Electrical Engineering (EE)

Professor: Mostafa Kaveh, head; Vernon D. Albertson; Fredric N. Bailey; Steven K. Case; Keith S. Champlin; Stephen Y. Chou; Philip I. Cohen; David H. Du; Tryphon T. Georgiou; Anand Gopinath; Jack H. Judy; Richard Y. Kain; John C. Kieffer; K. S. P. Kumar; E. Bruce Lee; James R. Leger; Ned Mohan; Marshall I. Nathan; Hendrik J. Oskam (emeritus); Keshab K. Parhi; Robert P. Patterson; William T. Peria; Dennis L. Polla; Mahmoud Riaz; William P. Robbins; P. Paul Ruden; James R. Slagle; Allen R. Tannenbaum; Ahmed H. Tewfik; Bruce F. Wollenberg; Pen-Chung Yew

Adjunct Professor: Gregory T. Cibuzar; Barry K. Gilbert; David Lamb; David S. Lo; Andrzej Peczalski; Frank G. Soltis; Frederick M. Waltz

Associate Professor: Kevin M. Buckley, director of graduate studies; Stephen A. Campbell; Vladimir S. Cherkassky; Douglas W. Ernie; Ramesh Harjani; Ted K. Higman; James E. Holte; Vipin Kumar; Thomas S. Lee; David J. Lilja; Jay Moon; Matthew T. O’Keefe; Nikolaos P. Papanikolopoulos; Gerald E. Sobelman; Jian-Gang Zhu

Assistant Professor: Philip Cheung; Shantanu Dutt; Gyungho Lee; Lori E. Lucke; Laurie B. Nelson; Andrew R. Teel; Bapiraju Vinnakota; Michael E. Zervakis

Other: William C. Black, Jr.

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S.E.E. (Plan A and Plan B), M.E.E. (Coursework Only and Design Project), and Ph.D.

Curriculum—Emphases in the major include solid state and physical electronics, sensors, micromechanics, nanoelectronics, quantum electronics, plasma physics, automatic controls, power systems, power electronics, communication systems and theory, optics, lasers, fiber optics, magnetic devices and systems, VLSI engineering, signal and image processing, computer vision, analog and mixed signal circuits, low-power electronics, microwave devices, and computer and systems engineering. Interdisciplinary work is also available in bioelectrical sciences, bioengineering, control sciences, and computer sciences.

Prerequisites for Admission—Graduate work is open to students who have shown exceptional scholarship and ability in an accredited undergraduate curriculum in electrical engineering or physics. Consideration is given to students who have completed another curriculum in engineering, science, or mathematics which includes sufficient preparation to pursue a graduate program in electrical engineering. In some instances, additional preparatory studies may be required after admission. Students whose training is in engineering technology will not be considered for admission.

Special Application Requirements—Scores from the Graduate Record Examination (General Test only) are required of all students desiring financial aid. International students applying from within the country should furnish letters attesting to their ability to understand technical instruction in English from United States faculty members. Students submitting transcripts from non-American institutions should furnish letters of recommendation that verify their academic standing in a specific way (e.g., class rank). Entry other than in fall quarter is not recommended. Applicants for fall quarter admission interested in financial aid should file a completed admission application with the Graduate School by December 15 for admission the following September and should send a copy of their application materials directly to the department.

Master’s Degree Requirements—The minimum credit requirements established by the Graduate School are used by the electrical engineering program; however, colloquium credits cannot be applied toward the degree, and the number of seminar and special investigations credits that can be applied is limited (see the program’s graduate student handbook for details). For the M.S.E.E. degree, part-time students are encouraged to choose the Plan B program, whereas full-time students may choose either Plan A or Plan B. For the M.E.E. degree, see Professional Master’s Degree in Engineering in the General Information section of this bulletin. The M.E.E. degree is offered under both the design project and coursework-only tracks. The final examination for the M.S.E.E. degree is oral, but no final oral examination is required for the M.E.E. degree taken under the coursework-only track.

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All master’s students must maintain a 3.00 GPA or be denied further registration; consult the program’s graduate student handbook for details. All coursework on the program must be taken under A-F grading (unless that option is not available for a particular course).

**Doctoral Degree Requirements**—The preliminary written examination is conducted by the department twice each year. Students who enter the program with the M.S. degree in electrical engineering must pass the examination during their first academic year in residence. All other students must pass the examination before the end of their second academic year in residence. The department requires that each Ph.D. program include a minimum of 60 credits, of which at least 9 credits must be in advanced graduate courses (8xxx), and that all coursework in the degree program be taken under A-F grading (unless that option is not available for a particular course); consult the department for details. Each Ph.D. student must satisfactorily complete the department’s program in oral paper presentation before the thesis proposal will be approved. All Ph.D. students must maintain a 3.30 GPA to register; see the program’s graduate student handbook for details.

**Minor Requirements for Students Majoring in Other Fields**—Credits presented to satisfy the minor requirement in electrical engineering must be from classroom and laboratory courses graded on an A-F scale. In particular, colloquia, seminar, and special investigations credits do not count toward meeting the minor requirements.

**Language Requirement**—None.

**For Further Information and Applications**—Contact the Director of Graduate Studies, Department of Electrical Engineering, University of Minnesota, 4-178 Electrical Engineering/Computer Science Building, 200 Union Street S.E., Minneapolis, MN 55455 (612/625-3564; fax 612/625-4583; e-mail graduate_studies@ee.umn.edu).

**Courses Acceptable Only for Satisfaction of Minor Requirements**

**EE 5002. Digital Signal Processing.** (3 cr; prereq upper div EE major or grad IT major, 3012 or #) Buckley, Lucke, Moon, Tewfik
General concepts of signal processing; discrete-time systems and digital filters.

**EE 5003. Digital Signal Processing Laboratory.** (1 cr; prereq upper div EE major, 3402 or ¶3402, 5002 or #) Buckley, Lucke, Moon, Tewfik
Computer experiments in digital signal processing and digital filter design.

**EE 5053. Design of Digital Circuits.** (3 cr; prereq upper div EE major or grad IT major, 3062 or #) Champlin
Design of modern digital integrated circuits at subsystem level. Nonlinear device models, use to predict system performance. Comparison of performance and topology of various logic families including TTL, MOS, CMOS, FL, and ECL.

**EE 5055. Instrumentation and Control Electronics.** (4 cr; prereq upper div EE major or grad IT major, 3012 or ¶3012, 3062 or #) Champlin, Robbins
Characteristics of operational amplifiers; applications of operational amplifiers including A-D and D-A converters; compensation of operational amplifiers; power amplifiers; semiconductor controlled rectifiers, applications; linear and switching voltage regulators.

**EE 5056. Electronics Circuits Laboratory.**
(1 cr; prereq IT student or grad IT major, 3402 or ¶3402, ¶5055) Champlin, Robbins

**EE 5090. Digital Circuit Design Laboratory.**
(1 cr; prereq 3402 or ¶3402, ¶5055) Champlin, Robbins

**EE 5151. Materials and Devices I.** (4 cr; prereq IT student or grad IT major, 3062, 3111, Phys 3501 or #) Nathan, Robbins
Fundamental electronic properties of materials, with emphasis on semiconductors. Carrier transport and statistics. Diodes, BJTs, LASERS.

**EE 5161. Materials and Devices II.** (4 cr; prereq 5151 or #) Nathan, Ruden
Introduction to fundamental physical properties of device structures and dielectrics. Metal semiconductor contacts, MOS structures, fiber optics, superconductors.

**EE 5162. Solid-State Transducers.** (4 cr; prereq IT student or grad IT major, 3060, 3111, Phys 3501 or #) Polla
Design and operation of solid state devices used for transducing physical and chemical signals.

**EE 5202. Analog Communication.** (3 cr; prereq upper div EE major or grad IT major, 3012, Stat 3091 or #) Nelson, Tewfik
Selected topics in analog communication systems: amplitude and frequency modulation. Spectral analysis and effect of noise in modulation systems. Detection.
EE 5203. Digital Communication. (3 cr; prereq upper div EE major or grad IT major, 3012, 5202, Stat 3091 or #) Kaveh, Moon, Nelson

EE 5240. Analog Communications Laboratory. (1 cr; prereq 3402 or 33402, 5202) Nelson, Tewfik

EE 5241. Digital Communications Laboratory. (1 cr; prereq 3402 or 33402, 5203) Kaveh, Moon, Nelson

EE 5253. Linear Control Systems. (3 cr; prereq upper div EE major or grad IT major, 3012 or #) Bailey, Teel

EE 5255. Digital Control Systems. (3 cr; prereq upper div EE major or grad IT major, 3351, 3352 or equiv, 5002 or #) Bailey, Georgiou, Tannenbaum
Time- and frequency-domain analysis of discrete-time and digital control systems. Data conversion and interfacing. Digital computers as control system components. Software and hardware considerations in digital control system design.

EE 5290. Digital Control Systems Laboratory. (1 cr; prereq 3402 or 33402, 5255) Bailey, Georgiou, Tannenbaum

EE 5291. Linear Control Systems Laboratory. (1 cr; prereq 3402 or 33402, 5255) Bailey, Teel

EE 5300. Electromechanics. (4 cr; prereq upper div EE major or grad IT major, 3011, 3110) Mohan, Riaz
Principles of electromechanical energy conversion with applications to actuators, transducers, and rotating machines. Performance characteristics derived from analytical models of AC and DC machines.

EE 5310. Electric Power Systems. (4 cr; prereq IT student or grad IT major, 3402 or 33402, 5300 or #) Albertson

EE 5315. Electromechanics in Robotics. (3 cr; prereq upper div EE major, 3012, 5300 or #) Mohan

EE 5322. Electromechanical Processes and Devices. (4 cr; prereq IT student or grad IT major, 3402 or 33402, 5300 or #) Mohan

EE 5355. Microprocessor Interfacing and System Design. (4 cr; prereq upper div EE major or grad IT major, 3351, 3352, 3402 or #) Liija

EE 5358. Digital Design With Programmable Logic. (4 cr; prereq 3351, 3352, upper div EE major or grad IT major or adult spec) Kinney
Focuses on designing viable projects using Mentor Graphics ECAD tools and Xilinx field programmable gate arrays.

EE 5470. Directed Study. (Cr ar [may be repeated for cr]; prereq ∆)
Studies of approved topics, theoretical or experimental in nature.

Courses Acceptable for Satisfaction of Either Major or Minor Requirements

EE 5505. Analog Integrated Circuit Design. (3 cr; prereq grad student or #) Harjani

EE 5506. Analog Circuits for Signal Processing. (3 cr; prereq 5505, grad student or #) Harjani
Review of filter types and Laplace and Fourier transforms; time and frequency-domain concepts; approximation methods (Butterworth, Chebyshev, etc.); frequency transformations. Ideal and non-ideal operational amplifiers. Switched-capacitor filters: biquads and higher-order filters. Switched-capacitor gain stages, rectifiers, and oscillators.

EE 5511. Digital Filtering and Signal Processing. (3 cr; prereq grad IT major, 5002 or #) Parhi
Review of theory of linear shift-invariant, discrete-time systems (z-transform, discrete-time Fourier transform, sampling, discrete Fourier transform); interpolation and decimation; fast Fourier transform and fast convolution; finite-impulse-response filter design approaches and techniques; infinite-impulse-response filter design approaches and techniques; quantization.
EE 5512. Adaptive Digital Filter Theory. (3 cr; prereq grad IT major, 5511, 5702 or # Buckley
Review of partial characterization of discrete-time random processes, correlation matrix eigenstructure; auto regressive modeling; FIR Wiener filter theory; linear prediction; least squares; LMS algorithm (transient and steady state behavior); RLS algorithm; lattice structure.

EE 5513. Multiscale and Multirate Signal Processing. (3 cr; prereq 5511, 5572, grad IT major or # Tewfik
Discrete time linear systems, sampling of continuous and discrete time signals; multirate discrete time systems; bases and frames; continuous wavelet transforms; scaling equations; discrete wavelet transforms; applications in signal and image processing.

EE 5514. Real-time Digital Signal Processing Lab. (3 cr; prereq 3352, 5511, EE sr or grad IT major or adult spec or # Buckley
Real-time computation of digital signal processing functions, including filtering, sample-rate change, and differential pulse code modulation; implementation of a current digital signal processing chip; chip architecture, assembly language and arithmetic; real-time processing issues, including data quantization, limiting and scaling, processor limitations, and I/O handling.

EE 5515. Fast Fourier Transform and Convolution Algorithms. (3 cr; prereq 5002 or # Sobelman
Theory and implementation of fast algorithms for Discrete Fourier Transform and convolution, including both one-dimensional and multidimensional cases.

EE 5560. Biomedical Instrumentation. (4 cr; prereq # Holte

EE 5561. Magnetism: Physics, Geophysics, and Engineering. (3 cr, §Geo 5561, §Phys 5545; prereq Phys 1253, IT major or grad IT major or IT adult spec)
Elementary statistical mechanics, rock magnetism, and micromagnetic modeling; applications of magnetism in geophysics, biomagnetism, magnetic sensors and recording.

EE 5571. VLSI Design I. (3 cr; prereq EE or CSci or Phys grad student or #) Lucke, Sobelman
CMOS switch model, stick diagrams, restoring logic, and steering circuits. Process flows, layout design rules, and latch-up avoidance. Parasitic resistance and capacitance, delay models, design optimization, and worst-case design. Dynamic circuit techniques, including precharging, Domino CMOS, multiple-phase clocking, charge sharing, clock generation, and synchronization failure. Subsystem design, including multiplexers, registers, decoders, PLAs, finite state machines, adders, and function units.

EE 5572. VLSI Design II. (3 cr; prereq 5571 or # Vinnakota
Design methodologies, switch-level simulation, symbolic layout, and compaction. CMOS fault models, scan design, signature analysis, and built-in test. Computational unit design, including arithmetic-logic units, counters, fast multipliers, and barrel shifters. Memory architectures, RAM and ROM cells, sense amplifiers, content-addressable memory, and hardware stack. VLSI system case studies.

EE 5573. VLSI Design III. (3 cr; prereq 5572 or # Sobelman
Register files, bus structures, pipelining, and fine-grained parallelism. Control structures based on random logic. PLAs and ROMs. Multilevel control schemes and microsequencer design. RISC architectures, including overlapped register windows, delayed branching, pipeline interlocks, and hardware-software trade-offs. Memory management units and cache memory design. VLSI system case studies.

EE 5574-5575†, Computer-Aided VLSI Design Laboratory. (3 cr per qtr; prereq IT sr or IT adult spec or grad IT major, # and 5571 or #5571 for 5574, 5574 and 5572 or #5572 for 5575) Lucke, Sobelman
Creative use of design aids in parameter extraction, schematic capture, chip layout, channel-routing, maze-routing, multilevel simulation, and artwork verification. Complete design of integrated circuits in MOS and bipolar technologies. Designs evaluated by computer simulation.

EE 5576. VLSI Modeling and Processing. (3 cr; prereq 5572 or # Parhi
Advanced modeling and processing; arithmetic considerations. Algorithmically specialized processors: locality, pipelining, and interconnection patterns. Special algorithms for signal processing, finite element problems, and tree search (optimization).

EE 5604. Introduction to Microwave Engineering. (3 cr; prereq EE sr or grad IT major, 3111 or equiv) Champlin

EE 5605. Microwave Devices and Circuit Applications. (3 cr; prereq 3111, 5604 or equiv or # Champlin, Gopinath
Two-terminal devices, including varactors, p-i-n diodes, step-recovery diodes, Gunn devices and Impatt diodes for device physics and circuit applications as detectors, mixers, frequency converters, amplifiers, and oscillators. Three-terminal devices, including FETS and Hetrostructure Bipolar Transistors, device physics and circuit applications in amplifiers, oscillators, mixers, and frequency converters.
EE 5606. Antenna Theory and Design. (3 cr; prereq 3111 or #) Champlin
Fundamentals of antenna design for transmission and reception at radio and microwave frequencies. Antenna analysis techniques. Antenna applications including linear, loop, microstrip, aperture, and traveling wave antennas; broadband antennas and antenna arrays.

EE 5625. Fourier Optics. (4 cr; prereq 3011, 3111 or #) Leger
Fourier analysis of optical systems and images with applications to spatial filtering, optical information processing, and holography. Fresnel and Fraunhofer diffraction. Current topics such as speckle interferometry, hybrid (optical-digital) information processing systems, and computer-generated holograms.

EE 5630. Contemporary Optics. (4 cr; prereq 3111 or Phys 5024 or #) Leger
Fundamentals of lasers, including propagation of Gaussian beams, optical resonators, theory of laser oscillation, electro-optic and acousto-optic modulation, and nonlinear optics.

EE 5631. Photonic Devices. (3 cr; prereq EE sr or grad IT major, 5630 or 5661) Higman, Ruden
Optical properties of semiconductors, light-emitting diodes, lasers, and photodetectors.

EE 5634. Physical Optics: Applications and Techniques. (3 cr; prereq 5625 or #) Leger

EE 5635. Optical System Design. (3 cr; prereq IT sr or grad IT major) Nussbaum

EE 5636. Optical Fiber Communication. (3 cr; prereq 3011, 3111 or #) Gopinath

EE 5637. Physical Optics Laboratory. (3 cr; prereq 5625 or #) Leger
Fundamental optical techniques, diffraction, optical pattern recognition, spatial and temporal coherence, speckle; interferometry, coherent and incoherent imaging, coherent image processing, and fiber optics. Also includes lab experiments at local industries.

EE 5650. Physical Methods in Solid State Materials I. (3 cr; prereq EE sr or adult spec or grad student, 3111) Cohen
Basic concepts in classical and statistical mechanics relevant to properties of solid state materials. Hamiltonian dynamics, statistical ensembles, phase space, partition function, classical and quantum statistics, relation between statistical mechanics and thermodynamics, Boltzmann transport theory.

EE 5651. Physical Methods in Solid State Materials II. (3 cr; prereq 5650 or #) Cohen
Application of quantum theory to solid state materials. Schrödinger’s equation, one-dimensional problems, angular momentum, central forces, scattering, spin, atomic and chemical structure. Crystal structure in solids, lattice vibrations and phonons, energy bands.

EE 5652. Physical Methods in Solid State Materials III. (3 cr; prereq 5651 or #) Nathan, Ruden

EE 5661. Semiconductor Properties and Devices I. (3 cr; prereq EE sr or adult spec or grad student, 5650, 3111 or #) Chou, Nathan

EE 5662. Semiconductor Properties and Devices II. (3 cr; prereq EE sr or adult spec or grad student, 5661) Chou, Nathan, Ruden

EE 5666-5667. Magnetic Properties of Materials and Applications. (3 cr per qtr; prereq #)
5666: Magnetic measurement techniques, physical principles of magnetism, and properties of magnetic materials with applications. 5667: Physical principles of crystalline and induced magnetic anisotropy, magnetostriction, magnetic domains and the magnetization process, fine particles and thin films and magnetization dynamics.

EE 5669. Magnetic Recording. (3 cr; prereq #)
Judy, Zhu
Review of fundamental magnetic concepts relevant to magnetic recording. Introduction to basic models of longitudinal and perpendicular magnetic recording and reproduction processes. Comparison of design, fabrication, and performance of conventional and thin film heads, tapes, disks, and recording systems.
EE 5670. Basic Microelectronics. (3 cr; 5670-5672; prereq EE sr or adult spec or grad student) Campbell
Experimental and theoretical studies of the basic physical processes used in microelectronic device fabrication. Transistor and integrated-circuit layout, fabrication, and evaluation.

EE 5672. Basic Microelectronics Laboratory. (1 cr; prereq IT sr or adult spec or grad student, 5670 or 5670-T) Campbell
Students fabricate a polysilicon gate, single-layer metal, NMOS chip, performing about 80 percent of processing, including photolithography, diffusion, oxidation, and etching. In-process measurement results compared with final electrical test results. Simple circuits used to estimate technology performance.

EE 5673. Advanced Microelectronics. (3 cr; prereq IT sr or adult spec or grad IT student, 5670, 5672 or 5670-T) Campbell
Integration of unit processes into a fabrication technology; physics and chemistry of advanced techniques such as molecular beam epitaxy, electron beam lithography, and reactive ion etching.

EE 5680. Principles of Thin Film Technology. (4 cr; prereq IT sr or grad IT major) Judy
Introduction to principles of fabrication, characterization, and processing of thin films for engineering applications. High-vacuum systems, thin film deposition techniques, energetics and kinetics of thin film formation, and electrical, dielectric, magnetic, optical, and piezoelectric properties of thin films. Lab.

EE 5700. Information Theory and Coding. (3 cr; prereq Stat 3091 or #; IT sr or EE adult spec or grad student) Kieffer, Nelson
Discrete information sources and channels, source encoding, the binary channel and Shannon’s second theorem. Block codes for the binary channel.

EE 5702. Stochastic Processes and Optimum Filtering. (3 cr; prereq Stat 3091, grad standing or #) Kieffer
Stochastic processes, linear system response to stochastic inputs. Gaussian process, Markov process. Linear filtering, maximum-likelihood estimate, stochastic control.

EE 5704. Digital Communication. (3 cr; prereq 5203, Stat 3091, upper div EE major or grad IT major or #) Moon
Theory and techniques: channel capacity, modulation and detection, data transmission over channels with large intersymbol interference, optimal and suboptimal sequence detection, equalization, error correction coding, and trellis-coded modulation.

EE 5712. Kalman Filtering and Applications. (3 cr; prereq grad student, 5702, Stat 3091 or #) Bailey, E B Lee
Mathematical description of random signals; response of linear systems to random inputs. Discrete Kalman filter; applications. Continuous Kalman filter; smoothing; nonlinear extensions.

