (3 cr; SP–[3004 or 3004], [jour major or jour minor or design comm premajor or design comm major or graphic design premajor or graphic design major or IDIM major or ICP major or BIS major]; Psy 1001 recommended; A-F only) Psychological principles, research techniques, and applications in advertising/selling. Consumer attitudes, behavior. Psychological mechanisms upon which effectiveness of advertisements/commercials depends.

Jour 5316. Theories of Visual Communication. (3 cr; SP–[3004 or 3004], 3006, [jour major or jour minor or IDIM major or ICP major or BIS major] or #; A-F only) Perspectives on study/analysis of visual communication. Message structure, systems of production, use of visual media. Contributions from sociology, anthropology, psychology, and history.

Jour 5501. Communication and Public Opinion. (3 cr; SP–Open to non-jour majors; jour major must have course appr on prog plan; pre-jour major should not enroll; A-F only) Theories of communication, persuasion, attitude change. Functions of interpersonal/mediated communication in diffusion of information and in opinion formation.

Jour 5531. Communication and Public Opinion II. (3 cr; JP–3004 or 3004, 3501, [jour major or jour minor or IDIM major or ICP major or BIS major] or #; A-F only) Advanced study of theories/research on opinion formation, persuasion, and diffusion of information. Social science contributions to studies of process/effects of mass communication.

Jour 5541. Mass Communication and Public Health. (2 cr; SP–Jour major or jour minor or grad major or IDIM major or ICP major or BIS major; A-F only) Role, function, effect of mass media on public health. Planned/unplanned effects. Review/analysis of literature on how theories, models, assumptions of mass communication research relate to public health.

Jour 5601W. History of Journalism. (3 cr; SP–[3004 or 3004], [jour major or jour minor or IDIM major or ICP major or BIS major] or #; A-F only) Development of American newspapers/periodicals from beginnings in Europe to present day. Rise of radio/television. Relation of communications development to political, economic, social trends.

Jour 5606W. Literary Aspects of Journalism. (3 cr; SP–Jour major or jour minor or IDIM major or ICP major or BIS major; A-F only) Literary aspects of journalism as exemplified in, and influenced by, works of English/American writers past/present. Lectures, discussions, weekly papers.

Jour 5725. Management of Media Organizations. (3 cr; SP–Jour major or jour minor or IDIM major or ICP major or BIS major; A-F only) Introduction to concepts/principles of media management. Strategic planning, leadership, organizational strategies, ethical/legal issues. Working in teams. Understanding a balance sheet and income statement. Motivating/promoting people.

Jour 5726. Case Studies in Modern Media Management. (3 cr; SP–Jour or IDIM or ICP or BIS major or jour minor; [4725 or 5725] recommended; A-F only) Key issues confronting media organizations. Integrating journalism, business, and entertainment. Corporate citizenship, public relations. Deciding what organization does. Business/market definition. Performance measurement, management of creative process. Investment, new business, media boundaries, technology.

Jour 5741. Minorities and Mass Media. (3 cr; JP–Jour major or jour minor; 3004, A–SP–[3004 or 3004], [jour major or jour minor or IDIM major or ICP major or BIS major]; A-F only) Relationships between mass media and communities of color in the United States. Focuses on issues of content/control.

Jour 5771. Media Ethics: Principles and Practice. (3 cr; SP–Open to non-jour majors; jour major must have course appr on prog plan; A-F only) What it means to act “ethically.” Tools to identify/analyze ethical issues. Ethical norms of print/broadcast journalism, photojournalism, public relations, and advertising.

Jour 5777. Contemporary Problems in Freedom of Speech and Press. (3 cr; SP–[3004 or 3004], [jour major or jour minor or IDIM major or ICP major or BIS major]; A-F only) Legal/constitutional derivation of freedom of speech/press. Emphasizes case law, judicial theories, doctrines, tests, and values. Symbolic, commercial, compelled speech, speech plus, petition/assembly, leading press cases, legal research techniques.

Jour 5825. World Communication Systems. (3 cr; SP–Open to non-jour majors; jour major must have course appr on prog plan; pre-jour major should not enroll; A-F only) Mass media systems of world, described/analyzed regionally/nationally. Historical roots. Social, economic, cultural context. Contemporary conditions/prospects. Relevance of journalism/mass communication to international affairs.

Jour 5990. Special Topics in Mass Communication. (1-4 cr; JP–Jour major or jour minor or IDIM major or ICP major or BIS major or #; A-F only) Topics specified in Class Schedule. "Special Topics" courses are taught in a range of formats including: seminars, colloquia, research projects, group discussions, and individual tutorials. The course topic is determined by the instructor, and it may change from semester to semester. Each "Special Topics" course is limited to 12 students. Based on student interest.

Jour 5993. Directed Study. (1-12 cr [max 12 cr]; SP–#) Guided individual reading or study.

Jour 5990. Special Topics in Mass Communication. (1-4 cr; JP–Jour major or jour minor or IDIM major or ICP major or BIS major or #; A-F only) Topics specified in Class Schedule. "Special Topics" courses are taught in a range of formats including: seminars, colloquia, research projects, group discussions, and individual tutorials. The course topic is determined by the instructor, and it may change from semester to semester. Each "Special Topics" course is limited to 12 students. Based on student interest.

Jour 8001. Studies in Mass Communication I. (3 cr; A-F only) Historical development of mass communication studies in social sciences, humanities, and legal areas; survey of research literature utilizing individualistic and structural approaches to mass communication.

Jour 8002. Studies in Mass Communication II. (3 cr; A-F only) Literature on history of the field, cultural and humanistic approaches to its study, and legal and ethical issues.


Jour 8333. FTE: Master’s. (1 cr; SP–Master’s student, adviser and DGS consent) Jour 8422. Seminar: Broadcast News. (3 cr; SP–[5442, 4442] or #; A-F only) Major issues. Confrontations between federal government and network news departments. Historical studies.

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