EE 5750. Topics in Linear Systems. (3 cr; prereq grad student, Math 5242 or #) E B Lee, Tannenbaum
State variable and input/output models of linear systems. Controllability, observability, stability, minimality, and structure. State variable feedback and observers.

EE 5751. Linear Optimal Control. (3 cr; prereq grad IT major, 5750, Math 5243 or Math 5243 or #) Georgiou, E B Lee

EE 5752. Computer-Aided Design of Control Systems. (3 cr; prereq grad IT major, 5751 or #) Tannenbaum, Teel

EE 5760. Biological System Modeling and Analysis. (4 cr; prereq #) Holte

EE 5802. Electric Power System Analysis. (3 cr; prereq 3010, 5300, 5310, IT sr or grad IT major or IT adult spec or #) Wollenberg
Formulating equations for describing electric power networks. Advanced computer methods for large-scale electric power systems. Application to power-flow, faulted system calculations, and stability studies.

EE 5803-5804. Power Generation, Operation, and Control. (3 cr per qtr; prereq grad IT major, 5802 or #) Wollenberg
Economic dispatch of generation units, transmission system loss models, unit scheduling via dynamic programming and Lagrange relaxation algorithms, fuel and hydro scheduling via linear programming and transportation algorithms, energy production costing algorithms, evaluation of energy transactions between suppliers, energy management systems, real time control of generating units, system security evaluation, state estimation techniques, optimal power flow algorithms.

EE 5805. Electric Power System Engineering. (3 cr; prereq 3010, 5300, 5310, IT sr or grad IT major or IT adult spec or #) Wollenberg
Control of large power systems. Power system overvoltages and transients caused by faults, switching surges, and lightning. AC and DC electric power transmission and distribution; overhead and underground. Environmental impact of electrical energy systems. Current research topics.
EE 5807. Power System Protection. (3 cr; prereq 3010, 5300, 5310, IT sr or grad IT major or IT adult spec or #) Wollenberg

EE 5814. Switched Mode Power Electronics I. (3 cr; prereq IT sr or IT adult spec or grad IT major, 3061, 3402 or #) Mohan
Overview of power capabilities and switching speeds of power semiconductor devices. Generic converter topologies and regulation techniques. Application and design of generic circuits such as switching power supplies, inverter devices for motors, battery chargers, uninterruptible power supplies, wind/photovoltaic inverters.

EE 5815. Switched Mode Power Electronics II. (3 cr; prereq IT sr or IT adult spec or grad IT major, 5814 or #) Champlin, Robbins
Limitations and methods of increasing power capabilities of switching devices. Device physics, switching characteristics, gate/base drives, stress reduction and loss considerations in using devices such as BJTs, MOSFETs, Gate-Turn-Off Thyristors. Future developments. Passive components and circuit layout in switched mode power electronics.

EE 5816. Switched Mode Power Electronics Laboratory. (2 cr; prereq IT sr or IT adult spec or grad IT major, 5815 or #) Mohan
Switching characteristics of power semiconductor devices. Gate/base drives and snubbers. DC to DC converter circuits. Design and control of a switching power supply. Drives for DC-, induction-, “brushless” DC-, and stepper-motors. Battery chargers and uninterruptible power supplies. Other residential and industrial applications.

EE 5820. Electromechanical System Dynamics. (3 cr; prereq #) Riaz

EE 5825. Finite-Element Methods in Electrical Engineering. (3 cr; prereq # grad IT major or EE sr) Riaz

EE 5851. Applied Switching Theory. (3 cr; prereq 3351, 3352 or #) Vinnakota
Review of traditional logic design methods; algorithmic state machine method; synthesis of sequential synchronous and asynchronous machines; synthesis by programmable devices; linear sequential circuits; Von Neumann architectures; register transfer language; hardware description in RTL.

EE 5852-5853. Computer Organization and Design I-II. (3 cr per qtr; prereq 3351, 3352, ¶5851) Cherkassky, Dutt, O ’Keefe
Digital computer organization; register-level simulation; control unit design; microprogramming; memory organization. Input-output techniques; arithmetic unit design; features of larger computers.

EE 5854. Advanced Computer Networks. (3 cr; prereq grad IT major or EE adult spec student, CSci 5211 or #) Cherkassky
International Standards Organization (ISO) network architecture; topology analysis; data communication; satellite and packet radio networks; distributed systems and case studies.

EE 5858. Computer Architecture. (3 cr; prereq IT sr or adult spec or IT grad student, 5853 or #) Kain, G H Lee
Conventional and unconventional uniprocessor system design options. Impact of software on system architecture. Instruction set selection and architectural consequences. Memory systems, including segmentation, paging, and cache memories. Control unit design. Object manipulation structures. Examples from current and historically important designs.

EE 5860. Microcomputer Architecture. (4 cr; prereq grad IT major, 5355 or #) O’Keefe
Advanced microprocessor organization, 16- and 32-bit microprocessors, microprocessor bus structures, exception processing, interrupts, and virtual memory. Coprocessor organizations and multiprocessor systems. Design for testability. Integral lab.

EE 5863. Computer Systems Performance Analysis. (4 cr; prereq 5858, grad IT major or #) Lilja
Tools and techniques for measuring and analyzing computer hardware, software, and system performance; benchmark programs, measurement tools, performance metrics; presenting data, summarizing measured data, comparing system performance; deterministic and probabilistic simulation techniques, random number generation and testing; bottleneck analysis.

EE 5865. Coding Techniques and Applications. (3 cr; prereq grad IT major or #) Kinney
Linear error detecting/correcting codes, application to computers, polynomial description of codes, cyclic codes, encoder and decoder circuits, application to magnetic tapes, random test vector generation for self-test, signature analysis for data compression.

EE 5874. Simulation and Test in Digital Design. (3 cr; prereq 5851, CSci 3113 or equiv, IT sr or grad IT major or IT adult spec) Vinnakota
Theory and practice of simulation and test generation algorithms in digital design.

EE 5952. Special Topics in Electrical Engineering. (1-3 cr; prereq grad IT major or adult spec or #)
Topics vary according to needs and staff.
EE 8060. Advanced Bipolar Transistor Theory. (3 cr; prereq 5660 or 5661 or #) Chou
Recent developments in device modeling with emphasis on bipolar junction transistors. High-level effects in base and collector regions and their interrelationship.

EE 8090. Electronics Seminar. (Cr ar [may be repeated for cr]; prereq #) Current literature; individual assignments.


EE 8140. Seminar: Plasma Physics. (Cr ar [may be repeated for cr]; prereq #) Current literature; individual assignments.

EE 8143. Seminar: Modern Optics. (Cr ar [may be repeated for cr]; prereq #) Current literature; individual assignments.

EE 8153-8154. Properties of Semiconductors. (3 cr per qtr; prereq #) Chou, Nathan, Ruden Application of modern solid-state theory to study of specific semiconductor materials. Influence of band structure and scattering mechanisms upon the electrical, optical, thermal, and thermoelectric properties. Plasma effects in semiconductors at low and high frequency. Mathematical treatments of generation-recombination kinetics, carrier injection, drift and diffusion. Use of semiconductor properties in devices, especially devices of current importance.


EE 8164. Quantum Electronics II (Guided Wave Optics). (3 cr; prereq 5630, grad IT major or #) Gopinath Planar optical wave guides and optical fibers, ray and wave analysis. Nonlinearities, nonlinear devices, modulators, switches, solitons, optical fiber amplifiers, and active planar amplifiers.

EE 8185. Low Power Analog Circuit Design. (3 cr; prereq grad IT major, 5505, 5506 or #) Harjani Advanced techniques for designing CMOS analog integrated circuits. Emphasis on low power and low voltage design techniques. Weak inversion models, advanced opamp topologies, low power comparator design, low power data converters.

EE 8190. Seminar: Quantum Electronics. (Cr ar [may be repeated for cr]; prereq #) Current literature; individual assignments.

EE 8191. Seminar: Surface Physics. (Cr ar [may be repeated for cr]; prereq #) Current literature; individual assignments.

EE 8192. Seminar: Magnetics. (Cr ar [may be repeated for cr]; prereq #) Current literature; individual assignments.

EE 8203-8204. Signal Detection and Estimation Theory With Applications. (3 cr per qtr; prereq 5702 or #) Kaveh, Nelson Risk theory approach to detection and estimation, random process representation, signal parameter estimation. Waveform estimation; detection of phase, frequency, and delay in signals. Applications to communications and radar-sonar signal design and processing.

EE 8205. Image Processing and Applications. (3 cr; prereq grad student, 5002, 5700 or #) Tannenbaum, Tewfik Two-dimensional digital filtering and transforms, application to image enhancement, restoration, compression and segmentation.

EE 8207. VLSI Digital Signal Processing Architectures. (3 cr; prereq grad IT major, 5571 or #) Lucke, Parhi Characteristics of DSP computations; iteration bound; high-level transformations such as unfolding, pipelining and retiming; implementation of computer arithmetic structures; carry-save arithmetic; canonic signed digit number systems; high-level synthesis of bit-serial systems; synthesis of dedicated DSP architectures.

EE 8211. Coding Theory. (3 cr; prereq 5700 or #) Sobelman Error correcting codes; cyclic codes, finite fields, and BCH codes; majority logic decoding; burst error correction, convolutional codes.

EE 8220. Topics in Statistical Theory of Communication. (3 cr {may be repeated for cr with #}; prereq 5700, 5702 or #) Selected special topics associated with recent advances in statistical communication theory.

EE 8240. Seminar: Communication. (Cr ar [may be repeated for cr]; prereq #) Current literature; individual assignments.

EE 8250-8251-8252. Advanced Control Topics. (3 cr per qtr; prereq # E B Lee, Tannenbaum, Teel Adaptive and learning systems, discrete systems, invariance, optimum control of deterministic and stochastic processes, modeling of physical systems, and stability of dynamical systems.

EE 8257, 8258. Advanced Systems Theory I, II. (3 cr per qtr; prereq grad IT major, # Georgiou Generalized linear systems: applications, structural properties, computational approaches, classification, functorial behavior, and synthesis.
EE 8260. Topics in Nonlinear Systems. (3 cr; prereq #)
Current topics in stability analysis of nonlinear systems, design of controllers for nonlinear systems, discrete-time and stochastic nonlinear systems.

EE 8290. Seminar: Control Theory. (Cr ar [may be repeated for cr]; prereq #)
Current literature; individual assignments.

EE 8291. Seminar: System Theory. (Cr ar [may be repeated for cr]; prereq #)
Current literature; individual assignments.

EE 8305. Sparse Matrix Methods in Power System Analysis. (3 cr; prereq 5802, grad IT major or #) Wollenberg
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 8340. Seminar: Electric Power. (Cr ar [may be repeated for cr]; prereq grad IT major or #)
Current literature, individual assignments in the areas of power systems and electromechanics.

EE 8341. Seminar: Energy Conversion. (Cr ar [may be repeated for cr]; prereq grad IT major or #)
Physical processes involved in converting nonelectrical energy to electrical energy and devices that exploit these processes.

EE 8342. Power Electronics: Utility Applications. (3 cr; prereq 5814, grad IT major or #) Mohan
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 8352. Fault Diagnosis and Reliable Design. (3 cr; prereq #) Kinney
Generation of fault tests for combinational and sequential machines; experiments on sequential machines; simulation techniques; redundancy techniques; linear sequential circuits and codes; current topics.

EE 8353. Sequential Circuit Theory. (3 cr; prereq #) Kinney
Analysis and synthesis of asynchronous sequential circuits; algebra of partitions; simplification of incompletely specified sequential machines; state assignments; current topics.

EE 8359. Computing With Neural Networks. (3 cr; prereq EE or Math or CSci grad student or #) Cherkassky
Neural networks as computation model. Relationship to AI, statistics, and algorithmic computing. Neural network models and learning rules. Applications to associative recognition/retrieval, optimization, expert systems. Software/hardware implementations and scaling issues.

EE 8362. Advanced Computer Architecture. (3 cr; prereq grad IT major, 8355, 8356 or #) G H Lee

EE 8363-8364. Parallel Processing I, II. (3 cr per qtr; prereq grad IT major, 5858 or #) Dutt, G H Lee
Parallel computer organization and architecture; shared and distributed memory architectures; synchronization techniques; static and dynamic scheduling; hardware/software interaction in parallel systems; parallel system software and compilers; example parallel machines and performance evaluation; I/O, networks, and secure computer design.

EE 8370. Design of Intelligent Systems. (3 cr) Cherkassky
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 8390. Computer Systems Seminar. (Cr ar [may be repeated for cr]; prereq grad IT major or #)
Current literature; individual assignments.

EE 8450. Special Investigations. (1-4 cr [may be repeated for cr]; prereq #)
Studies of approved topics, theoretical or experimental in nature.

EE 8451. Advanced Topics in Electrical Engineering. (Cr ar [may be repeated for cr]; prereq #)
Topics vary according to needs and available staff.

EE 8460-8461. Plan B Project. (4 cr per qtr [no cr toward PhD]; may be taken to satisfy requirement for Plan B master’s degree, may appear on master’s program but may not be applied toward 20-cr minimum in major field; prereq EE grad student)
Project topic(s) arranged between student and adviser. Written report(s).

EE 8490-8491-8492. Graduate Seminar. (1 cr per qtr [may be repeated for cr]; prereq grad student or staff)
Recent developments in electrical engineering and related disciplines.

Elementary Education
See Curriculum and Instruction.
English

**Professor:** Shirley N. Garner, *chair*; Madelon Sprengeroth, *director, creative writing program*; Kent Bales; Michael Dennis Browne; Thomas S. Clayton; Geneviève J. Escombe; Michael Hancher; Gordon D. Hirsch; Karen N. Hoyle; Klaus P. Jankofsky; Richard J. Kelly; Calvin B. Kendall; Toni A. H. McNaron; Valerie J. Miner; Marcia Pankake; Paula Rabinowitz; Peter J. Reed; Donald Ross, Jr.; Marty Roth; Robert Solotaroff; Ellen J. Stekert; David J. Wallace; Joel C. Weinsheimer

**Associate Professor:** Rita Copeland, *director of graduate studies*; Christopher Anson; Lillian Bridwell-Bowles; Robert L. Brown, Jr.; Maria Damon; Andrew Elfenbein; Maria J. Fitzgerald; Arthur I. Geffen; David B. Haley; Archibald I. Leyasmeier; Ellen Messer-Davidow; John W. Mowitt; Angelita D. Reyes; Charles J. Sugnet; John A. Watkins; John S. Wright

**Assistant Professor:** Josephine D. Lee; David B. Luke

**Lecturer:** Marisha Chamberlain; Kathleen Coscran; Samuel R. Delany; John Engman; Katharine V. Green; Janet Holmes; James Moore; David A. Mura; Sheila M. O’Connor; Alexis D. Pate; Julie Schumacher; Susan Welch

**Other:** Stephanie C. Van D’Elden

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

**Degrees Offered**—M.A. (Plan B only), M.F.A., and Ph.D.

**Curriculum**—Course requirements for the Ph.D. program are broadly defined, allowing the student to shape a personal program of study. The English program encourages and supports interdisciplinary work. Three emphases are available in the master’s program: language and literature; literary genre; and English language and linguistics. The M.F.A. program requires coursework in English and writing and emphasizes intensive work on a creative project. The M.A. programs in literary genre and the M.F.A. program in creative writing may be completed through University College (formerly Continuing Education and Extension), which schedules mainly late afternoon and evening classes.

**Admission to the Program**—Holders of a bachelor’s degree may apply either to the master’s program or to the doctoral program. An M.A. degree, but not an M.F.A. degree, can be gained en route to the Ph.D. degree. Admission to the master’s program ordinarily is restricted to those having immediate career objectives for which an M.A. in English is important. However, M.A. candidates who wish to continue their studies may apply for admission to the Ph.D. program.

**Prerequisites for Admission**—A minimum of 16 credits in English, 12 of which must be at the upper division level, is required. The courses should be widely distributed.

**Special Application Requirements**—Three letters of recommendation; scores from the General Test of the Graduate Record Examination; a short essay explaining scholarly, professional, and personal goals and reason for choosing the University of Minnesota; and a writing sample, such as a course paper, are required. Applications to the M.F.A. in creative writing are reviewed by the writing faculty; these applications should include a substantial portfolio of writing in place of the usual writing sample. Candidates for all degrees are admitted fall quarter only; all materials must be received by December 20.

**Master’s Degree Requirements**—The minimum requirement is 44 credits (normally 11 courses).

For the master’s degree with an emphasis on language and literature—the degree program with an historical emphasis—coursework must include at least 36 credits (nine courses) in English, of which 8 credits (two courses) are at the 8xxx level, including 4 credits (one course) at the seminar level; 8 credits (two courses) in related fields outside of English; and three Plan B papers.

For the master’s degree with an emphasis on literary genre—the degree program with a literary problems or theoretical emphasis—coursework must include Engl 8012; 4 credits (one course) in English language or English linguistics; 16 credits (four courses) in literary genres, such as poetry, the novel, drama, literary theory, and nonfictional prose (three of the four courses to be devoted to the same genre); 8 credits (two courses) in related fields outside
of English; three elective courses in English or related fields; and three Plan B papers.

For the master’s degree with an emphasis on English language and linguistics, coursework must include at least 44 credits (eleven courses), of which at least 24 credits (six courses) are in English (specifically including Engl 5815, Engl 5851, and Engl 5843) and at least 8 credits (two courses) are in related fields outside of English; and three Plan B papers.

The written examination for the master’s program (all emphases except English language and linguistics) is administered twice a year, in the fall and the spring. The written examination for the emphasis in English language and linguistics is administered separately.

**Master of Fine Arts Degree Requirements**—The minimum requirement is 68 credits, which includes 16 creative project credits.

Coursework must include 4 credits (one course) in a multi-genre writing seminar, preferably taken during the first quarter of study; 20 credits (five courses) in writing, including one seminar and one course outside the primary genre; 20 credits (five courses) in language and literature; 8 credits (two courses) in related fields outside of English, including one in a related artistic field; 16 creative project credits, including 8 credits in a manuscript preparation workshop and 8 credits of creative project registration; and an M.F.A. essay based on a list of twenty books chosen biannually by the creative writing faculty. The M.F.A. essay is administered once yearly at the beginning of spring quarter.

**Doctoral Degree Requirements**—The following courses are required: Engl 8011 and 8012, preferably during the first year of doctoral study; four courses, distributed among broad areas; four additional English courses in a focused area of emphasis; and two extra-departmental courses related to the area of emphasis. Students are encouraged to enroll in additional courses as appropriate.

All doctoral students must take a preliminary written examination and a preliminary oral examination; both are based on a reading list of approximately 50 to 75 works defining a research program that the student constructs in consultation with his or her examining committee. A dissertation and a final oral examination in defense of the dissertation complete the program.

**Language Requirements**—For the master’s program, a reading knowledge of one classical or modern language approved by the director of graduate studies is required. For the doctorate, a reading knowledge of two languages, classical or modern, approved by the director of graduate studies, is required. The master of fine arts degree does not have a language requirement.

**Minor Requirements for Students Majoring in Other Fields**—A minimum of 16 undergraduate credits in English literature is a prerequisite for undertaking a minor in English.

For a master’s program minor, a minimum of 16 graduate credits in English is required. For a doctoral program minor, a minimum of 20 graduate credits in English is required. Students should consult the director of graduate studies for advice in selecting courses.

**For Further Information and Applications**—Contact the Director of Graduate Studies, Department of English, University of Minnesota, 209 Lind Hall, 207 Church Street S.E., Minneapolis, MN 55455 (612/625-3882; http://english.cla.umn.edu).

Engl 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

Engl 8888. Thesis Credits: Doctoral. (36 cr required)

**English (Engl)**

Recent course offerings typically include many specialized courses under the “seminar,” “topics,” and “studies” numbers. For a current listing of these courses, contact the director of graduate studies.

Engl 5131. Renaissance Poetry. (4 cr; offered alt yrs) Watkins
Historical and intellectual background; poetic theory; major figures, including Wyatt, Sidney, Spenser, Donne, Herbert, and Jonson.

Engl 5133. Nineteenth-Century British Poetry. (4 cr; offered alt yrs) Elfenbein
Historical and intellectual background; poetic theory; major figures, including Wordsworth, Coleridge, Keats, R. Browning, E. B. Browning, Tennyson, and Arnold.

Novels by such authors as Defoe, Richardson, Fielding, Smollett, Sterne, and Austen.
Novels by such authors as Scott, Dickens, the Brontës, Thackeray, Eliot, and Hardy.

Engl 5153. Twentieth-Century English Novel. (4 cr) Reed
Novels by such modern authors as Conrad, Ford, Joyce, Woolf, Lawrence, Forster, Cary, and Waugh.

Engl 5171. English Drama to the Time of Shakespeare. (4 cr; prereq 3241 or 3242, grad student or Engl undergrad major or Δ; offered alt yrs) Mystery plays, moralities, interludes, academic and court plays; plays of Kyd, Marlowe, Lyly, Greene, and Peele.

Engl 5173. Restoration and 18th-Century Drama. (4 cr; prereq 3241 or 3242) Haley
The heroic play, tragedy, comedy of manners, and sentimental comedy.

Engl 5174. Modern Drama, 1880-1920. (4 cr; offered alt yrs) Lee, Leyasmeyer
Beginnings of modern realism, naturalism, and expressionism in English and Continental drama.

Engl 5175. Modern Drama Since 1920. (4 cr; offered alt yrs) Lee, Leyasmeyer
Survey of chief dramatists, English, American, and Continental.

Engl 5211. Old English (Anglo-Saxon). (5 cr) Kendall
Introductory study of the language to A.D. 1150. Selected readings in prose and poetry. Some attention to the culture of the Anglo-Saxons.

Engl 5212. Readings in Old English Prose and Verse. (4 cr; prereq 5211) Kendall
Critical reading of texts, introduction to versification.

Engl 5213. Beowulf. (4 cr) Kendall
Introduction to the Old English poem, with reading of considerable portions of text.

Engl 5215. Major Types of Middle English Literature. (4 cr) Copeland, Wallace
Readings in Middle English, in romance, lyric, allegory, and devotional prose.

Engl 5221. Chaucer. (5 cr; prereq grad student or Engl undergrad major or Δ) Wallace
Reading of Chaucer’s works and introduction to Chaucer’s language. Prerequisite for all courses in Middle English literature (5215-5222).

Engl 5261. Milton. (4 cr) McNaron
Paradise Lost, Samson Agonistes, minor poems, Areopagitica, and often, though not always, Paradise Regained.

Engl 5363, 5364. James Joyce. (4 cr per qtr) 5363: Life and early works, particularly Dubliners, A Portrait of the Artist as a Young Man, and the first four episodes of Ulysses. 5364: Ulysses and Finnegans Wake.

Engl 5414. Contemporary American Literature. (4 cr) Important authors, intellectual currents, movements, conventions, genres, and themes since 1940.

Engl 5431, 5432, 5433. American Poetry. (4 cr per qtr) Bales, Damon, Puria, Geffen, Griffin

Engl 5451, 5452. American Novel. (4 cr; prereq grad student or Engl undergrad major or Δ) Bales, Geffen, Griffin, Ross, Roth
Typical authors: Hawthorne, Melville, Stowe, Twain, James, Dreiser, Cather, Hemingway, Fitzgerald, Faulkner.

Engl 5471. American Drama. (4 cr; prereq grad student or Engl undergrad major or Δ) Geffen

Engl 5481, 5482, 5483. Folksong. (4 cr per qtr; prereq 5481 or 5482 for 5483) Stekert
5481: Folklore genres such as proverbs, oral prose narratives (tales and legends), foodways, and games. Outline of the history of folklore. 5482: Manner in which folklore is transmitted and changed with concentration on how folklore functions in literature, the mass media, and everyday activity. Emphasis on folk customs, festivals, heroes, humor, and medicine. 5483: Training in collection of folklore materials.

Engl 5486-5487. Introduction to Anglo- and African-American Folksong. (4 cr per qtr; prereq 5486 or # for 5487, grad student or Engl undergrad major or Δ; offered alt yrs) Stekert
5486: Introduction to Anglo- and Afro-American folksong: basic elements of the folksong with emphasis on how folksongs change over time and space; concentration on such genres as ballads, blues, broadsides, lyric, and sentimental and topical songs. 5487: Development of Anglo- and Afro-American folksong: how these two streams of American folksong influenced one another as well as the “folksong revival.”

Engl 5593. The Afro-American Novel. (4 cr, §Afro 5593; offered alt yrs) Wright
Contextual readings of 19th- and 20th-century black novelists such as Charles Chesnutt, James Weldon Johnson, Zora Neale Hurston, Richard Wright, Chester Himes, Ann Petry, James Baldwin, John Williams, Toni Morrison, and Ishmael Reed.

Engl 5597. The Harlem Renaissance. (4 cr, §Afro 5597; offered alt yrs) Wright
Multidisciplinary review of Harlem Renaissance of Jazz Age: literature, popular culture, visual arts, political journalism, and black and white figures such as Jean Toomer, Claude McKay, Langston Hughes, Bessie Smith, DuBose Heyward, Carl Van Vechten, Eugene O’Neill, and Marcus Garvey.
**Engl 5620. British and American Women Writers.** (4 cr per qtr; prereq grad student or Engl undergrad major or ∆; offered alt yrs) Garner, McNaron, Rabinowitz, Sprengnether
Readings of one or more women writers, perhaps working at various times within various forms. Writers specified in the *Class Schedule.*

**Engl 5651. Techniques of Poetry.** (4 cr)
Analysis of poetry. Form and sound; meter, stanza, euphony, free verse.

**Engl 5671. Theory of the Novel.** (4 cr) Firchow, Rabinowitz
Readings in theoretical criticism of the novel with application to selected British and American fiction.

**Engl 5711. Classics of Literary Criticism.** (4 cr, §3711, §ClCv 3711, §ClCv 5711) Copeland, Hancher
Principles of criticism as expressed and used in selected major works in classic critical tradition by such writers as Plato, Aristotle, Horace, Longinus, Sidney, Dryden, Johnson, Hume, Coleridge, and Eliot.

**Engl 5714. Modern and Contemporary Critical Theory.** (4 cr) Mowitt
Readings in modern and postmodern literary criticism, with attention to contemporary movements, theory, and practice.

**Engl 5811. Celtic World.** (4 cr; offered alt yrs)
Survey of history, folklore, and literature of the six Celtic countries: Brittany, Cornwall, Ireland, Isle of Man, Scotland, and Wales.

**Engl 5815. History of the English Language.** (4 cr)
The development of the English language from Old to Early Modern English: phonology, morphology, and syntax.

**Engl 5831. Development of American English.** (4 cr; offered alt yrs)
History of the English language in the United States; significant regional variation.

**Engl 5843. American Social Dialects.** (4 cr)
Escure
Methods for and results of investigating social and class variation in American English; emphasis on urban dialects.

**Engl 5851. Structure of Modern English.** (4 cr, §3851) Anson, Bridwell-Bowles, Brown, Escure
Survey of modern English grammar dealing with English phonology, syntax, and semantics; variations and change in English.

**Engl 5852-5853-5854. Modern Irish Language.** (5 cr per qtr; prereq grad student or Engl undergrad major or ∆ for 5852) Stenson
Grammatical structures of modern Irish dialect of Connemara, Co. Galway; development of skills in both oral and written language: vocabulary, manipulation of grammatical structures, speaking, listening, reading and writing practice; modern Gaelic culture.

**Engl 5862. World Englishes.** (4 cr) Escure
Development, significance, and linguistic characteristics of varieties of English spoken in non-western countries (Caribbean, Central America, Africa, Asia). Pidgins, creoles, and local standards included with reference to issues of cultural identity and language nativization.

**Engl 5910. Topics in English and North American Literature.** (4 cr)
Topics specified in *Class Schedule.*

**Engl 5920. Topics in Anglophone Literature.** (4 cr)
Topics specified in *Class Schedule.*

**Engl 5940. Figures in English and North American Literature.** (4 cr)
Figures specified in *Class Schedule.*

**Engl 5950. Figures in Anglophone Literature.** (4 cr)
Figures specified in *Class Schedule.*

**Engl 8011. Introduction to Advanced Literary Study.** (4 cr)
Ends and methods of literary research, including professional literary criticism, analytical bibliography, and textual criticism, with attention to basic reference works, critical and scholarly journals, bibliographies of broad and narrow literary subjects, and forms of presenting results of critical and scholarly investigation.

**Engl 8012. Problems in Literary History and Theory.** (4 cr) Bales, Messer-Davidow, Mowitt, Rabinowitz, Weinsheimer
Approaches to practical and theoretical problems of literary history and genre.

**Engl 8050. Studies in Special Subjects.** (2-4 cr [max 12 cr])
Topics specified in *Class Schedule.*

**Engl 8111 through 8119. Proseminars.** (4 cr each)
Wide reading in the literature of a given period or subject designed to prepare graduate students for work in other graduate courses or seminars. Attention to relevant scholarship or criticism.

**Engl 8111. Proseminar in Medieval Studies (Copeland)**

**Engl 8115. Proseminar in the English Romantic Movement (Elfenbein)**

**Engl 8116. Proseminar in Victorian Studies (Hirsch)**

**Engl 8117. Proseminar in Early American Literature (Griffin)**

**Engl 8118. Proseminar in 19th-Century American Literature (Bales, Ross)**

**Engl 8119. Proseminar in 20th-Century British and American Literature (Solotaroff)**
Engl 8210 through 8810. Seminars. (4 cr each)
Descriptive title specified in the Class Schedule.

Engl 8210. Medieval Studies (Copeland, Kendall, Wallace)
Engl 8220. Chaucer (Wallace)
Engl 8230. Renaissance Studies (Watkins)
Engl 8240. Shakespeare (Clayton, Garner)
Engl 8250. Seventeenth-Century Studies (Haley)
Engl 8330. Victorian Studies (Hancher, Hirsch)
Engl 8480. Studies in Folklore (Stekert)
Engl 8510. Studies in Early American Literature (Griffin)
Engl 8530. Studies in 19th-Century American Literature (Ross, Roth)
Engl 8590. Studies in Afro-American Literature (Wright)
Engl 8610. Studies in 20th-Century British and American Literature (Furia, McNaron, Solotaroff)
Engl 8650. Studies in Poetry (Damon, Furia)
Engl 8670. Studies in Prose Fiction (Solotaroff)
Engl 8690. Studies in Drama (Lee)
Engl 8710. Studies in Criticism (Hancher, Messer-Davidow, Rabinowitz, Weinsheimer)
Engl 8720. Studies in Feminist Criticism (Rabinowitz, Sprengnether)
Engl 8810. Studies in the English Language (Anson, Bridwell-Bowles, Brown, Escure)
Engl 8970. Independent Reading (1-15 cr; prereq #, ∆)

English Creative and Professional Writing (EngW)

EngW 5101, 5102, 5103. Advanced Fiction Writing. (4 cr per qtr; prereq ∆) Fitzgerald, Miner
Advanced workshop for students with considerable experience in writing fiction.

EngW 5105, 5106, 5107. Advanced Poetry Writing. (4 cr per qtr; prereq ∆) Browne
Advanced workshop for students with considerable experience in writing poetry. Opportunity for students to open their work to new possibilities and to read widely in contemporary poetry and poetics.

EngW 5110. Topics in Advanced Fiction Writing. (4 cr; prereq ∆) Fitzgerald, Miner
Workshops by Edelstein-Keller visiting writers. See the Class Schedule for particular topics.

EngW 5120. Topics in Advanced Poetry Writing. (4 cr; prereq ∆) Hampel, Browne
Special workshops by Edelstein-Keller visiting writers. See the Class Schedule for particular topics.

EngW 5130. Topics in Advanced Creative Writing. (4 cr; prereq Engl grad student or ∆)
Workshop in areas other than fiction, poetry, and nonfiction.

EngW 5201, 5202. Memoir Writing. (4 cr per qtr; prereq ∆) Hampel
Autobiographical prose writing. Students read numerous memoirs, consider aspects of memory and imagination and the memoir genre, and write their own autobiographical pieces.

EngW 5204, 5205. Advanced Playwriting. (4 cr per qtr; prereq ∆)
Advanced workshop for students with creative writing experience and interest in writing for stage or screen. Step-by-step creation of short script; field trips to local productions.

EngW 5210. Topics in Advanced Literary Nonfiction. (4 cr; prereq ∆) Sprengnether, Sugnet
Special topics in essay writing, such as arts reviewing, writing about public affairs, and writing in personal voice. See the Class Schedule for particular topics.

EngW 5310, 5320. Reading as Writers. (4 cr per qtr; prereq for 5310, Engl grad student or ∆ for 5320) Fitzgerald, Miner, Sprengnether, Sugnet
Special topics. Open to graduate and advanced undergraduate students in literature, as well as to creative writing students. See the Class Schedule for particular topics.

EngW 5401. Introduction to Professional Editing. (4 cr) Marquit, Ready
Beginning editing, from substantive editing to nature of editor-writer relationship: manuscript reading, author queries, rewrite and style, some discussion of copy editing. Editing awareness and skills developed by working on varied writing samples.

EngW 5402. Advanced Editing. (4 cr; prereq EngW 5401, #, ∆) Marquit
For students with advanced editing competence to further advance their skills. Workshop/seminar: editing long text and fiction, children’s literature, translations, and indexes.

EngW 5501. Minnesota Writing Project Institute. (4 cr; prereq writing teacher [K-college] eligible for grad cr through University College; requires nomination and competitive selection by board of Minnesota Writing Project)
Summer workshop in which participants reflect on own writing processes as they produce essays and examine current pedagogical theory and practice through readings and demonstrations.

EngW 5502. Minnesota Writing Project Open Institute. (3 cr; prereq writing teacher [K-college] eligible for grad cr through University College)
Summer workshop in which participants reflect on own writing processes as they produce essays and examine current pedagogical theory and practice through readings and demonstrations.
EngW 5570. Minnesota Writing Project: Directed Studies. (1-4 cr)
Workshops in which writing teachers investigate current theories of writing and writing pedagogy.

EngW 5970. Directed Study in Writing. (1-4 cr; prereq #, ∆)
Projects in writing poetry, fiction, drama, and nonfiction, or study of ways to improve writing.

EngW 8101. Reading Across Genres. (4 cr; prereq creative writing MFA student, ∆)
Contemporary writing in fiction, poetry, and creative nonfiction. Primarily a reading course rather than a writing workshop.

EngW 8110. Seminar: Writing of Fiction. (4 cr; prereq ∆)
Writing of fiction with focus on full-length book, e.g., a novel or collection of short stories. Some common assignments, but each student works on individual project.

EngW 8120. Seminar: Writing of Poetry. (4 cr; prereq ∆)
Writing of poetry with focus on the exploration and practice of various styles. Some common assignments, but each student works on individual project.

EngW 8130. Seminar: Writing of Literary Nonfiction. (4 cr; prereq ∆)
Advanced workshop in areas that do not fit into fiction or poetry categories exclusively. Complements EngW 8110 and EngW 8120.

EngW 8140. Fiction: Manuscript Preparation. (4-8 cr; prereq 8110, creative writing MFA student, #)
For students working on their creative project.

EngW 8150. Poetry: Manuscript Preparation. (4-8 cr; prereq 8120, creative writing MFA student, #)
For students working on their creative project.

EngW 8160. Literary Nonfiction: Manuscript Preparation. (4-8 cr; prereq 8130, creative writing MFA student, #)
For students working on their creative project.

EngW 8990. Creative Project Credits: MFA. (1-16 cr; prereq 8140 or 8150 or 8160, creative writing MFA student, #)
For students working on their creative project.

Degree Offered—M.A. (Plan A and Plan B).

Curriculum—The program offers a master’s degree for those wishing to teach English as a second or foreign language to adults at the college or university level. The major emphasis is on preparation in applied linguistics. Elective coursework allows students to specialize in a variety of areas, including second-language acquisition, English for special purposes, computer-assisted instruction, and materials development.

Prerequisites for Admission—A bachelor’s degree in the liberal arts or sciences with a strong academic record is required.

Special Application Requirements—Scores from the General (Aptitude) Test of the Graduate Record Examination, three letters of reference, and a statement of the applicant’s research interests in the field are required. Non-native speakers of English must submit scores (minimum 550) from the Test of English as a Foreign Language (TOEFL). Students may begin the program fall quarter or first summer session. Applications for both admission dates are due on March 15. Applications for financial aid must be submitted by January 15.

Master’s Degree Requirements—The requirement is 34 credits in applied coursework (TESL 5721, 5722, Ling 5001, 5002, 5301, 5701, 5741, 5742) and 8-12 additional credits of elective coursework. See the English as a Second Language Program brochure for details. A final oral examination is required.

Language Requirement—Proficiency, demonstrated by examination or coursework, in one language not native to the student is required upon completion of the program.

Minor Requirements for Students Majoring in Other Fields—TESL 5721, Ling 5001, 5301, 5741, and 5742 are required. Prospective minors must be approved by the program to be granted the status of minor. A minimum grade point average of 3.20 is required for approval.

For Further Information and Applications—Contact the Program in English as a Second Language, University of Minnesota, 192 Klaeber Court, 320 16th Avenue S.E., Minneapolis, MN 55455 (612/624-3331; fax 612/625-2312).
ESL 8777. Thesis Credits: Master's. (16 cr required; Plan A only)

Teaching English as a Second Language (TESL)

TESL 5721. English as a Second Language: Methods. (4 cr; prereq Ling 3001 or Ling 5001 or #)
Teaching methods.

TESL 5722. English as a Second Language: Practicum. (4 cr; prereq ESL major or minor, 5721, #; S-N only)
Observation of and practice in teaching English as a second language.

TESL 5723. English as a Second Language: Materials. (3 cr; prereq 5721, 5722, #; offered alt yrs)
Evaluation and preparation of teaching materials.

TESL 5910. Seminar in Teaching English as a Second Language. (4 cr; prereq #)
Topics specified in Class Schedule.

TESL 5970. Directed Studies. (1-5 cr per qtr; prereq ESL major, #)
TESL 8751. English for Special Purposes. (4 cr; prereq 5741, 5742 or #)
Critical review of the literature. Investigation of types of English used in fields such as engineering, nursing, and business.

Program Requirements
Ling 5001. Introduction to Linguistics (Gundel)
Ling 5002. Linguistic Analysis (Gundel, Kac, Stenson)
Ling 5301. Phonetics (Stemberger)
Ling 5701. Introduction to Second-Language Acquisition (Cohen, Tarone)
Ling 5741-5742. Linguistic Description of Modern English (Downing, Gundel, Tarone)
TESL 5721. English as a Second Language: Methods (Cohen, Tarone)
TESL 5722. English as a Second Language: Practicum (Cohen, Tarone)

Suggested Electives
Structure of a foreign language (not English)—See language department listings.
Cl 5362. Introduction to Computer-Based Instructional Design
Cl 5656. Reading and Writing in a Second Language
Cl 5657. Speaking and Listening in a Second Language
Cl 5658. Second Language Testing, Assessment, and Evaluation
Cl 5662. Critical Issues in Second Language Curriculum
LgTT 5101. Technology in the Language Classroom (Stenson)
Ling 5201. Introduction to Syntax (Downing, Gundel, Kac)

Entomology (Ent)

Professor: Mark E. Ascerno, head; Ann M. Fallon; Timothy J. Kurtti; Roger D. Moon; Edward B. Radcliffe; David W. Ragsdale; David D. Walgenbach

Adjunct Professor: William E. Miller

Associate Professor: Ralph W. Holzenthal, director of graduate studies; David A. Andow; William D. Hutchison; Karen A. Mesce; Kenneth R. Ostlie

Adjunct Associate Professor: Susan Palchick-Silver

Assistant Professor: Vera A. Krischik; Marla Spivak; Susan J. Weller

Adjunct Assistant Professor: Steven A. Katovich

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S. (Plan A and Plan B) and Ph.D.

Curriculum—This program is administered in the Department of Entomology. Fundamental research areas such as ecology, molecular genetics, microbiology, physiology, and systematics are available, as well as specialized or applied areas such as apiculture, biological control, economic entomology, host-plant resistance, integrated pest management, and insects related to forests, livestock and humans, plant diseases, and urban areas.

Prerequisites for Admission—A bachelor’s degree with a major in a biological science is a prerequisite. Preference is given to students with a broad background in the basic sciences.

Special Application Requirements—Three letters of recommendation are required from persons well acquainted with the student’s academic record. Graduate Record Examination scores are recommended, but not required. Students are admitted each quarter.
Degree Requirements—Requirements for the master’s and doctoral degrees beyond the Graduate School’s requirements include a core curriculum of fundamental entomology courses and two credits of Graduate Seminar. Additional requirements are flexible and are determined by the student in consultation with the adviser and other members of the student’s advisory committee. Master’s Plan A is recommended for all master’s students contemplating a career in entomological research. Written and oral preliminary examinations and final oral examinations are required for all degrees.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Requirements are flexible and are determined by the student in consultation with the director of graduate studies in entomology.

For Further Information and Applications—Contact the Department of Entomology, University of Minnesota, 219 Hodson Hall, 1980 Folwell Avenue, St. Paul, MN 55108 (612/624-3636; fax 612/625-5299; e-mail entodept@tc.umn.edu).

Ent 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

Ent 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

Ent 8888. Thesis Credits: Doctoral. (36 cr required)

Ent 5010f. Insect Morphology. (5 cr; prereq 3005 or #; offered alt yrs) Weller
Comparative study of insect structure within evolutionary and phylogenetic perspective.

Ent 5020f. Insect Taxonomy. (5 cr; prereq 3005 or equiv) Holzenthal
Identification of families of adult insects; evolution and classification of insects; techniques of collecting and curating insects; principles of phylogeny reconstruction.

Ent 5030w. Insect Physiology. (3 cr; prereq 5010, 1 biochem course or #) Kurtti, Mesce
Essential processes of insects. Includes nerve and muscle mechanisms, energy metabolism, respiration, nutrition and digestion, excretion, regulation and interactions of processes, sensory mechanisms and behavior; reproductive behavior, embryology, and postembryonic development of insects.

Ent 5040f. Insect Ecology. (4 cr; prereq Biol 5041 or EBB 5122 or #; offered alt yrs) Andow
Synthetic analysis of causes of insect diversity and of fluctuations in insect abundance. Focus on abiotic, biotic, and evolutionary mechanisms influencing insect populations and communities.

Ent 5210w. Insect Pest Management. (4 cr; prereq 1005 or #) Radcliffe
Prevention or suppression of injurious insects by comprehensive and coordinated integration of multiple control tactics, e.g., chemical, biological, cultural. Strategies to optimize dynamic integration of control methodologies in context of their economic, environmental, and social consequences.

Ent 5215s. Insects in Relation to Plant Diseases. (3 cr; prereq ent course, plant pathology course or #; offered alt yrs) Ragsdale
Insect transmission and dissemination of plant pathogens; development of plant-insect relationships; habits of principal insect vectors.

Ent 5250s. Forest and Shade Tree Entomology. (4 cr; prereq any 2 courses among the forestry, zoological, botanical, biological and/or agricultural sciences) Ascerno
Lectures and lab concerning ecology and population management of forest and shade tree insects, with emphasis on tree factors and integrated control.

Ent 5275f. Medical Entomology. (3 cr; prereq 3005 recommended; offered alt yrs) Fallon, Kurtti, Moon
Biology of arthropod vectors of human disease. Disease transmission and host, vector, and pathogen interactions.

Ent 5280w. Livestock Entomology. (4 cr) Moon
Biology and management of insects, mites, and ticks that affect domestic livestock and pets.

Ent 5310w. Sampling Biological Populations. (4 cr; prereq Stat 5021 or equiv; offered alt yrs) Moon
Design of sampling plans for study of field and lab populations of living organisms. Sampling distributions and techniques for detecting and coping with aggregation. Randomization, required sample size, and optimal resource allocation within alternative sampling designs.

Ent 5320f. Ecology of Agriculture. (4 cr; prereq 3xxx biol or environmental studies course or equiv or #; offered alt yrs) Andow
Ecological perspective on post-industrial agriculture; origins of agriculture, social functions, and ecology of contemporary and extinct agricultural systems. Soils, plant development, pest ecology, forage quality, animal production, and food quality as an interactive network.

Ent 5350f. Insect Pathology. (3 cr; prereq 5030; offered alt yrs) Kurtti
Survey of major pathogenic microorganisms that cause diseases in insects; routes of infection of insects; lab propagation of disease agents; factors in application of disease to control of pest insects with safety considerations.
Ent 5360. Aquatic Insects. (3 cr; prereq 3005 or equiv or #; offered alt yrs and Itasca summer session I) Holzenthal
Taxonomy and natural history of aquatic insects, including their importance in aquatic ecology, resource management, recreation, and conservation. Family-level identification. Field trips to local aquatic habitats. Collection required.

Ent 5370s. Principles of Systematics. (3 cr; prereq #; offered alt yrs) Holzenthal, Zink
Theoretical and practical procedures of systematics, including phylogeny reconstruction, classification, systematic literature, nomenclature, and presentation of systematic research results.

Ent 5380. Lepidopterology. (2 cr [3 cr with term paper]; prereq ent course or #; 1 ecology and 1 genetics course recommended) Miller
Processes and phenomena such as polymorphism, mimicry, and individual quality well demonstrated by this order.

Ent 5480w. Invertebrate Neurobiology. (2 cr) Mesce
Principles and concepts underlying cellular bases of behavior and “systems” neuroscience. Particular invertebrate preparations discussed.

Ent 5900f,s. Basic Entomology. (Cr ar; prereq #)
Opportunity to make up certain deficiencies in biological background.

Ent 5910f,w,s. Special Problems in Entomology. (Cr ar; prereq #)
Individual field, lab, or library studies in various aspects of entomology.

Ent 5920. Special Lectures in Entomology. (Cr ar)
Lectures and/or labs in special fields of entomological research given by a visiting scholar or regular staff member.

Ent 5999. Special Workshop in Entomology. (1-4 cr; prereq #)
Offered off campus. Topics specified in Class Schedule.

Ent 8040f. Advanced Insect Genetics. (3 cr; prereq basic course in genetics, 5030 or #; offered alt yrs) Fallon
Survey of molecular genetic techniques and their applications, with emphasis on insect species other than *Drosophila*. Application of genetic techniques to physiological processes.

Ent 8050f. Toxicology. (3 cr; prereq 15 cr incl 1005 or equiv or #; inorganic and organic chemistry; offered alt yrs) Fallon
Chemistry, physiological action, toxicity of insecticides.

Ent 8200. Colloquium in Social Insects. (1-3 cr; prereq 3020 or 3200) Spivak
Discussion of current research on bees, wasps, ants, and termites. Student critiques and research reports.

Ent 8210. Colloquium in Insect Evolution. (1-3 cr; prereq 5370 or #)
Research issues in systematics and evolution. Among topics are comparative biology, biogeography, and molecular evolution. Students may re-enroll as topics alternate. Students critique papers from primary literature.

Ent 8240f,w,s. Colloquium in Insect Ecology. (1-2 cr; prereq 5040 or #; Andow
Advanced topics.

Ent 8300f,w,s. Graduate Seminar. (1 cr; prereq #)
Ragsdale
Oral and written reports on and discussion by students of selected topics from current literature in entomology.

Ent 8500f,w,s. Research in Entomology. (Cr ar; prereq #)

Environmental Health (PubH)¹

Professor: Jack S. Mandel, head; Donald E. Barber; Sagar M. Goyal; Jordan L. Holtzman; Irving J. Pflug; R. Ashley Robinson; Ken Sexton; Sheldon B. Šparber; Donald Vesley; James H. Vincent; W. Dixon Ward (emeritus)

Adjunct Professor: Paul W. Willard
Associate Professor: Deborah L. Swackhamer, director of graduate studies; Susan G. Gerberich; Ian A. Greaves; Rita B. Messing

Clinical Associate Professor: Alan P. Bender
Assistant Professor: Lisa M. Brosseau; Rebecca A. Johnson; George Maldonado; Patricia McGovern; Gurumurthy Ramachandran; Fuy M. Thompson; Elizabeth V. Wattenberg

Adjunct Assistant Professor: Jeffrey H. Mandel; Marian C. Marbury; David L. Parker

Instructor: Debra K. Olson

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S. (Plan A and Plan B) and Ph.D.

Curriculum—Emphases include environmental epidemiology, environmental chemistry, environmental toxicology, industrial hygiene, environmental policy, environmental microbiology, occupational epidemiology, occupational health nursing, occupational injury, epidemiology and control, and occupational medicine.

¹ A master of public health degree (M.P.H.) with an emphasis in environmental health is offered by the School of Public Health. Consult the School of Public Health Bulletin for more information.
Prerequisites for Admission—A bachelor’s degree, including coursework in biological, chemical, or physical sciences or engineering, is required. Prerequisites depend on requirements of specialty area within the degree program.

Special Application Requirements—Graduate Record Examination scores, a letter describing the applicant’s professional objectives, and three letters of recommendation are required.

Master’s Degree Requirements—The program requires a selection of specialty area. Most specialty tracks require two years to complete. Students are required to complete PubH 5156, 5158, 5159, 5250, and 5261 or 5267. Other core courses from the area of emphasis in the major are also required and are expected to include courses in biostatistics and epidemiology. An oral final examination is required.

Doctoral Degree Requirements—Candidacy for the Ph.D. program requires completion of the master’s degree (or the equivalent) in environmental health.

Language Requirements—For the master’s degree, none. For the doctoral degree, reading ability in a foreign language or additional coursework is required at the discretion of the adviser.

For Further Information and Applications—Contact the Student Services Center, School of Public Health, University of Minnesota, Box 819 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (612/626-3500 or 1/800/774-8636; fax 612/626-6931; e-mail sph-uofm@greg2.sph.umn.edu; http://www.sph.umn.edu).

PubH 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

PubH 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

PubH 8888. Thesis Credits: Doctoral. (36 cr required)

Note—Courses in environmental health are listed and described under Public Health later in this bulletin. See PubH 5150 to 5281 and 8150 to 8272.

Epidemiology (PubH) 1

Professor: Russell V. Luepker, head; Henry Blackburn; Richard S. Crow; Aaron R. Folsom; Laël Gatewood; Richard H. Grimm; John H. Himes; David R. Jacobs, Jr.; Robert W. Jeffery; Robert L. Kane; Harry A. Lando; Arthur S. Leon; Jack Mandel; David M. Murray; Cheryl L. Perry; Phyllis L. Pirie; R. Ashley Robinson; Leslie L. Robison; David G. Thawley; Alexander C. Wagenaar

Adjunct Professor: Michael T. Osterholm

Associate Professor: John R. Finnegan, Jr., director of graduate studies; Patricia J. Elmer; Jean L. Forster; Lawrence H. Kushi; Alan R. Lifson; Leslie L. Lyle; Paul G. McGovern; Joseph P. Neglia; Thomas A. Sellers; Eyal Shahar; Carolyn L. Williams

Adjunct Associate Professor: Alan P. Bender

Assistant Professor: Kristin E. Anderson; Donna K. Arnett; Simone A. French; Myron D. Gross; Wendy L. Hellerstedt; Rhonda J. Jones-Webb; Philip W. Lowy; George Maldonado; Dianne Neumark-Sztainer; Pamela Schreiner; Xiao Ou Shu; Seth L. Welles; Mark Wolfson; Wei Zheng

Adjunct Assistant Professor: Sally A. Bushhouse; Richard N. Danila

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S. (Plan A and Plan B) and Ph.D.

Curriculum—The division offers basic and advanced instruction for students planning teaching, research, or administrative careers in epidemiology. Courses are also available to students from other public health and health-related programs.

Students may select areas of concentration appropriate to their academic interests and career objectives, including the epidemiology of cancer, epidemiology of infectious diseases, epidemiology of cardiovascular diseases, nutritional epidemiology, and behavioral epidemiology. In addition to the required public health courses, students may select courses from a wide range of areas such as anthropology, biochemistry, computer science (public health), genetics, microbiology, pathology, physiology, and sociology. A detailed description of the course of study and a more comprehensive list of elective courses may be obtained by writing to the director of graduate studies.

1 A master of public health degree (M.P.H.) with an emphasis in epidemiology is offered by the School of Public Health. Consult the School of Public Health Bulletin for more information.
Prerequisites for Admission—For the master’s program, a strong undergraduate background in biological and physical sciences and high scholastic achievement are desirable.

For the doctoral program, applicants must have received a master’s degree. Applicants who have not yet completed a master’s degree in epidemiology or a related field are usually admitted, initially, to the master’s program in epidemiology, where they must demonstrate their research capability. Because positions in the program are relatively limited, selection of students is competitive with respect to academic background and experience presented.

Special Application Requirements—The following materials are required by the department: an acceptable score on the Graduate Record Examination (test results should be forwarded to the department); a minimum of three recommendations (form and separate letter) from faculty or work supervisors with knowledge of the applicant’s scholastic and professional capabilities and potential; and a statement of goals and objectives (letter of intent) for seeking a career in epidemiology.

In addition to the above materials, applicants for the Ph.D. program must submit a separate essay demonstrating evidence of their capability in or potential for original research.

M.S. and Ph.D. students should begin their studies in the fall quarter. Applications must be completed by January 15 of the same year.

Master’s Degree Requirements—The M.S. degree program prepares students for careers in teaching, research and program development, administration and evaluation in health agencies, medical institutions, regulatory agencies, and industry. The two-year program includes advanced coursework in the basic medical sciences. Students who have a graduate degree in a health-related field or a professional degree such as an M.D., D.D.S., or D.V.M. may complete the program in one year. Students usually complete the curriculum under Plan B. A complete list of degree program requirements may be obtained from the director of graduate studies. Students take an oral final examination.

Doctoral Degree Requirements—The doctoral program helps students develop proficiency in epidemiologic investigations as a preparation for careers in service, research, or teaching in health agencies and institutions. The program includes advanced coursework, with electives chosen according to the individual’s background, interests, and needs. Students participate in ongoing field research designed to provide increasingly complex experiences commensurate with their development. The thesis should be based on an original field investigation of acceptable complexity and sophistication.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—For the master’s degree, a minimum of 9 credits selected by the minor adviser on the basis of the student’s major field of study is required. For the doctoral degree, a minimum of 20 credits selected by the minor adviser on the basis of the student’s major field of study is required.

For Further Information and Applications—Contact the Student Services Center, School of Public Health, University of Minnesota, Box 819 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (612/626-3500 or 1/800/774-8636; fax 612/626-6931; e-mail sph-uofm@greg2.sph.umn.edu; http://www.sph.umn.edu).

PubH 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qr; doctoral student who has not passed oral prelims)

PubH 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

PubH 8888. Thesis Credits: Doctoral. (36 cr required)

Note—Courses in epidemiology are listed and described in the Public Health section of this bulletin. See PubH 5330 to 5399 and 8330 to 8389.

Experimental Surgery

See Surgery.

Family Education

See Work, Community, and Family Education.
Family Practice and Community Health (FPCH)

Professor: Edward W. Ciriacy, head; Carole J. Bland; Joseph M. Keenan; John T. Kelly; Roger S. Mazze; Vernon E. Weckwerth

Associate Professor: Donald S. Asp, director of graduate studies; Edmond J. Coleman; Dwenda K. Gjerdingen; Harold R. Ireton; Richard L. Reed; B. R. Simon Rosser; Sharon B. Satterfield

Assistant Professor: Donald R. Houge; Leon J. Nesvacil; James J. Pattee; Harold C. Seim

Lecturer: Faruk Abuzzahab

Other: Michael E. Metz

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degree Offered—M.S. (Plan B only).

Curriculum—Studies focus on the discipline of family medicine and on academic skills.

Prerequisites for Admission—Applicants must have completed an M.D. or D.O. degree.

Special Application Requirements—Applicants must meet with a department adviser to obtain a letter of endorsement, which must be submitted with the formal application. Students are admitted each quarter.

Master’s Degree Requirements—A minimum of 20 credits from the major field is required. Nonclinical courses must make up a minimum of 50% of the credits in the major. If the total number of credits presented in the major is 30 or fewer, however, a minimum of 16 credits must be in nonclinical courses. For the minor, at least 9 credits are required. Courses may be taken from more than one department if they are relevant to the major and form a coherent sequence related to the minor. All courses included in the minor must be nonclinical, and must be taken on the A-F grading system. In lieu of choosing a minor, students may elect to present at least 8 credits in a number of related nonclinical fields outside the major. A final oral examination is required.

Language Requirements—None.

For Further Information and Applications—Contact the Department of Family Practice and Community Health, 6-240 Phillips-Wangensteen Building (Box 381 Mayo), University of Minnesota, 516 Delaware Street S.E., Minneapolis, MN 55455 (612/624-2622).

Note—The courses listed below are described in the broadest outline to convey the character of the work. Coursework in fields related to family practice and community health is also available in other departments of the University.

FPCH 5251. Cross-Cultural Medicine and International Health. (Cr ar; prereq family practice residency or #) Patten, staff

Concepts of illness and healing within different cultural contexts; efficacy of systems of healing other than biomedicine; interaction of cultural and biological factors in disease and illness; population-based health, illness, disease.

FPCH 5345-5346. Analysis of Instruction and Educational Evaluation. (3 cr per qtr; prereq #) 5345: Curriculum design: from identifying course goals to building course goals to building course, teacher, or learner evaluations. 5346: Acquiring effective teaching strategies, including lecture, demonstration, small-group discussion, clinical teaching, and computer-assisted instruction.

FPCH 5504. Medical Ethics. (2 cr) Daly

Reading and discussion of major ethical issues relevant to the practice of medicine. Critical review of case studies to gain experience in solving medical ethics problems.

FPCH 5555. Sexual Counseling for Family Physicians. (2 cr; prereq medical school completion) Coleman, staff

Assessment of and therapy for sexual dysfunction problems that arise in clinical practice of primary care physicians.

FPCH 5563. Clinical Neuropsycho-pharmacology. (2 cr; prereq FPCH residency) Abuzzahab

Identification, diagnosis, treatment, and follow-up of major psychiatric disorders. Emphasis on the neuro-psychopharmacological approach, identification of psychoactive drugs, contraindications, side effects, and long-term management of patients.

FPCH 5564. Family Practice Seminar. (1-3 cr)

Knowledge, skills, and attitudes in biomedical and behavioral sciences that form foundation for academic discipline of family medicine; medical decision making, common problems and procedures, family theory and assessment, clinical pharmacy, and human sexuality.

FPCH 5570. Practicum in Counseling. (1 cr; prereq completion of 1st-yr residency) Kelly

Basic techniques of short-term counseling. Lectures, classroom exercises, and actual counseling contact.

FPCH 5582. Practice Management Workshop. (2 cr; prereq completion of 1st-yr residency or #) Ciriacy, staff

Practical counsel and information on day-to-day management of medical clinics including economic and legal aspects; community and hospital relations; human relations; types of practice opportunities. Two-day workshop with department faculty and community specialists on concepts relevant to effective management of a family practice clinic.
FPCH 5583. Personal and Financial Planning. (2 cr) Seim
Personal and financial planning. Includes an overview of life insurance, equity investments, and real estate. Pros and cons of these methods of personal investments, sources of information about them, and their history.

FPCH 5596. Introduction to Intercultural/International Medicine. (4.5 cr; prereq 3rd- or 4th-yr med student or FPCH resident; apply at least 3 months ahead)
Didactic and field experience program during four-week period. Combines clinical activity and involvement in ongoing field-based research. Conducted in conjunction with Indian Health Services.

FPCH 5598. Introduction to Physician’s Role in Nursing Homes. (2 cr) Ciriacy, staff
Roles of nursing home staff. Helps medical fellows become comfortable in nursing homes.

FPCH 5650, 5651, 5652. Principles of Geriatrics. (1 cr per qtr; prereq candidate for or recipient of grad degree in hith sci) Boult
Geriatric approach to medicine, common geriatric syndromes, diseases of later life. Instructors include rotating clinical faculty, geriatric fellows, and guest lecturers. Held at local nursing homes.

FPCH 5653. Future Health Interventions for Older Populations. (2 cr; prereq hith sci grad student or hith sci grad degree)
Successful and promising interventions designed by managed care organizations, including outcome data.

FPCH 5843. Disease Prevention and Health Promotion: An Appraisal of Goals and Techniques in Family Practice. (2 cr; prereq MD)
Role of family physician in development, operation, and research of office-based prevention/promotion activities. Presentation and discussions with leaders in this field.

FPCH 5903. Community Health. (Cr ar; prereq #)
Lindblom, Staff
Practical experience in delivery of healthcare in urban or rural communities.

FPCH 5904. Community Health. (2 cr; prereq 2nd- or 3rd-yr residency or #)
Introduction to concepts of community health. In-depth look at community health activities in Minnesota. Tools and techniques for the study of contemporary health problems in the state. Strategies to meet community health needs.

FPCH 5950. Clinical Issues in Human Sexuality. (3 cr; prereq enrollment in health sciences grad programs in CSPP, Psych, PubHl, SW or FSoS or #) Coleman
Clinical issues, assessment techniques, and treatment techniques pertaining to common sexual problems.

FPCH 5952-5953-5954. Practicum in Sexual Counseling. (3-6 cr per qtr; prereq #; offered when feasible) Coleman

FPCH 5955. Directed Study. (1-15 cr; prereq #: qualified students may register with # for work on a tutorial basis) Kelly

FPCH 5956. Human Sexuality Throughout the Life Cycle for the Primary Care Physician. (3 cr; prereq college-level human sexuality intro course, #: offered alt years) Metz
Developmental aspects of sexuality throughout the life cycle examined from such theories as psychodynamics and social role theory, with emphasis on significance of psychosocial aspects of sexuality for the primary care physician.

FPCH 5957. Female Sexuality. (3 cr; offered alt yrs) Satterfield
Lectures and discussions on basic aspects of the female experience of sexuality.

FPCH 5958. Small Group Process. (3 cr; prereq #) Coleman
Group dynamics; various schools of group process and therapy active today. Experiential and cognitive methods used.

FPCH 5960. Basic Research Methods Seminar and Practicum. (4 cr) Kelly
Basic inquiry skills. Topics suitable for the advancement of family practice research.

FPCH 5962. Clinical Hypnosis Workshop. (1-2 cr per workshop; prereq #) Houge
New departures and/or new applications from the behavioral science area of clinical practice. Lectures, workshops, and conferences.

FPCH 5967. Introduction to Health Data Systems. (Cr ar; prereq completion of 1st-yr residency or #)
Machine-readable databases and decision support systems relevant to community health.

FPCH 5972, 5973, 5974. Research Methods in Family Medicine I, II, III. (2 cr per qtr; prereq FPCH grad student or #)
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. (Cr ar) Ciriacy, staff
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 the benefit of the patient and family are emphasized with particular emphasis on health hazard appraisal. New and refined methods of recording, documentation, and retrieval of clinical data.

FPCH 8202. Families in Loss, Grief: Recovery Resources. (2 cr; prereq #) Seim

FPCH 8204. Seminar: Quantitative Strategies in Healthcare Practice and Research. (2 cr; prereq #) Weckwerth
Review of elementary statistical methods for both description and inference. Use of workbooks to identify and sharpen skills. Application of elementary decision making with emphasis on sensitivity/specificity and decision errors. Elementary literature critiques. Students make presentation and write paper, based on one or more journal articles, explaining an application to patient care of a strategy.
FPCH 8205. Medical Records Systems. (2 cr)
Ciriacy
Introduction to the problem-oriented medical record. Emphasis on forms analysis, tabulation systems, and the use of a structured medical record in health services research.

FPCH 8206. Seminar: Psychology in Medicine. (2 cr; offered when feasible) Ireton

FPCH 8207. Seminar: Common Diseases Seen in Family Practice. (1 cr) Ciriacy, staff

FPCH 8208. Family Medicine Conferences. (1 cr) Ciriacy, staff
Problem cases from the Family Practice Service. Diagnosis, treatment, and consideration of relevant current literature.

FPCH 8209. Family Medicine X-Ray Conference. (1 cr) Ciriacy, staff

FPCH 8210. Family Medicine Grand Rounds. (1 cr) Asp, staff
Monthly conference with each institution presenting topics.

FPCH 8211. Practice Management. (2 cr)
Lindblom
Establishment of practice, allocation of income, and professional relations.

FPCH 8212. Clinical Psychiatry Rounds. (1 cr; prereq 1st-yr FPCH resident) Kelly
Medical fellows meet with a teaching psychiatrist to review cases, preferably from among patients. Topics of high clinical relevance presented and discussed.

FPCH 8215. Seminar: Psychosomatic Medicine. (2 cr; prereq completion of 1st-yr residency or #) Kelly
Concept of multicausality of disease including biologic, psychologic, and social factors that may predispose, precipitate, or aggravate disease. Theoretical models of psychosomatic disease and concept of “symptom choice” by patients. Methods of recognition, quantification, and treatment including pharmacal therapy and psychotherapy.

FPCH 8216. Pediatric Psychology. (2 cr; prereq completion of 1st-yr residency or #) offered when feasible) Ireton

FPCH 8217. Seminar in Counseling. (2 cr; prereq 5567, 8215 or #) Kelly
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 8223. Introduction to Gerontology and Geriatric Medicine. (2 cr; prereq completion of 1st-yr residency or #) Reed
Introduction to human aging: social, biological, and psychological aspects. Programs and policies dealing with aging. Developmental and holistic approaches to the aging process and healthcare.

FPCH 8224. Community Mental Health Seminar. (1 cr; required for 3rd-yr residents; prereq completion of 2nd-yr residency) Kelly
Background material in a given area of community mental health followed by a community experience in that particular area and sharing of experiences with other residents at the training center. Split-time experience for the resident during which experience in medical sociology is made available.

FPCH 8225. Medical Sociology. (3 cr; offered when feasible)

FPCH 8226. Medical Sociology Seminar. (2 cr; prereq physician or sociology grad student; offered when feasible)

FPCH 8228. Seminar: Interdisciplinary Health. (2 cr; prereq #) Kelly

FPCH 8240. Community Resources. (2 cr) Kelly
Discussions with representatives of selected community agencies.

FPCH 8242. Economics of Healthcare Delivery Systems. (3 cr; offered when feasible)

FPCH 8243. Family Medicine in the Rural Area. (Cr ar; prereq #) Lindblom
Problems specific to rural areas such as physician distribution, use of allied health personnel, initial emergency treatment, referral patterns.

FPCH 8250. Quantitative Strategies in Healthcare Practice and Research II. (2 cr [1 addtl cr available]; prereq 8204) Weckwerth
Presumptive review of elementary descriptive and inferential quantitative methods; models for decision making; evaluation; logic tree; critique of literature. Major output: designing in-practice study of test, treatment, service, or method of choice to show outcome effect on patients.

FPCH 8582. Practice Management II. (2 cr; prereq 3rd-yr residency, 5581; offered when feasible) Lindblom

FPCH 8253. Research Problems. (Cr ar; prereq #) Kelly
Under supervision of faculty member.

Family Social Science (FSoS)

Professor: M. Janice Hogan, head; Kathryn D. Rettig, director of graduate studies; Jean Bauer; Pauline Boss; Thomas Brothen; Daniel F. Detzner; William J. Doherty; M. Geraldine Gage (emeritus); Harold D. Grotevant; Mary E. Heltsley; James W. Maddock; David H. Olson; Paul C. Rosenblatt; Shirley Zimmerman

Associate Professor: Bonnie S. Braun; Rose M. Brewer; Sharon M. Danes; Ann W. Garwick; Joan M. Patterson; Beatrice E. Robinson; Marlene S. Stum

Other: Philip L. Colgan; William J. Goodman

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.
Degrees Offered—M.A. (Plan A and Plan B) and Ph.D.

Curriculum—Family social science is a multidisciplinary program that offers an integrated program of study in the areas of family relationships, family therapy, and family policy, economics, and resource management. The program uses the knowledge of various social sciences to study the family as a system and its interaction with other social systems. The goals of graduate training include emphasizing theory, research, and application (e.g., family life education, marriage and family therapy, family policy). Marriage and family therapy is not available at the master’s level.

Prerequisites for Admission—Minimum requirements for admission to the master’s program include two family courses; at least one course in economics, political science, government, or public policy; one course in sociology, anthropology, or human geography; one psychology course; and one statistics course. Minimum requirements for admission to the doctoral program include all the requirements for admission to the master’s program plus two additional social or behavioral science courses and two additional statistics and/or research methods courses.

It is recommended that students have one research methods course, one course in calculus, experience working with families through paid employment or volunteer work, and evidence of interest in research and in the development of research competence, particularly for students applying for the Ph.D. program.

Students may apply for admission to the Ph.D. program after completing either a bachelor’s degree or a master’s degree.

Special Application Requirements—Consult the Family Social Science Graduate Handbook or the director of graduate studies. The application deadline is December 15 for admission fall quarter of the following year.

Degree Requirements—Consult the Family Social Science Graduate Handbook or the director of graduate studies.

Language Requirements—None.

For Further Information and Applications—Contact the Department of Family Social Science, University of Minnesota, 290 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108 (612/625-3116 or 612/625-1900; fax 612/625-4227).

FSoS 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

FSoS 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

FSoS 8888. Thesis Credits: Doctoral. (36 cr required)

FSoS 5001. Human Sexual Behavior. (5 cr; prereq 90 cr, 3600 or grad student in social or behavioral or educational or health science or human service program or #) Maddock

Multidisciplinary approach to sexual development through individual/family life cycles, emphasizing scientific knowledge to promote sexual health through individual, family, and community services; ethics and values issues.

FSoS 5025. Parenting. (4 cr; prereq 5200 or 5202)

Parenting methods and child development from infancy through adolescence. Students identify differing parenting techniques, develop their own parenting approach, and conduct parenting classes.

FSoS 5200. Family Systems. (5 cr; prereq intro course in psych and soc) Doherty, Olson

Advanced survey of current developments emphasizing families as complex systems of interpersonal relationships that also interact with larger social systems.

FSoS 5202. Family Psychology: The Study of Close Relationship Processes. (4 cr; prereq 3600 for FSoS majors, Psy 3204 for psych majors and others) Boss, Grotevant

Processes of interaction and communication within families of origin, families of choice, and other close relationships. Consideration of multidisciplinary research and theory taken from psychology, sociology, and family therapy. Marriage, divorce, friendship, partnership, and being single discussed in light of theories of attraction, love, intimacy, and sexuality. Issues of fairness, altruism, equity, power, violence, and communication as central to relationship formation and dissolution. Focuses on dynamic processes of family and couple relationships within diverse social contexts.

FSoS 5205. Introduction to Family Research Methods. (4 cr; prereq 3260, 5200) Rosenblatt

Logic and philosophy of scientific method. Family research questions and objectives, standards for evaluating family research, techniques of data gathering (qualitative and quantitative methods), analysis, reporting, and writing.

FSoS 5210. The Family in World Perspective. (4 cr; prereq 3600 or 5200, intro cultural anth course or #) Rosenblatt

Comparison of kinship, marriage, family organization, the family life cycle and modes of family functioning across cultures; relationship to economic, political, religious, and other institutions, with emphasis on adaptations of the family to urbanization and industrialization.
GRADUATE PROGRAMS

FSoS 5218. Family Financial Management. (4 cr; prereq 3260 or equiv) Hogan, Rettig Analysis of family financial management principles. Financial planning of savings, investments; credit, mortgages; taxation; life, disability, health, property insurances; public, private pension; estate planning.

FSoS 5220. Family Economics. (4 cr; prereq 3260 or #) Rettig Variations in family income, saving, spending, and decision making related to socioeconomic factors. Conceptual development and research on economic problems of families.

FSoS 5230. Independent Study in Family Social Science. (1-5 cr [max 16 cr]) Independent reading or research under faculty supervision.

FSoS 5240. Special Topics in Family Social Science. (2-6 cr per qtr [max 16 cr]; prereq determined by instructor, specific for each topic) Review of research and discussion. See the Class Schedule for topics.

FSoS 5241. Legal-Economic Controversies in Family Life. (4 cr; prereq 3260 or 3600 or 5200 or #) Rettig Interdisciplinary seminar on legal-economic controversies across family life span for diverse family forms. Alternative family definitions and living arrangements; premarital and marital contracts; alternative means of parenting; income, support, and debt issues; property transfer at death and divorce; decision making for health and long-term care.

FSoS 5251. Aging Families. (4 cr; prereq 3600 or 5200 or SW 5024 or #) Detzner Aging families as complex developing systems interacting with changing social structure. Marital relationships, role changes, and family care-giving issues.

FSoS 5252. Aging, Family, and Society. (4 cr; prereq 3600 or 5210 or SW 5024 or #) Detzner Elderly populations from diverse cultures examined within context of individual life history, family systems, and social structure.

FSoS 5253. Humanities, Aging, and Family Living. (4 cr; prereq 3600 or 5200 or SW 5024 or #) Aging and family living from literature and film perspectives.

FSoS 5255. Approaches to Family Policy. (4 cr; prereq 3260 or 3600, SW 3202 or #) Zimmerman Interrelationship between families and social policy in welfare, housing, healthcare, family law, education, and social services.

FSoS 5256. Family Policy: An International Perspective. (4 cr; prereq 5210 or 5252 or 5255 or #) Zimmerman Comparison of different countries’ policy choices and actions in areas directly affecting families: health, education, social services, income maintenance, employment and the work force, taxation; values and traditions such policies represent.

FSoS 5260. Dynamics of Family Decision Making. (4 cr; prereq 3260 or #) Rettig Conceptual models of decision making and resource management. Review and critique of current research and literature.

FSoS 5500. Racial and Ethnic Diversity in Families. (4 cr; prereq 3600) Goodman, Rosenblatt Overview of family issues of various American racial and ethnic populations. Study of research and case studies; individual projects to develop and enrich understanding of cultural diversity.

FSoS 8203. Family Stress, Coping, and Adaptation. (4 cr; offered alt yrs) Boss Theories related to family development, structure, and behavior in response to social and psychological stress. Normal and dysfunctional family behavior. Emphasis on research and intervention for family stress or crisis.

FSoS 8205. Qualitative Family Research. (3 cr; prereq 8255) Rosenblatt Intensive examination of role of qualitative methods in social sciences. Data collection techniques; participant observation; informant interviewing; document analysis; sampling; field relations and rapport; ethical issues; reliability and validity of qualitative data; role of theory in field studies. Students conduct qualitative study.

FSoS 8214. Theories of Marital and Family Therapy. (4 cr; prereq 8255) Boss, Doherty Comprehensive review and critique of major theories of marital and family therapy with emphasis on clinical integration of these models.

FSoS 8215. Clinical Issues in Marital and Family Therapy. (4 cr; prereq 8214; offered alt yrs) Boss, Doherty, Maddock Issues such as divorce, sexual dysfunction, enrichment, and chemical dependence, using research and theory to determine clinical strategies.

FSoS 8216. Marital and Family Assessment. (4 cr; offered alt yrs) Olson Overview and experience administering and interpreting a variety of marital and family assessment tools.

FSoS 8217. Clinical Interventions for Sexual Problems. (3 cr; prereq human service or health science grad student, 5001 or #; offered alt yrs) Maddock Rationales for sexual healthcare in clinical settings and methods of intervention into sex-related problems of various populations, with focus on assessment, behavioral change techniques, and specialized therapy approaches.

FSoS 8221. Internship in Teaching College-Level Family Courses I. (4 cr; prereq 12 cr FSoS; offered alt yrs) Detzner, Maddock, Rettig Theoretical course on learning styles, teaching techniques, curriculum development, and family life education. Students develop philosophy of teaching/learning inclusive of race, class, and gender differences. Practical teaching issues analyzed: course content, objectives, syllabi development, formal/informal teaching techniques, and student evaluation.
FSoS 8222. Internship in Teaching College-Level Family Courses II. (2 cr; prereq 8221, #) Detzner, Maddock, Rettig Practice-teaching course. Students assist in planning 3xxx course, participate in its teaching, and construct method for evaluation of student performance.

FSoS 8223. Internship in Teaching College-Level Family Courses III. (2 cr; prereq 8222, #) Detzner, Maddock, Rettig Students plan, teach, and evaluate student performance in 1xxx course under supervision and mentoring of faculty. Videotaped self-assessment of teaching.

FSoS 8230. Directed Study in Family Social Science. (1-7 cr; prereq #)

FSoS 8231. Seminar in Gender Roles. (3 cr; offered alt yrs) Doherty, Hogan Discussion and research on selected problems in area of gender roles, similarities, and differences; review of scholarly literature.

FSoS 8242. Value Theories and Research in Family Social Science. (4 cr; prereq 5200, 5260 or equiv or #; offered alt yrs) Rettig Review and critique of theories and research on values and valuing processes in families.

FSoS 8251. Problems: Family Social Science. (1-5 cr; prereq #)

FSoS 8255. Conceptual Frameworks in the Family. (4 cr; prereq 5200 or equiv, #) Boss, Doherty Required of all first-year graduate students in family social science. Overview and theoretical orientation to family field.


FSoS 8257. Family Theory Development. (3 cr; prereq 8255; offered alt yrs) Olson Meta-analysis, inductive and deductive approaches, and qualitative and quantitative approaches to developing family theory.

FSoS 8258. Family Research from Economic Perspectives. (4 cr; prereq soc sci theories grad course, research methods course; offered alt yrs) Rettig Review and critique of family research.

FSoS 8260. Family Decision Making. (4 cr; prereq 5260 or #; offered when feasible) Hogan, Rettig

FSoS 8261. Process Seminar for Family. (2 cr; prereq #) Required of all first-year family social science students (orientation to graduate program); not open to other students.

FSoS 8266. Family Research Methodology. (4 cr; prereq 8255; offered alt yrs) Olson Various research approaches, research design, and instrument development used to study the family. Students design and conduct pilot research projects. (First of two courses.)

FSoS 8270. Practicum in Family Research. (1-5 cr; prereq #) Supervised family research.

FSoS 8317-8318. Family of Origin: I, II. (2 cr per qtr; prereq family therapy intern) AAMFT-approved clinical faculty In-depth study of each intern’s family of origin in process setting of fellow interns and clinical family therapy supervisor.

FSoS 8319. Ethical and Legal Issues in Marital and Family Therapy. (4 cr; prereq 8214, 8215 or #; offered alt yrs) Boss, Doherty, Maddock Major issues—ranging from general social issues (e.g., feminism), to legal concerns (e.g., reporting laws), to specific client situations (e.g., sexual exploitation by therapists)—explored from a systemic perspective.

FSoS 8500. Clinical Consultation with Couples and Families. (3 cr; prereq 8214, official acceptance into AAMFT-accredited training program or #) Students become part of supervised consultation team working with community clinicians and their clients.

FSoS 8501. Family Therapy Practicum. (4 cr; prereq 8255, official acceptance into AAMFT-accredited training program, #) Boss, Doherty, Goodman, Maddock, Olson Clinical experiences in preparation for internship; focus on integrating theory with skills in presence of families.

FSoS 8551. Internship in Marital and Family Therapy. (1-7 cr; prereq 8214, 8215, #) Boss, Doherty, Maddock Participation in actual marital and family therapy clinical practice in approved community setting with on-site supervision (one to one) plus on-campus supervision (group setting with fellow interns).

Feminist Studies

Professor: Helen E. Longino (women’s studies), director of graduate studies; Terence Ball (political science); Karlyn K. Campbell (speech-communication); Mary Dietz (political science); Sara Evans (history); Patricia Faunce (women’s studies); Mary L. Fellows (law); Shirley Garner (English); Barbara A. Hanawalt (history); Ruth-Ellen Joeres (German); Indira Y. Junghare (South and Southwest Asian studies); Amy Katz Kaminsky (women’s studies); Sally G. Kohlstedt (history of science and technology); Barbara Laslett (sociology); Elaine Tyler May (American studies); M. J. Maynes (history); Toni McNaron (English; women’s studies); Valerie J. Miner (English); Jeylan Mortimer (sociology); Susan J. Noakes (French and Italian); Jean Quam (social work); Paula Rabinowitz (American Studies); Martin Roth (English); Naomi Scheman
GRADUATE PROGRAMS

(philosophy; women’s studies); Madelon Sprengnether (English); Billie J. Wahlstrom (rhetoric)

Associate Professor: Lisa Albrecht (General College); Jean M. Allman (history); Ronald Aminzade (sociology); Walter O. Bockting (Medical School); Maria Minich Brewer (French and Italian); Rose M. Brewer (women’s studies; Afro-American and African studies); Lilian S. Bridwell-Bowles (English); Maria Damon (English); Lisa J. Disch (political science); Lois Erickson (educational psychology); Susan Geiger (women’s studies); Jane F. Gilgun (social work); Linda Jones (social work); Mary Jo Kane (kinesiology and leisure studies); Sally J. Kenney (Humphrey Institute of Public Affairs); Helen Q. Kivnick (social work); Mary M. Lay (rhetoric); Richard W. McCormick (German); Ellen R. Messer-Davidow (English); Carol A. Miller (American studies); Joanna O’Connell (Spanish and Portuguese); Gianna Pomata (history); Riv- Ellen Prell (American studies); Gloria Goodwin Raeaja (anthropology); Angelita D. Reyes (women’s studies); Julia Robinson (architecture); Hanna Schissler (German; history); Amy Sheldon (linguistics); Eileen B. Sivert (French and Italian); Janet Spector (anthropology); Constance Sullivan (Spanish and Portuguese); Caroline Turner (educational policy and administration); Ann B. Wulter (history); Oliver J. Williams (social work); Gayle Graham Yates (American studies); Jacquelyn Zita (women’s studies)

Assistant Professor: Lisette E. Josephides (anthropology); Josephine D. Lee (English); Lisa A. Norling (history); Jean M. O’Brien-Kehoe (history); Jennifer L. Pierce (sociology)

Lecturer: Doris G. Marquit (women’s studies)

Course of Study—Minor in feminist studies, applicable to master’s (M.A. and M.S.) and doctoral programs.

Curriculum—A structured interdisciplinary graduate minor in feminist studies is offered in conjunction with the Center for Advanced Feminist Studies (CAFS). The program focuses on the acquisition of skills and competencies in four general areas: interdisciplinary knowledge of women and gender; feminist theories and methods; competency in feminist research in a specific field; feminist practice through teaching or internships.

Prerequisites for Admission—Admission to the CAFS graduate minor is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School.

Special Application Requirements—Completion of application form, due February 1 for consideration for acceptance into the minor program in the following academic year. Applications received after February 1 are considered as space allows. It is anticipated that no more than fifteen students will be admitted into this minor each year. CAFS does not require an undergraduate major or minor in Women’s Studies as a prerequisite for admission to the minor program. However, applicants are expected to show general knowledge of feminist scholarship as evidenced, for example, in some combination of previous coursework, research, writing, or organizational experience.

Minor Requirements—A sequence of two core seminars in feminist theory and methods is required of all students in the program. In addition, M.A. students must take two electives, for a total of 16 credits, for a minor. Doctoral students take one additional seminar, in feminist research and writing, and two electives, for a total of 20 credits for a minor.

Language Requirements—None specific to the minor program.

For Further Information and Applications—Contact the Center for Advanced Feminist Studies, University of Minnesota, 496 Ford Hall, 224 Church Street S.E., Minneapolis, MN 55455 (612/624-6310; fax 612/624-3753; e-mail cafs@tc.umn.edu).

Women’s Studies (WoSt)

WoSt 5100, 5200, 5300, 5400, 5500, 5600. Topics in Women’s Studies. (4 cr per qtr [max 12 cr]) Topics specified in the Class Schedule.

WoSt 5101. History of Western Feminism. (4 cr; prereq 1001, 1002; offered alt yrs) Feminist thought and movements; feminist politics since 1790, especially in the United States and Great Britain; other international references.

WoSt 5102. Current Feminist Scholarship. (4 cr; prereq 1001, 1002 or grad student or #; offered alt yrs) Current scholarship dealing with feminist ideas and issues.

WoSt 5103. Feminist Pedagogies. (4 cr; prereq 8 cr WoSt or #) Albrecht, Geiger, McNaron, Scheman, Zita

Theory and practice of feminist teaching and learning as system or systems of inquiry, emphasizing challenges raised by diversity of women’s experiences and perspectives.

WoSt 5106. The Cultural Construction of Sex, Gender, and Sexuality. (4 cr; prereq Center for Advanced Feminist Studies student or undergrad with 12 cr WoSt or #) Messer-Davidow, Zita

Euro-American concepts of sex, gender, and sexuality in representative texts and images from 17th century to present. Critical and source materials from literary and cultural studies, history, biology, anthropology, psychology, and sociology.
WoSt 5201. The Older Woman: A Feminist Perspective. (4 cr; prereq 12 cr WoSt or substantial work in social sciences or psychology) Quam
Changing roles of older women in our society. Societal, health, economic, familial, emotional, sexual, and political concerns unique to older women.

WoSt 5202. Feminist Therapies. (4 cr) Faunce
Exploration of sexism in theoretical views of women and in therapy; alternative views and therapeutic approaches for women.

WoSt 5203. Women, Feminism, and Power. (4 cr; prereq 12 cr WoSt or #) Faunce
Feminist conceptualizations of power, including personal power, empowerment, spirituality, networking, civil disobedience, holism, and utopias.

Prescriptive application of label “madness” to women since 19th century. Readings in literature, case studies, and critical and theoretical texts.

WoSt 5301H. Women’s Autobiographical Narratives. (4 cr)

WoSt 5305. Women and Representation in Europe. (4 cr; prereq 12 cr literature or feminist theory; offered alt yrs) Kaminsky
Ways in which women and gender are represented in various cultural discourses, including fiction, drama, poetry, painting, music, medicine, and science in Europe.

WoSt 5308H. Women Writers of Africa and Latin America. (4 cr, §5308; prereq 8 cr WoSt or Latin Amer St or African St or #) Kaminsky
Novels, short stories, poetry, and/or drama by contemporary African and Latin American women in context of gender analysis and history of colonialism.

WoSt 5401. Women, Colonialism, and Underdevelopment. (4 cr) Geiger
Impact of colonial domination and economic underdevelopment on lives of women in Third World, strategies used by women to resist, survive, and overcome oppressive conditions.

WoSt 5402. Women and Contemporary American Spirituality. (4 cr; prereq 8 cr WoSt or grad student or #) Yates
Present-day American women’s spiritual consciousness and participation in religious institutions and religious movements. New forms of women’s spiritual/religious knowledge and beliefs; quests for and expressions of them; their history and sources.

WoSt 5501. Women and the Law. (4 cr) Balos, Fellows
The legal system as it relates to women. Areas of criminal law, welfare law, employment law, corporate law, alternative delivery systems for legal service, and legal education.

WoSt 5502. Women and Public Policy. (4 cr; prereq 1001, 1002 or #) Jones, Kenney
Survey of social problems and public policy issues of special significance to women in United States. Macro-political, social, and economic forces shaping women’s experiences as policy makers, administrators, citizens, and clients.

WoSt 5601. Gender and Class. (4 cr; prereq grad student or 12 cr WoSt incl 1001 or 1002 for undergrad, #) Laslett, Maynes
Interactions between gender roles and social class in historical and comparative perspective; introduction to concepts and methods of gender and class analysis, women’s work and economic systems, domestic work, social reproduction, feminism, socialism.

WoSt 5602. Working Class Women’s Lives. (4 cr, §5304; prereq 12 cr WoSt or # offered alt yrs) McNaron, Rabinowitz
Social, historical, economic, and ideological influences/effects of women’s participation in wage labor. Multidisciplinary study of impact of class, race, ethnicity, and gender on employment issues; protective legislation, job segregation, comparable worth, trade unions; women’s experiences in workplace, child-rearing, and family life.

WoSt 5970. Directed Study. (1-5 cr per qtr [max 12 cr]; prereq #, △, CLA approval)

WoSt 8101. Intellectual History of Feminism. (4 cr; prereq #) Evans, Waltner
Survey of Western feminist thought from Enlightenment to 1980; emphasis on United States.

WoSt 8102. Feminist Literary Criticism. (4 cr; prereq #) Kaminsky
Key concepts and approaches in current feminist literary theory and criticism: survey of topics and international perspectives.

WoSt 8103. Feminist Theories in the Social Sciences. (4 cr) Geiger
Recent disciplinary and interdisciplinary feminist theories in social sciences: major developments and issues; perspectives from disciplines; national and international conceptual frameworks.

WoSt 8510. Feminist Theory and Method. (4 cr; prereq #) Dietz, Kaminsky, Longino, Maynes, Rabinowitz
Multidisciplinary methods, feminist theories; frameworks for feminist work; differences between feminist and traditional research; development of skills for challenging assumptions in methods and theories that define traditional fields.

WoSt 8511. Feminist Theory and Method. (4 cr; prereq 5810, #) Disch, Kaminsky, Longino, Messer-Davidow, Pierce
Continuation of 8510.

WoSt 8610. Topics in Feminist Studies. (4 cr; prereq 8 cr grad-level WoSt or substantial work in topic area or #)
Selected topics in interdisciplinary feminist research and scholarship.
WoSt 8710. Feminist Research and Writing. (4 cr per qtr [max 8 cr]; prereq 8511, passed prelims in degree-granting program, #) Geiger, Kaminsky, Spector
Examine and compare feminist research methods and evaluate feminist writing. Students research and write complete text or portion of extended project (e.g., thesis or dissertation proposal, chapter, article).

WoSt 8970. Directed Study. (1-8 cr; prereq completion of courses approved by faculty supervisor and director of graduate studies)
Allows students to register for independent readings with appropriate program faculty.

Fisheries (FW)

Professor: Ira R. Adelman, head, director of graduate studies; Yosef Cohen; Anne Kapuscinski; Daniel A. Panshin; George R. Spangler
Associate Professor: Raymond M. Newman; Peter W. Sorensen; Bruce C. Vondracek
Adjunct Associate Professor: Gerald T. Ankley; Clayton J. Edwards
Adjunct Assistant Professor: Charles S. Anderson; Ned H. Euliss, Jr.; Cecil A. Jennings; Donald L. Pereira
Research Associate: Carl Richards

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S. (Plan A and Plan B) and Ph.D.

Curriculum—This program is administered within the Department of Fisheries and Wildlife. Areas of emphasis include fish ecology, physiology, behavior, and genetics; fish population dynamics; computer modeling; stream ecology; aquaculture; and fishery management.

Prerequisites for Admission—Prospective students are expected to have a basic background in the biological sciences. Some experience in fisheries or aquatic science is desirable, but not required. A strong background in physical sciences, chemistry, mathematics, statistics, and computer use is recommended. For admission to the Ph.D., a master’s degree is recommended.

Special Application Requirements—Three letters of recommendation from persons able to evaluate the applicant’s academic and professional experience and results from the Graduate Record Examination (GRE) General Test are required. When registering for the GRE, prospective students should list the fishery sciences major field code (0106). Applications are accepted at any time. However, because the faculty reviews most applications in late January for admission the following fall, applications should be sent before January 1.

Master’s Degree Requirements—Plan A is recommended, although Plan B may be pursued with the consent of the advisory committee. For Plan A, the minimum coursework requirement is 20 credits in the major and 8 credits in a related field; for Plan B, the minimum is 44 credits. The Plan A thesis should be on a subject within the areas of emphasis. Coursework requirements are flexible, but typically include courses in fisheries, limnology or aquatic biology, statistics and biometrics, computer science, and related subjects. Programs may include a traditional minor or coursework in a related field. An oral preliminary examination is required as well as a final seminar and oral defense of the thesis or Plan B papers.

Doctoral Degree Requirements—The doctoral program includes a major research effort in the areas of emphasis, resulting in a written dissertation. It also includes advanced coursework in fisheries, limnology or aquatic ecology, and related subjects. Students must present a public lecture describing the thesis findings.

Language Requirements—No foreign language is required for either the master’s or doctoral degree, except when the advisory committee determines that a foreign language is needed to support the student’s research objectives.

For Further Information and Applications—Contact Karen Kanda, College of Natural Resources, University of Minnesota, 115 Green Hall, 1530 N. Cleveland Avenue, St. Paul, MN 55108 (612/624-2748; e-mail kkanda@forestry.umn.edu; http://www.fw.umn.edu).

FW 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

FW 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

FW 8888. Thesis Credits: Doctoral. (36 cr required)
FW 5279. Special Lectures in Fisheries. (Cr ar; offered when feasible)

FW 5455. Aquaculture. (3 cr; prereq Biol 1009, 1103, 1106 or equiv, Chem 1001-1002 or Chem 1004-1005 or equiv or #; offered alt yrs) Kapuscinski Role of aquaculture in resource management and world food production; institutional and economic considerations; principles of husbandry of aquatic organisms; interactions between fish metabolism and water quality; nutrition and energetics; fish health and genetics.

FW 5459. Fish Physiology. (4 cr; prereq EEB 5136 or EEB 5156 or AnSc 3301 or #) Sorensen Relationships among fish physiology, fish behavior, and the aquatic environment. Ionic and osmotic balance, gas exchange, locomotion, orientation and migration, reproduction, endocrinology, growth, and stress.

FW 5460. Pollution Impacts on Aquatic Systems. (2 cr; prereq Biol 5041, EEB 5601, Chem 1004, Chem 1005, Chem 3301, Chem 3305 or #; offered alt yrs) Pollution assessment approaches, biological effects, fate and flow of contaminants in aquatic systems, and major types of pollutants.

FW 5461. The Behavior of Fishes. (3 cr; prereq 5459 or EEB 3111 or #; offered alt yrs) Sorensen Organismal and sub-organismal perspectives of fish behavior. Feeding behavior and optimal foraging theory; learning and intelligence; genetic, neural, and endocrine bases of behavior; communication; orientation and navigation; schooling and shoaling; reproduction; and application of understanding of behavior to harvest, management, and conservation.

FW 5565. Fisheries and Wildlife Ecology and Management: Field Trip. (1 cr) Ten-day field trip to Wyoming and points en route during spring break. Includes big game, waterfowl, and endangered species.

FW 5600. Fisheries and Wildlife Techniques. (4 cr; prereq Biol 5041 or EEB 3001 or #; offered at Itasca) Introduction to field techniques and skills; planning and implementing field projects; data collection and analysis using microcomputers; written reports and field journal.

FW 5601. Fisheries Population Analysis. (4 cr; prereq NRES 1020 or computer competency, Stat 3011, Stat 3012 or Stat 5021, 1 qtr intro calculus) Theory and methods for estimating vital statistics of fish populations. Students use microcomputers and statistical software to describe and model attributes of fish populations in case studies drawn from literature of marine freshwater fisheries management.

FW 5604. Fisheries Ecology and Management. (3 cr; prereq EEB 5601 or equiv or #, NRES 1020 or computer competency) Emphasizes managed species and systems; applied aquatic and fish ecology related to fisheries; role of planning in fisheries management; applying management tools and assessing their effectiveness.


FW 5701f, 5702w. Senior Project. (1, 2 cr; prereq FW/ sr or grad student or #) Cooper Problem-solving training. Management problem identification and analysis design, information and data gathering and analysis, and oral and written problem reporting. Problem selection influenced by guest speakers, resource agency contacts, and group discussions; topic is contemporary fisheries and wildlife management issue.

FW 8100. Seminar. (Cr ar) Lectures by and discussions with faculty members, visiting scholars, and graduate students on current topics.

FW 8200. Seminar. (Cr ar) Oral and written reports and discussion by students on selected topics from current literature in fisheries biology and management. Lectures by and discussions with faculty members and visiting specialists.

FW 8364.* Research in Fisheries Biology. (Cr ar; prereq fisheries grad student) FW 8448. Fishery Science. (4 cr; prereq fisheries grad student or #; offered alt yrs) Spangler Applications of ecological theory to the study and manipulation of fish populations; dynamics of growth, mortality, and yield of fish stocks; simulation applied to management problems.

FW 8452. Conservation Biology: Genetic and Demographic Issues. (3 cr; prereq #) Kapuscinski, Smith Seminar on current conservation biology issues; genetic, demographic, and environmental analysis and management of populations; ecosystem conservation; case studies of species conservation strategies.

FW 8459. Stream and River Ecology. (4 cr; prereq EBB 5601 or equiv or #; offered alt yrs) Newman Introduction to structure and dynamics of running waters from an ecosystem perspective. Historical perspective, basic hydrology and fluvial geomorphology, terrestrial-aquatic interactions, detrital dynamics, metabolism, drift, trophic relations, biotic and abiotic interactions, ecosystem experiments and natural alterations, stability and succession, and ecosystem dynamics in a watershed perspective. One field trip.

FW 8460. Fish Habitats and Restoration. (3 cr; prereq Biol 5041 or equiv, grad student or #; offered alt yrs) Vondracek Mechanisms underlying physiology and behavior that shape fish community structure in specific north temperate habitats; current techniques and planning procedures for restoration of lakes and streams.
FW 8579. Ecosystem Analysis and Simulations: A Numerical Approach. (5 cr; prereq 1 qtr calculus, 1 qtr statistics, some exposure to computers; offered alt yrs) Cohen
Systems analysis methods (e.g., state-space models, transfer functions) and numerical simulations in ecology and fisheries/wildlife management. Presentation of data in time and frequency domains; interpretation of results.

NRES 5575. Wetlands Conservation
See Ecology for other relevant courses.

Food Science (FScN)

Professor: Francis F. Busta, head; Gary A. Reineccius, director of graduate studies; Paul B. Addis; Linda J. Brady; William M. Breene (emeritus); Agnes S. Csallany; Eugenia A. Davis; Richard J. Epley; R. Gary Fulcher; Joan Gordon (emeritus); Theodore P. Labuza, Larry L. McKay; Howard A. Morris (emeritus); Irving J. Pflug; Joanne L. Slavin; David E. Smith; Sita R. Tatini; Joseph J. Warthesen; Edmund A. Zottola

Associate Professor: Elaine H. Asp; Craig A. Hassel; H. William Schafer; Zata M. Vickers

Assistant Professor: Eric D. Bastian; Mrinal Bhattacharya; Joellen M. Feirtag; Daniel J. O’Sullivan; Rongsheng R. Ruan

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S. (Plan A and Plan B) and Ph.D.

Curriculum—Students may emphasize the chemistry, engineering, microbiology, nutrition, or technology of food products.

Prerequisites for Admission—Superior applicants with an undergraduate major in any physical or biological science usually have completed the necessary prerequisites. The minimum requirements are general chemistry, organic chemistry with laboratory, physics with laboratory, and calculus. If preparation appears inadequate, certain additional courses may be required after admission.

Special Application Requirements—Submission of scores from the General (Aptitude) Test of the Graduate Record Examination is required. Submission of three letters of reference is also required whether or not the prospective student is applying for financial assistance. Students are admitted each quarter.

Master’s Degree Requirements—Coursework in each of five program areas is required so that students develop a depth and breadth of knowledge in the field. The five program areas and the appropriate courses (equivalents may be substituted) are: (1) Chemistry—minimum of 5 credits from among FScN 5110, 5312, 5314, 8311, 8312, 8315, 8403; (2) Engineering—a minimum of 5 credits from among FScN 5135, 5555, 8322, AgEn 5140; (3) Technology—a minimum of 4 credits from among FScN 5512, 5522, 5523, 5530, 5540, 5550, 5562; (4) Microbiology—a minimum of 5 credits from among FScN 5120, 5122, 5123, 5320, 8322, 8323, 8324; and (5) Consumer Issues—a minimum of 3 credits from among FScN 5360, 5390, 5404, 5474, 5524, 5564. In addition, 1 credit of FScN 8205 is required. Familiarity with nutrition, as demonstrated through completion of a course equivalent to FScN 1612, as a minimum, is required.

Master of science candidates may exceed the 40 percent limit on transfer of Continuing Education and Extension/University College credits customarily permitted in the Graduate School. Students wishing to do so must consult the director of graduate studies for further instructions.

The minor may be chosen from a variety of fields including biochemistry, business administration, chemistry, chemical engineering, economics, industrial engineering, marketing, microbiology, nutrition, physiology, public health, and technical communication. A final oral examination is required; a final written examination may be required at the discretion of the graduate faculty.

Doctoral Degree Requirements—No specific coursework for the major is designated, but students must take an entrance examination to suggest courses that will assure a broad food science background. Courses beyond these are determined by the student and adviser, with approval by the graduate studies committee. Students usually take the basic courses required for the M.S. degree (Plan A), along with courses in the thesis area. To assure approval of the program, students should consult with the adviser and director of graduate studies. The minor may be chosen from among the fields suggested for the master’s degree minor.
Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—For the master’s degree, a minimum of 11 credits selected from two of the five program areas. For the doctoral degree, a minimum of 20 credits from three of the five program areas. These courses should be chosen in consultation with the director of graduate studies.

For Further Information and Applications—Contact the Graduate Program in Food Science, University of Minnesota, 225 Food Science and Nutrition, 1334 Eckles Avenue, St. Paul, MN 55108 (612/624-1290).

FScN 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

FScN 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

FScN 8888. Thesis Credits: Doctoral. (36 cr required)

FScN 5110. Food Chemistry. (4 cr; prereq 3102, BioC 3031 or Biol 5001) Csallany
Chemical structures and functional properties of food components in relation to their roles as parts of complex biochemical systems and as modified by environmental and processing factors.

FScN 5111. Independent Study in Food Science and Nutrition. (1-5 cr [may be repeated for cr]; prereq A)
Individual lab or library research in some area related to food science or nutrition.

FScN 5120. Food Microbiology. (5 cr; prereq 3102, 3112, VPB 3103 or MCB 5105 or #) Tabbini
Relationship of environment to occurrence, growth, and survival of microorganisms in foods; methods of evaluation, mechanisms to control, genera and species of importance, control of foodborne pathogens and toxins. Enumeration, isolation, and identification of microbes in foods.

FScN 5122. Control Systems in Food Microbiology. (2 cr; prereq 5120) Zottola
Control and destruction of microorganisms in foods; hazard analysis; critical control points; chemical, physical, and microbiological considerations in cleaning and sanitizing food contact surfaces and equipment; microbiological criteria for raw and processed foods; sampling methodologies.

FScN 5123. Food Fermentations and Biotechnology. (3 cr; prereq 5120) McKay
Food fermentation processes; characteristics of microorganisms involved in food fermentations and production of food ingredients; composition and factors influencing activity of starter cultures; microbiology of natural and controlled fermentations; properties of lactic bacteriophages and methods of control during dairy fermentations.

FScN 5135. Food Engineering Unit Operations. (5 cr; prereq 3136, Phys 1042) Bhattacharya
Principles and food system applications of the following unit operations: fluid flow, heat transfer, drying, evaporation, contact equilibrium (distillation, extraction, crystallization, and membrane processes), and mechanical separation (filtration, centrifugation, sedimentation, and sieving).

FScN 5312. Instrumental Analysis of Foods. (3 cr; prereq 3112, 5110) Reineccius
Application of instrumental methods of analysis to the examination of food products.

FScN 5314. Physicochemistry of Foods. (4 cr; prereq 5110; offered alt yrs)
Characterization of crystalline systems, gels, emulsions, and foams; functionality of food macromolecules in these systems.

FScN 5316. Quantitative Light Microscopy in Agriculture and Food Research. (4 cr; prereq Biol 1009 or Chem 1052; offered alt yrs) Fulcher
Introduction to light microscopy and its variants. Description and applications of quantitative instruments for characterizing cell, tissue, and other raw or processed materials. Digital image analysis, scanning microspectrophotometry, and laser scanning microscopy.

FScN 5360. Sensory Evaluation of Food Quality. (4 cr; prereq 3102, Stat 3012 or Stat 5021; offered alt yrs) Vickers
Fundamentals of sensory perception. Test designs and methods used in studying the sensory quality of foods.

FScN 5380. Food Packaging. (4 cr; prereq 1102, 3102, Phys 1042; offered alt yrs) Willson
Basics of packaging materials; principles of packaging development and product protection as applied to foods.

FScN 5390. Introduction to Food Law. (4 cr; prereq 1102 or #; offered alt yrs) Labuza
Analysis of federal and state legal requirements and case law history affecting production, processing, packaging, marketing, and distribution of food and food products.

FScN 5401. Special Topics in Food Science and Nutrition. (1-4 cr; prereq varies with topic)
In-depth investigation of topic not covered by other courses; topics specified in Class Schedule.

FScN 5404. Current Issues in Food and Nutrition. (2-4 cr; prereq 15 cr food science and nutrition or #)
Evaluation of popular and scientific literature as it deals with nutrition, food additives, food safety, food fads, health foods, environmental contamination, the consumer movement, naturally occurring food toxicants, processed foods, synthetic foods, organically grown foods.

FScN 5474. Food Marketing Economics. (3-4 cr; #AgEc 5550; prereq AgEc 3101 or #) Asp, Senauer
Economics of food marketing in United States. Food consumption trends; consumer food behavior; food expenditure and consumption data; consumer survey methodology; food distribution and retailing system; food policy issues related to food marketing. Individual and group projects required.
**FScN 5512. Meat Technology.** (4 cr; prereq 5110; offered alt yrs) Addis
Industrial processing of meat, fish, and poultry products, including protein functionality, thermal processing, curing, smoking, and deterioration during storage. Use of preblending and least-cost analysis in product development and formulation.

**FScN 5522. Technology of Fluid and Concentrated Milk Products.** (4 cr; prereq 3136, 5110; offered alt yrs) Smith
Application of scientific principles to problems involved in processing fluid and dehydrated milk systems and their control. Demonstration of basic processing operations including heating, cooling, homogenization, evaporation, drying, crystallization, and freezing.

**FScN 5523. Technology of Fermented Dairy Products.** (4 cr; prereq 5110, 5123; offered alt yrs) Bastian
Integration of chemical, microbiological, and physical principles involved in manufacturing and storing cheeses and fermented milks.

**FScN 5524. Sensory Evaluation of Dairy Products.** (1 cr; prereq 3102) Smith
Lab and commercial procedures for evaluating the sensory properties and market quality of dairy products. Cause and identification of common defects in flavor, physical properties, and appearance.

**FScN 5540. Fats and Oils Chemistry and Technology.** (4 cr; prereq 5110; offered alt yrs) Csallany
Nature of fats and oils, their structure, composition, chemical and physical properties; raw materials for fat and oil products; extraction, refining, hydrogenization, and other industrial manipulations; handling, storage, analysis, and grading of raw materials and finished products.

**FScN 5550. Grains: Introduction to Cereal Chemistry and Technology.** (4 cr; prereq Biol 1009 or Chem 1052; offered alt yrs) Fulcher
Origins, structure, biochemistry, and cellular properties of major cereal grains as they relate to primary processing (milling) and secondary processing (production of cereal products). Relation between structure and functionality as determinants of quality in grains and grain products. Quality evaluation technologies.

**FScN 5555. Freezing and Dehydration of Foods.** (5 cr; prereq 1102, 5135; offered alt yrs) Labuza
Principles involved in the processing, handling, and storage of frozen, dry, and intermediate moisture foods, with emphasis on the physicochemical properties of water in foods.

**FScN 5560. Introduction to New Product Development.** (3 cr; prereq 8 crs food science; offered alt yrs) Fulcher
Principles, from identification and testing of new product concepts through prototype testing, to basic process design using an interactive format and industrial examples. Statistical and chemical control of new processes and methods for evaluating consumer acceptance.

**FScN 5562. Flavor Technology.** (4 cr; prereq 1102, 5110; offered alt yrs) Reineccius
Flavor and off-flavor development in foods. Industrial production of food flavorings and their proper application to food systems.

**FScN 5614. Nutrition Education.** (3 cr; prereq 3610)
Application of educational principles, models, and theories to development, delivery, and evaluation of nutrition lessons, curricula, and communications.

**FScN 5620. Nutrition and Metabolism.** (5 cr; prereq 3612 or #; Biol 5001) Brady
Physiological function and metabolic fate of carbohydrates, lipids, and proteins and their involvement in fulfilling energy needs for maintenance, growth, and work. Physiological function of vitamins and minerals.

**FScN 5623. Vitamin and Mineral Biochemistry.** (4 cr; prereq 3612, Biol 5001, Phsl 3051) Gallaher
Nutritional/biochemical and physiological function of essential vitamins and minerals in humans and experimental animal models.

**FScN 5624. Human Protein and Energy Utilization.** (4 cr; prereq 5622) Kurzer
Regulation of human protein and energy use, interactions, adaptations; critical evaluations of methods for determining requirements; technical and ethical problems in human experimentation and determination of recommended levels of intake.

**FScN 5643. World Food Problems.** (3 cr, §AgEc 5790, §Agro 5200, §CAPS 5280; prereq sr or grad student; limited enrollment)
Multidisciplinary approach to social, economic, and technical problems of feeding the world’s growing population. Principles from social and economic sciences and from plant, animal, and food sciences for application to world food problems.

**FScN 5999. Special Workshop in Food Science and Nutrition.** (1-4 cr; prereq #)
Offered off campus. Topics specified in Class Schedule.

**FScN 8101. Research Seminar.** (1 cr; prereq #; S-N only)
Seminar discussion with faculty member(s) of research progress within the group, or review and discussion of current research literature related to food science and nutrition.

**FScN 8205. General Seminar.** (1 cr; prereq #; S-N only)
Presentation of topics related to food science and nutrition by staff members, graduate students, and outside speakers.

**FScN 8311. Flavor Chemistry.** (3 cr; prereq 5312 or #; offered alt yrs) Reineccius
Chemistry of food flavor including biogenesis of flavor, production during processing, deterioration during storage, potentiation, duplication as an art and science, and use in food industry.
FScN 8312. Reaction Kinetics of Food Deterioration. (3 cr; prereq Chem 5520 or #; offered alt yrs) Labuza
Review of the basis for application of chemical kinetic theory to deteriorative reactions occurring in the processing and storage of foods. Specific systems studied include hydrolytic reactions, vitamin deterioration, lipid oxidation, non-enzymatic browning, frozen reactions and moisture changes. Application of these kinetics to the study of accelerated shelf life testing of foods and choice of food packaging material based on legal requirements of nutritional labeling and open dating.

FScN 8315. Food Proteins. (3 cr; prereq 5110, 5312 or #; offered alt yrs) Hackett
Principles of isolating, handling, and processing of proteins from conventional and new protein sources.
Relationship of structural, functional, and interactive properties of proteins to developing and/or maintaining nutritional and aesthetic properties of products.

FScN 8323. Microbial Starter Cultures. (3 cr; prereq 5123, Biol 5001 or #; offered alt yrs) McKay
Microbiology of food starter cultures; selection, identification, and composition of starters; nutrition and metabolism, strain association and compatibility, cause and control of culture related defects; genetics, preservation, and mass production; bacteriophage in cheesemaking.

FScN 8324. Microbial Toxins and Toxic Microorganisms in Foods. (4 cr; prereq 5120 or #; offered alt yrs) Tatini
Incidence and reasons for presence of various microbial toxins and toxic microorganisms in foods. Nature of toxins and mechanisms of toxicity. Biological, serological, and biochemical methods for detecting toxins. Means for control of these toxins in foods for prevention of food-borne public health hazards.

FScN 8401. Independent Study: Food Science. (1-5 cr; prereq ∆)
Independent study and written reports.

FScN 8403. Advanced Topics in Food Science. (1-4 cr; prereq #)
Review of recent research in food science or presentation of special topics course.

Nutr 8745. Seminar. (1 cr [may be repeated for cr]; prereq #)

Nutr 8990. Graduate Research. (2-5 cr; prereq #)

Forestry
Professor: Alfred D. Sullivan, dean; Kenneth N. Brooks, director of graduate studies; Joseph G. Massey, head, forest products; Alan R. Ek, head, forest resources; Neil A. Anderson; Marvin E. Bauer; Melvin J. Baughman; Robert A. Blanchette; Charles R. Blinn; James L. Bowyer; Thomas E. Burk; Edward J. Cushing; Paul V. Ellefson; Roland O. Gertjejansen; Hans M. Gregersen; David F. Grigal; Wesley P. Hackett; Leo H. McAvoy, Jr.; Carl A. Mohn; John L. Nieber; James A. Perry; Peter B. Reich; Dietmar W. Rose; C. Ford Runge; Elmer L. Schmidt; Edward I. Sucoff

Associate Professor: Dorothy H. Anderson; Glenn R. Furnier; Howard M. Hoganson; Patrick H. Huelman; Gary R. Johnson; Shri Ramasawamy; Simo Sarkanan; J. L. David Smith; Ulrike Tschirner
Assistant Professor: Paul V. Bolstad; Stephan P. Carlson; Timothy D. Larson; Steven B. Laursen; Mutombo Muvundumina; Harlan D. Petersen; Klaus Y. Puettmann

Other: David N. Bengston; Erwin R. Berglund; Stephen M. Bratkovich; Kenneth L. Cole; Karlyn Eckman; Daniel L. Erkkila; Lee E. Freliech; Thomas A. Greene; Robert G. Haight; Mark H. Hansen; George H. Honadle; Glenn T. Howe; Judson G. Isebrands; Rolfe A. Leary; David W. Lime; David C. Lothgren; Allen L. Lundgren; Thomas J. Nichols; Jacek Oleksyn; Michael E. Ostry; Michael J. Phillips; Don E. RiemenSchneider; Thomas L. Schmidt; Robert T. Seavey; Elon S. Verry; Xiwei Yin; Zhu Xu

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S. (Plan A and Plan B), M.F., and Ph.D.

Curriculum—Students normally emphasize one of the following subfields: the chemistry of lignocellulosic materials; paper and fiber products recycling; deterioration of wood; wood mechanics; structural design with wood; wood moisture interaction and drying; processing and performance of wood composites; economics of manufacturing systems; technology and processing of solid wood products; design and production of housing components; energy-efficient building construction; ecology and silviculture; ecophysiology; economics in forest and related natural resource management; genetics and tree improvement; geographic information systems; hydrology and water quality; watershed management; survey, measurement, and modeling; policy and administration; tree physiology and tissue culture; recreation land management; remote sensing; and urban forestry. Faculty in forestry also offer courses in natural resources and environmental studies (NRES) listed after the forest products and forest resources courses below.

Prerequisites for Admission—Prerequisites vary by subfield. Most admitted students have earned degrees in forestry or forest products. Applicants with exceptional academic records but no forestry background are eligible; if admitted, they may complete the necessary
prerequisites for advanced courses during the early stages of their graduate program. Applicants for the doctoral program should demonstrate a capacity for advanced study and independent research.

Special Application Requirements—Applications are processed on a continual basis, and students are admitted each quarter. Graduate Record Examination scores are required. Letters of recommendation are optional but highly recommended. Applicants for the doctoral program should supply the names and addresses of three people who can provide evaluations of their capacity for advanced study and independent research.

Master’s Degree Requirements—M.S. (Plan B) students, in consultation with faculty, design a program that develops competence in one or more subfields. M.S. (Plan A) students usually design a program to support their specific thesis project. Master’s degree students are required to present a seminar on the thesis, Plan B project, or a topic selected in consultation with the graduate adviser. Specific requirements vary by subfield; prospective students should contact the director of graduate studies and/or a prospective faculty adviser for specific information. Students in the M.F. program are required to complete basic science courses and introductory forestry courses if not included in their undergraduate program. The minimum number of course credits for both Plan A and Plan B is that set by the Graduate School.

The final examination is oral.

Doctoral Degree Requirements—The program ensures that students gain the necessary competence in the subfield for independent research. Programs normally vary from 60 to 90 credits, not including thesis credits. Course selection and thesis proposals are developed by each student in consultation with the faculty adviser for review and approval by the forestry graduate study committee.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Students who wish to minor in forestry should contact the director of graduate studies. The selection of courses for an acceptable minor is influenced by the student’s background and educational objective. Minor field competence is evaluated in the oral examination.

For Further Information and Applications—Contact the Forestry Graduate Program, College of Natural Resources, University of Minnesota, 115 Green Hall, 1530 Cleveland Avenue North, St. Paul, MN 55108 (612/624-2748; fax 612/625-5212; e-mail kkanda@forestry.umn.edu).

ForS 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)
ForS 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)
ForS 8888. Thesis Credits: Doctoral. (36 cr required)

Forest Products (ForP)
ForP 5300.* Wood-Fluid Relations. (3 cr; prereq 1301 or #) Larson
Moisture in wood and its relationship to density and specific gravity, shrinking and swelling, electrical properties, strength properties, thermoconductivity, absorption isotherms, dimensional stabilization, permeability and diffusion.

ForP 5301. Mechanical Properties. (3 cr; prereq 1301 or #) Larson
Basic mechanics and strength of materials as applied to wood products.

ForP 5302. Wood Chemistry I. (3 cr; prereq Chem 3302) Sarkanen
Molecular structure of wood cell wall. Structures, properties, and reactions of monosaccharides and derivatives; oligosaccharides. Structure, properties, and biogenesis of cellulose; cellulose derivatives; comparison with starch.

ForP 5303. Wood Drying and Preservation Processes. (4 cr; prereq 5300, 5303 or #) Petersen
Drying of wood and wood products by bacteria, fungi, insects, marine organisms, fire, and weathering; methods of preservation and preservatives used. Lecture and lab.

ForP 5304.* Wood Drying and Preservation Processes. (4 cr; prereq 5300, 5303 or #) Petersen
Materials, equipment, processes, and technical considerations involved in industrial drying and preservative treatment of wood products. Lectures, lab exercises, and plant tours.

ForP 5305. Pulp and Paper Technology. (2 cr; prereq 5300 or #) Tschirner
Pulping processes; fiber refining and processing; manufacture of paper; fiber and paper properties; recycling of paper; water requirements and effluent treatment. Lecture and lab.
ForP 5306. Analysis of Production Systems. (3 cr; prereq 1301 or §; 3300 recommended) Bowyer Engineering and economic analysis of manufacturing and distribution systems for wood-based products. Material balances, equipment selection, economic analysis, and presentation techniques.

ForP 5307. Wood-Base Panel Technology. (4 cr; prereq 5300, 5301 or #) Gertjejansen Design, manufacture, properties, and applications of structural and nonstructural wood-base panels. Adhesives and their application in the panel industry. Lecture and lab.

ForP 5308. Wood Machining. (3 cr; prereq 1301, 1303) Bowyer Wood machining technologies and methods; development and application of wood processing systems. Lectures, discussions, demonstrations, and company visits.

ForP 5310. Pulp and Paper Process Laboratory. (3 cr; prereq 5305 or #) Gertjejansen, Muvundamina Chemical and mechanical pulping, pulp preparation, secondary fiber, wet end additives. Lab problems and exercises supplemented by lectures.

ForP 5311. Pulp and Paper Process Engineering Calculations I. (4 cr; AgET 3030 or CSci 3101, ChEn 5011, CE 3400, ME 3301 recommended) Physical and chemical process engineering calculations; steady and unsteady state material and energy balances applied to pulping and papermaking processes; flowsheet and system calculations; computer-aided material and energy balances.

ForP 5312. Pulp and Paper Process Engineering Calculations II. (4 cr; prereq 5311 or ChEn 5101, ¶ME 3301; AgET 3030 or CSci 3101, ChEn 5011, CE 3400 recommended) Physical and chemical process engineering calculations; steady and unsteady state material and energy balances applied to pulping and papermaking processes; flowsheet and system calculations; computer-aided material and energy balances.

ForP 5313. Pulp and Paper Process Operations I. (4 cr; prereq 5305, 5312, 5353, CE 3400, ME 3301, ChEn 5102 or ME 5342 or #) Ramaswamy Application of principles of momentum, heat, and mass transfer to unit operations in pulp and paper industry: fluid transport, filtration, sheet forming, sedimentation, drainage, pressing, heat exchange, evaporation, washing, bleaching, humidification and drying, and chemical and energy recovery. Computer simulation of multiple-stage systems.


ForP 5315. Paper Engineering Laboratory. (2 cr; prereq 5305, 5310 or ¶5310, 5312 or #; 5306 recommended) Ramaswamy Experiments that illustrate and apply the principles of momentum, heat, and mass transfer. Operation and performance optimization of pilot-plant paper machine. Process engineering studies of industrial production systems.

ForP 5316. Coated Product Development. (2 cr; prereq 5359) Tschirner Coating process and products (primarily paper) associated with process components of coating: theory, techniques, and procedures for formulating and applying coatings; properties of coated products and their uses.

ForP 5318. Pulp and Paper Process Dynamics and Control. (3 cr; prereq 5305, 5310, 5311, 5312, 5315, CE 3400, ME 3301, ¶ME 5342 or #) Ramaswamy Theory and practice of process control in pulp and paper industry; sensors, control equipment and algorithms, final control elements; applications to industrial pulp and paper manufacturing and quality control; applications of SPC and SQC; available hardware and software.

ForP 5320. Biological and Environmental Science of Pulp and Paper. (3 cr; prereq jr or sr or grad student in ForP) Schmidt Environmental impacts related to biology and chemistry of pulp and paper processes; treatment of process effluents and discharges; governmental regulations and industry compliance; theory, design, and operation of equipment for treatment or prevention of environmental effects; biochemistry of pulp and paper aquatic systems; advances in biological pulping and papermaking.

ForP 5321. Material Science of Paper: Paper and Fiber Physics and Properties. (4 cr; prereq 5305, 5310, 5311, 5312, 5315, CE 3400, ¶Chem 5520, ME 3301, ME 5342 or #) Muvundamina Advances in understanding response of fibers subjected to various operations of papermaking processes; mechanisms acting in stock preparation, refining, wet-end operations, web consolidation, and drying; analysis of corresponding influences on fiber, pulp suspension, and paper properties; challenges placed on end products by changing raw materials and requirements, including introduction of recycled pulp in paper products.

ForP 5350. Woody Tissue Microtechnique. (2 cr; offered when feasible)

ForP 5353. Wood Chemistry II. (3 cr; prereq 5302) Sarkanen Composition, distribution, and structures of hemicelluloses and their interactions with cellulose; biosynthesis, structure, and analytical degradation of lignin; delignification of wood; pulp bleaching chemistry; lignin biodegradation.

ForP 5355.* Mechanics and Structural Design With Wood Products. (4 cr; prereq 5301) Larson Mechanical behavior of lumber, plywood, and particleboard applied to structural considerations in building construction. Lecture and lab.
ForP 5359. Surface and Colloid Chemistry of Papermaking. (3 cr; prereq 5361 or # Chem 3302, Chem 5520) Muvundamina
Principles of surface and colloid chemistry applied to basic problems in pulp and paper manufacturing operations and product uses.

ForP 5361. Adhesion and Adhesives. (3 cr; prereq Chem 3302, Chem 5520) Sarkanen
Scope and utility of adhesive applications; fundamental nature of adhesion; ideal adhesive joint; conformations of linear polymers; statistical thermodynamics and polymer adsorption onto adherend surface; adhesives in common use; mechanical properties of adhesive joints.

ForP 5405. Paper in Today’s World. (3 cr, §5305) Gertjejansen
Primarily to enable elementary and secondary school teachers to prepare unit on pulp and paper for elementary through senior high school science classes. Lectures, labs, and demonstrations on pulp and paper manufacturing, properties and characteristics of paper, uses for paper, recycling with pulp, and paper equipment, including a pilot plant paper machine. Written report required for graduate credit.

ForP 5362. Adhesion and Adhesives Laboratory. (2 cr; prereq 5307)
Principles of surface and colloid chemistry applied to basic problems in pulp and paper manufacturing operations and product uses.

FR 5101. Field Silviculture. (4 cr; prereq 5100, Δ; offered at Cloquet) Nichols
Regeneration surveys, plantation inspection, site preparation and reforestation prescription. Practice in marking for thinning and determining effect on stands. Compartment examination and prescription. Written and oral reports.

FR 5102. Forest Wildlife Habitat Management. (1 cr; prereq 5100, FW 3052, ¶5101; offered at Cloquet) Vordon
Forest vegetation management techniques for developing and maintaining wildlife habitat; vegetation dynamics, habitat requirements, and silvicultural techniques.

FR 5104. Forest Ecology. (4 cr; prereq 8 cr biol, 4 cr chem) Sucoff
Ecological concepts and principles as basis for conservation and management of forest ecosystems.

FR 5107. Forest Ecology Laboratory. (1 cr, §5160; prereq §5104)
Field trips to introduce forest stands, communities, and ecosystems.

FR 5108. Physiological Ecology: Organisms to Ecosystems. (3 cr; prereq 5103 or 5104 or Biol 5041 or Hort 5041) Reich
Interaction between plants and their environment, focusing on mechanisms affecting whole plant, community, and ecosystem processes. Variation in resource availability and stress in diverse ecosystems: causes and consequences and relationships to plant establishment, growth, and survival. Links between organismal, community, successional, and ecosystem processes.

FR 5114. Forest Hydrology. (4 cr; prereq 3103, Biol 1009, Chem 1052, Geo 1001, Math 1142, Phys 1001 or # Brooks
Introduction to the hydrologic cycle and hydrologic processes. Effects of forest management activities on water yield, storm flow, and water quality.

FR 5115. Forest Hydrology, Field Applications. (2 cr; prereq 5114 or # Brooks
Use of hydrologic instrumentation needed to measure precipitation, streamflow, infiltration capacity, soil moisture, air temperature, evaporation, and selected water quality constituents. Collection and interpretation of hydrologic information needed to evaluate forest-use impacts on water quantity and quality.

FR 5120. Tree Physiology. (3 cr; prereq Chem 1001 or Chem 1004, 10 cr biol) Sucoff
Genetic variation in forest trees, its underlying causes, and its use in forestry. Tree growth, nutrition, and water relations. Environmental and internal regulation of growth. Plant biochemistry and photo-chemistry. Physiology related to silviculturally and ecologically significant phenomena.
FR 5126. Silviculture: Soil-Site Relationships. (2 cr; prereq 1122, 5100, δ; offered at Cloquet) Grigal
Field examination of forest soils and their relationship to site productivity and forest management.

FR 5130. Geographic Information Systems in Natural Resource Analysis. (2 cr; prereq sr or grad student or #) Bolstad
Introduction to application of Geographic Information Systems to natural resource and regional planning studies; theory and technical points, emphasizing applications; hands-on microcomputer experience; performance of case study, including map digitizing, data processing, and generation of map products.

FR 5131. Geographic Information Systems Lab. (1 cr; prereq §15130)

FR 5142. Tropical Forest Ecology. (3-4 cr; prereq 1 ecology course at 3xx or higher) Reich
Ecological principles related to form, function, and development of wet and dry tropical forests, at organismal, community, and ecosystem scales. Succession, productivity, biodiversity, sustainability, agroforestry, and management alternatives. Natural distribution of forest types; causes, consequences, and extent of deforestation.

FR 5146. Dynamics of Global Change: Plant Ecology. (3-4 cr; prereq plant ecology or plant physiology course at 3xx or higher) Reich
Implications of global change upon wild and cultivated vegetation, including forests, grasslands, and agricultural ecosystems. Responses at ecosystem, community, organismal, and physiological scales. Potential climate change; elevated atmospheric concentrations of carbon dioxide, ozone, and other trace gases; acid deposition; and other pollutants.

FR 5152.* Forest Genetics. (3 cr; prereq Bot 1103, Stat 3011) Mohn
Genetic variation of forest-tree species and underlying principles; application of plant breeding principles to forestry.

FR 5153.* Advanced Forest Hydrology. (4 cr; prereq 3220, 5114 or #) Brooks
Current hydrologic problems associated with management of forested watersheds. Analytical methods to evaluate vegetation management effects on quantity and quality of runoff.

FR 5160. Practicum in Forest Biology and Measurements. (3 cr; prereq grad student, #; offered at Itasca) Sucoff
Plant identification, plant dynamics, land survey, tree measurement.

FR 5200. Aerial Photo Interpretation. (3 cr) Bauer
Types, characteristics, procurement, preparation, viewing, and interpretation of color, black-and-white, and color infrared aerial photographs; basic aerial photography; introduction to mapping; applications to resource surveys.

FR 5202. Remote Sensing: Field Applications. (2 cr; prereq 5200, 5212; offered at Cloquet) Bauer
For inventorying, mapping, and monitoring forest and natural resources.

FR 5215. Forest Fire Ecology and Management. (2 cr; prereq 1100, Itasca Session, 3103, 5100 or #) Cole
Effects and control of fire on wild landscapes, especially forests and grasslands; fire effects on vegetation, fire history studies, fire behavior, fuel load modeling, and fire policy in land management agencies.

FR 5218. Assessment and Modeling of Forests. (3 cr; prereq Itasca Session, Math 1142 or Math 1211, NRES 5210, Stat 3011 or Stat 5121) Burk
Measurement and sampling methods for forest vegetation, tree and stand growth modeling, and landscape processes, characterization, and modeling.

FR 5221. Plant Molecular Evolution. (3 cr, §Bot 5221; prereq Bot 5003 or GCB 3022 or GCB 5022) Furnier
Experimental molecular techniques applicable to evolutionary studies; molecular methods of quantifying genetic diversity; statistical methods for phylogenetic reconstruction; application of RFLPs to study of chromosomal and morphological evolution; evolution of organellar genomes and multigene families; role of transposable elements in plant evolution; DNA sequence evolution; molecular aspects of development relating to plant evolution.

FR 5222. Forest Resources Inventory. (2 cr; prereq 5212; offered at Cloquet) Ek
Field application of sampling methods for estimating natural resources characteristics for inventory, appraisal, and monitoring purposes.

FR 5225. Directed Study Experience. (1-5 cr; prereq jr or sr or grad student, #) Opportunity to pursue experiences not available under independent study or extra credit registration. In consultation with adviser for project, student develops prospectus and completes progress and final reports on project.

FR 5226. Forest Economics and Planning. (5 cr; prereq Ag Econ 1101 or Econ 1101 or #) Gregersen, Rose
Conduct and interpretation of economic analysis, forest planning concepts, principles, and techniques of forest regulation.

FR 5228. Advanced Topics in Resource Assessment and Modeling. (4 cr; prereq 5218 or equiv, NRES 5210 or equiv, Stat 5021 or equiv) Burk
Recently developed mathematics, computer science, and statistics methodologies applied to problems of resource functioning, management, and use.
FR 5231. Range Management. (3 cr; prereq Biol 1103 or #) Brooks
Important range plants; range livestock; range
management methods and improvements; public grazing
land administration; relationship of livestock grazing to
wildlife, forest, watershed, and recreation management
on public and private range lands.

FR 5236. Forest Recreation Planning. (1 cr; 
prereq 5232, ∆; offered at Cloquet) D Anderson
Recreation area and site planning, examples and
managerial concerns. Fieldwork and presentation.

FR 5240. Natural Resource Policy and 
Administration. (3 cr; prereq AgEc 1101 or Econ
1101, AgEc 1102 or Econ 1102, Pol 1001, Rhet 1151) 
Ellefson
Basic concepts of political and administrative processes
important to development of natural resource policies
and programs. Focus on policy processes, agenda
setting, political decision rules, strategies for achieving
agreement, participants in policy development, public
means of implementing policies, and case examples.

FR 5248. Harvesting and Engineering. (3 cr; 
prereq 3300 or CE 3100, ∆; offered at Cloquet)
Introduction to harvesting systems, relationship to forest
management, and the preparation and administration of
timber sales. Location, construction, and maintenance of
forest roads.

FR 5250. Role of Renewable Natural 
Resources in Developing Countries. (2 cr) 
Gregersen, Rose
International perspective on important resource issues,
including integration of natural resource, social, and
economic considerations. Overviews on important issues
and case studies. Term paper and/or other requirements.

FR 5257.* Recreation Land Policy. (3 cr; prereq
5232 or #; offered alt yrs) D Anderson, Lime
Policy issues affecting the use and management of lands
devoted entirely or in part to recreational objectives.

FR 5259.* Analysis of Outdoor Recreation 
Behavior. (3 cr; prereq 5232, RRM major or grad
student or #; offered alt yrs) D Anderson, Lime
Development of environmental framework for
understanding recreation behavior; contributions of
several disciplines; current cultural trends; management
implications.

FR 5262. Remote Sensing of Natural 
Resources. (4 cr)
Basics, interpretation, measurement, and mapping from
aerial photography; introduction to digital remote
sensing and image analysis.

FR 5264. Quantitative Techniques in Forest 
Management. (3 cr; prereq 5212, 5226 or #) Rose
Forestry applications of quantitative techniques in
allocation and other decision-making problems.
Mathematical programming, simulation.

(3 cr; prereq 5218, ApEc 1101 or Econ 1101, ApEc
1102 or Econ 1102, NRES 5260) Rose
Role of models in resource decisions at stand and forest-
wide levels; regulation principles and techniques;
management scheduling approaches; principles of
economic trade-off and impact analysis.

FR 5403.* Fundamentals of Natural Resource 
Education. (1-3 cr; prereq elem school tchrs or #) Ek,
Johnson, Vogt
The forest community, tools used by forester, and
effective forest management practices. Forestry-related
indoor and outdoor activities for classroom use.

FR 5412. Advanced Remote Sensing. (4 cr; 
prereq 5262 or #) Bauer
Theoretical basis and practical applications of
quantitative remote sensing, including spectral-
biophysical relationships, radiation measurements, and
spectral pattern recognition. Lectures, problems, and
case studies with digital image analysis system.

FR 5500. Urban Forest Management. (4 cr) 
Johnson
Terminology and principles of urban tree inventory,
forest care, and health evaluation; management case
studies; sociology of urban forestry and best
management practices.

FR 5703. Colloquium in Forest Biology. (1-4 cr; 
prereq varies with topic) Furnier, staff
Specialized topics in forest biology and silviculture.

FR 5704. Colloquium in Natural Resources. 
(1-4 cr; prereq varies with topic) Brooks, Gregersen, 
staff

(Cr ar) Puettmann
FR 8101.* Research Problems: Forest-Tree 
Physiology. (Cr ar) Sucoff
FR 8102.* Research Problems: Forest-Tree 
Genetics. (Cr ar) Furnier, Mohn
FR 8103.* Research Problems: Forest 
Hydrology. (Cr ar) Brooks, Perry
(1-8 cr) Grigal, Reich, Sucoff
FR 8105. Advanced Field Silviculture. (3 cr; 
prereq 5101, #)
Selected current problems and research in silviculture.
Plant-soil relationships with particular reference to forest
soils. Methods of forest soil investigations in the field
and lab.

FR 8107. Seminar: Forest Resources. (1 cr) 
Assigned topics, problem analyses, and research reports.
FR 8112. Research Problems: Physiological Ecology. (1-8 cr) Reich, Sucoff
Interaction between plants and their environment, focusing on mechanisms that affect whole plant, community, and ecosystem processes. Causes and consequences of variation in resource availability and stress in diverse ecosystems; relationships of resource availability and stress to plant establishment, growth, and survival; linkages between organismal, community, successional, and ecosystem processes.

FR 8200.* Research Problems: Forest Management. (Cr ar) Blinn, Hoganson, Rose
FR 8201.* Research Problems: Forest Economics. (Cr ar) Ellefson, Gregersen, Hoganson, Rose
FR 8202.* Research Problems: Forest Measurements. (Cr ar) Burk, Ek, Rose
FR 8203.* Research Problems: Forest Recreation. (Cr ar) D Anderson, Lime
FR 8204.* Research Problems: Forest Policy. (Cr ar) Baughman, Ellefson, Gregersen
FR 8205.* Research Problems: Remote Sensing. (Cr ar) Bauer, Bolstad
FR 8207. Economic Analysis of Forestry Projects. (3 cr; prereq #) Gregersen
FR 8301. Teaching Practicum. (2-4 cr; prereq adviser permission, #) Furnier, staff
FR 8302. Survey, Measurement, and Modeling Methods for Natural Resources I. (4 cr; prereq AgEt 3030 or CSci 3101 or CSci 3102 or CSci 3113 or GC 1571, Math 1142 or Math 1251, Stat 3011 or Stat 5021) Ek
FR 8575. Wetlands Conservation. (4 cr; prereq EEB 3001 or EEB 3101, Biol 5041 or #; plus one more hr per wk) Cooper
FR 5101. Integrated Natural Resource Planning. (5 cr; prereq 5210 or FR 5212, FR 5226, FR 5240, rec resource mgmt course, ecol course, hydrology course or #) Rose, staff
FR 5210. Survey, Measurement, and Modeling Methods for Natural Resources I. (4 cr; prereq AgEt 3030 or CSci 3101 or CSci 3102 or CSci 3113 or GC 1571, Math 1142 or Math 1251, Stat 3011 or Stat 5021) Ek
FR 5220. Survey, Measurement, and Modeling Methods for Natural Resources II. (4 cr; prereq 5210 or FR 5212 or equiv; offered alt yrs) Burk, Ek
FR 5225. Directed Study Experience. (1-5 cr; prereq jr or sr or grad student, #) Opportunity to pursue experiences not available under independent study or extra credit registration. In consultation with adviser for project, student develops prospectus and completes progress and final reports on project.
FR 5575. Wetlands Conservation. (4 cr; prereq EEB 3001 or EEB 3101, Biol 5041 or #; plus one more hr per wk) Cooper
FR 5600. Principles of Waste Management. (4 cr; prereq Biol 1009 or Chem 1051, Stat 3011 or #) Cooper, Holbach
FR 5100. Problem Solving in Natural Resources and Environmental Studies. (5 cr; prereq 12 cr in concentration for NRES majors, FR 5232 and FR 5233 for rec resource mgmt majors, Rhet 3562, Stat 3012) D Anderson, Bolstad
World vegetation management practices, extent, and implications. Forest management, agriculture, and agroforestry; historical, current, and prospective practices and environmental and societal implications.
FR 5100. Problem Solving in Natural Resources and Environmental Studies. (5 cr; prereq 12 cr in concentration for NRES majors, FR 5232 and FR 5233 for rec resource mgmt majors, Rhet 3562, Stat 3012) Anderson, Bolstad
French and Italian

Professor: Maria F. Paganini, chair; Ronald F. Akehurst; Tom C. Conley; Susan J. Noakes; Joseph L. Waldauer
Associate Professor: María M. Brewer, director of graduate studies; Betsy K. Barnes; Daniel Brewer; Ronald L. Martinez; Judith Preckshot; Peter H. Robinson; Eileen B. Sivert
Assistant Professor: Susanna Ferlito; Catherine Liu

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.


Curriculum—Majors in French and Italian are offered.

Prerequisites for Admission—For major work, 50 upper division quarter credits or the equivalent in the major field (French or Italian), at least 20 credits of which are in literature, are required. Students in the program ordinarily find it necessary to supplement their undergraduate work with a considerable amount of independent reading.

Special Application Requirements—New students may enter in any quarter or summer term.

Master’s Degree Requirements—Before registering for their first quarter of graduate work, students must consult the director of graduate studies. Students also should familiarize themselves with the special requirements of the department. The minimum coursework requirement is 28 credits for Plan A and 44 credits for Plan B. A final written examination (given during the third week of fall and spring quarters) and a final oral examination are required. See the department’s general information bulletin for details.

Doctoral Degree Requirements—Before registering for their first quarter of graduate work, students must consult the director of graduate studies. Students entering with an M.A. degree from another institution may be required to take a qualifying examination before the end of the seventh week of their second quarter. Immediately after passing the M.A. or qualifying examination, students design their programs in consultation with their advisory committees. The minimum coursework requirement is 60 credits in the major. Four topics or fields of inquiry are chosen. See the department’s general information bulletin for details.

Language Requirement—See the department’s information bulletin. Master’s students must demonstrate proficiency in one language other than French or English. Doctoral students must demonstrate this proficiency at a level higher than for master’s students and suitable for use in research. Doctoral students intending to specialize in the Middle Ages, Renaissance, or Early Modern Period (to roughly 1666) must also demonstrate knowledge of Latin.

For Further Information and Applications—A department general information bulletin and a projection of graduate-level courses to be offered is available from the Department of French and Italian, University of Minnesota, 260 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612/624-4308).

Fren 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

Fren 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

Fren 8888. Thesis Credits: Doctoral. (36 cr required)

Ital 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

French (Fren)

Fren 5017. Composition et Stylistique. (4 cr; prereq 3017 or #) Translation, imitation, and composition of fiction and nonfiction, prose and poetry, using both English and French texts.

Fren 5105. Topics in Criticism. (4 cr; prereq 3209 or above, undergrad French lit major or MA student) Introduction to current issues in critical theory.

Fren 5207. Old French. (4 cr; prereq 3209 or above) Akehurst Preparation for reading medieval French texts in the original.

Fren 5219. Humanism and Italianism in the Literature of the 16th Century. (4 cr, §Frt 5219, §ital 5219; prereq 3209 or above) Conley Aspects of Italian civilization from Dante to Machiavelli that led to the Renaissance. Focus on French and Italian literary texts. Taught in English; knowledge of Italian not required.

Fren 5289. Topics in African Literature. (4 cr; prereq 3209 or above) Preckshot Francophone African and Afro-Caribbean literature in its historical, cultural, or ideological contexts.

Fren 5311. Renaissance Poetry Before the Pélade. (4 cr; prereq 3209 or above) Conley The grands rhetoriqueurs, Lemaire, Marot, Saint-Gelays, Louise Labé, and others; includes study of elegy, emblem, blason, and art poétique.
Fren 5312. Pléiade and Baroque. (4 cr; prereq 3209 or above) Conley
Ronsard, Du Bellay, and other poets of the Pléiade and the first baroque poets, including Sponde, Du Bartas, Desportes, Chassignet.

Fren 5331. French Poetry From D’aubigné to La Fontaine. (4 cr; prereq 3209 or above) Conley
Movement from baroque to classicism studied in the great verse creations of the 17th century.

Fren 5354. Drama of the 18th Century. (4 cr; prereq 3209 or above) Waldauer
Tragedy, drama, comedy (emphasis on comedy).

Fren 5355. Novel of the 18th Century. (4 cr; prereq 3209 or above) Waldauer
Emphasis on novels of Marivaux, Diderot, and Laclos.

Fren 5368. Short Stories of the 19th Century. (4 cr; prereq 3209 or above) Sivert
From Charles Nodier to Villiers de l’Isle-Adam. (See 5467 for Flaubert).

Fren 5380. The French Novel in the 20th Century. (4 cr; prereq 3209 or above) M Brewer, Paganini

Fren 5415. Rabelais. (4 cr; prereq 3209 or above) Conley
Gargantua and Pantagruel in original text.

Fren 5457. Rousseau. (4 cr; prereq 3209 or above) Waldauer

Fren 5459. Diderot. (4 cr; prereq 3209 or above) D Brewer, Waldauer

Fren 5461. Baudelaire. (4 cr; prereq 3209 or above) Robinson

Fren 5465. Stendhal. (4 cr; prereq 3209 or above) Sivert, Waldauer

Fren 5466. Balzac. (4 cr; prereq 3209 or above) Sivert

Fren 5467. Flaubert. (4 cr; prereq 3209 or above) Paganini, Sivert

Fren 5471. Mallarmé. (4 cr; prereq 3209 or above) Robinson

Fren 5475. Zola and the Naturalistic Novel. (4 cr; prereq 3209 or above) Sivert

Fren 5486. Proust. (4 cr; prereq 3209 or above) Paganini

Fren 5505. Topics in Culture. (4 cr; prereq 3201 or above, knowledge of French)
Comprehensive seminar on contemporary continental theories of discourse and culture. Conceptions of language, ideology, and culture as symbolic systems.

Fren 5701. Structure of French: Phonology. (4 cr; prereq 3014 or 3016 or #) Barnes
Advanced study of sound system of contemporary French.

Fren 5702. Structure of French: Morphology and Syntax I. (4 cr; prereq 3016; 5701, Ling 3001 or Ling 5001 recommended) Barnes
Linguistic study of word forms of contemporary French (derivational and inflectional morphology); introduction to French syntax (linguistic study of grammar).

Fren 5703. Structure of French: Syntax II. (4 cr; prereq 5702 or #)
Linguistic study of selected aspects of contemporary French syntax, such as pronouns, relative clauses, interrogatives, reflexive verbs. Some attention to syntactic features of spoken French.

Fren 5710. Topics in French Sociolinguistics. (4 cr; prereq 3016)
Socioculturally appropriate uses of the language and regional and contextual language variation.

Fren 5800. CIEE Contemporary Film Programs in Paris. (1-45 cr [undergrad], 1-15 cr [grad]; prereq 1105 or #)
Semester or year of study in film criticism and/or history with French faculty. Structural analysis, modern institutions and media, study/criticism of European and American film. Remedial courses in French available. Advanced students also may take courses at Paris universities.

Fren 5900. Topics in French Literature. (3-5 cr per qtr [max 15 cr]; prereq 3209 or above)

Fren 5920. Topics in Early French Prose (800-1600). (3-5 cr per qtr; prereq 3219 or above)

Fren 5930. Topics in Medieval-17th Century Poetry. (3-5 cr per qtr; prereq 3219 or above)

Fren 5940. Topics in Early Modern French Prose (1600-1900). (3-5 cr per qtr; prereq 3219 or above)

Fren 5950. Topics in Modern French Poetry (19th and 20th Centuries). (3-5 cr per qtr; prereq 3219 or above)

Fren 5960. Topics in Modern French Prose (1850-present). (3-5 cr per qtr; prereq 3219 or above)

Fren 5980. Topics in French Theatre. (3-5 cr per qtr; prereq 3219 or above)

Fren 5999. Foreign Language Teaching: Theory and Practice. (4 cr; prereq grad student or #) Barnes
Theoretical and practical aspects of French-language learning and teaching.

Fren 8010. Seminar in Poetry. (3-5 cr per qtr [max 15 cr]) Preckshot

Fren 8030. Seminar in Drama. (3-5 cr per qtr [max 15 cr]) M Brewer, Sivert

Fren 8050. Seminar in Fiction. (3-5 cr per qtr [max 15 cr]) M Brewer, Paganini

Fren 8070. Seminar in Poetic Theory. (3-5 cr per qtr [max 15 cr]) Robinson

Fren 8090. Seminar in Filmic Analysis. (3-5 cr per qtr [max 15 cr]) Conley
Fren 8110. Seminar in Problems of Medieval Writing. (3-5 cr per qtr [max 15 cr]) Akehurst, Noakes
Fren 8120. Seminar in Problems of 16th-Century Writing. (3-5 cr per qtr [max 15 cr]) Conley, Noakes
Fren 8130. Seminar in Problems of 17th-Century Writing. (3-5 cr per qtr [max 15 cr]) D Brewer, Liu
Fren 8150. Seminar in Problems of 18th-Century Writing. (3-5 cr per qtr [max 15 cr]) D Brewer, Waldauer
Fren 8170. Seminar in Problems of 19th-Century Writing. (3-5 cr per qtr [max 15 cr]) Sivert
Fren 8190. Seminar in Problems of 20th-Century Writing. (3-5 cr per qtr [max 15 cr]) M Brewer, Paganini
Fren 8310. Seminar in Criticism and Literary Theory. (3-5 cr per qtr [max 15 cr])
Fren 8501. Methodology and Bibliography. (4 cr)
Fren 8701. History of the French Language. (4 cr) Akehurst
Fren 8704. Old Provencal. (4 cr) Akehurst Language and literature of the troubadours.
Fren 8970. Directed Readings for Graduate Students. (1-5 cr)
Fren 8980. Directed Teaching. (1-5 cr)
Fren 8990. Ph.D. Topics. (1-7 cr per qtr; prereq PhD student in French) For students who have completed major portion of coursework and are preparing Ph.D. exam topics. Does not fulfill degree requirements.

Italian (Ital)

Ital 5042. Intensive Reading of Modern Italian Narrative Literature. (4 cr; prereq 3015 or 3041 or #) Twentieth-century authors analyzed from linguistic and literary points of view to achieve high level of reading competency and understanding of contemporary Italian literary scene. Taught in Italian.

Ital 5219. Humanism and Italianism in the Literature of the 16th Century. (4 cr, §Fren 5219, §Frit 5219; prereq 3209 or above) Taught in English; knowledge of French and Italian not required. Aspects of Italian civilization from Dante to Machiavelli that led to the Renaissance. Focus on French and Italian literary texts.


Ital 5328. Italian Renaissance Authors. (4 cr; prereq 3015) Martinez Bembo, Poliziano, Machiavelli, Gaspara Stampa, Castiglione, and others. Male and female authors subject to system of court patronage and currents of humanism and anti-humanism. Taught in Italian.

Ital 5331. Modern Poetry. (5 cr; prereq 3015) Crepuscular and hermetic poets from Gozzano to Ungaretti, Montale, Saba, and Quasimodo.

Ital 5337. Manzoni and the 19th-Century Novel. (4 cr; prereq 3015 or #) Ferlito I promessi sposi; novels by Verga, Deledda, D’Annunzio, and others. Textual analysis; evolution of modern novel.

Ital 5385. Twentieth-Century Narrative. (4 cr; prereq 3015 or #) Ferlito Evolution and analysis of modern novel and novella. Authors include Svevo, Vittorini, Calvino, and others. Taught in Italian.

Ital 5401-5402-5403. Dante. (4 cr per qtr; prereq 3015) Martinez Divina Commedia and minor works. Historical approach to most important literary work in Italian. Study of cosmology, scriptural exegesis, Italian history and Roman authors (Virgil, Ovid, Boethius) on Middle Ages, and revolution due to reintroduction of Aristotle, while following Dante’s pilgrim through otherworld. English and Italian sections.


Ital 5418. Boccaccio and the Novella. (4 cr; prereq 3015) Martinez Decameron and Boccaccio’s minor works; story collections in Middle Ages and Early Renaissance, from Novellino to Bandello. English and Italian sections.

Ital 5609. Dante (in English). (4 cr) Martinez

Italian (FrIt)

Frit 5531. Baroque Literature in France and Italy. (4 cr; prereq at least one 3xxx or 5xxx course in literature of France or Italy) Taught in English. Spread of the Baroque in literature through Europe. Movement from Italy, changing but rooted in particular view of the world.
Genetics

See Molecular, Cellular, Developmental Biology and Genetics.

Geography (Geog)

Professor: Helga Leitner, director of graduate studies; John S. Adams; Ward J. Barrett; Dwight A. Brown; Philip J. Gersmehl; John F. Hart; Mei-Ling Hsu; Fred E. Lukermann (emeritus); Philip W. Porter; John G. Rice; Joseph E. Schwartzberg; Earl P. Scott; Eric S. Sheppard; Richard H. Skaggs; Graham A. Tobin

Associate Professor: Lawrence M. Knopp, Jr.; Judith A. Martin; Robert B. McMaster; Roger P. Miller; Abdi I. Samatar; Roderick H. Squires; Connie H. Weil

Assistant Professor: William J. Craig (Center for Urban and Regional Affairs); Katherine Klink; Howard D. Veregin

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.A. (Plan A and Plan B) and Ph.D.

Curriculum—This geography program covers six broad clusters: cultural and historical geography and the history and philosophy of the discipline; physical geography and environmental systems; urban and economic geography; cartography and geographic information systems; regional geography; and social and political economy of development. Students work with their advisers to design individual programs suited to their educational and professional goals.

Prerequisites for Admission—Prospective students should have completed the equivalent of introductory courses in physical and human geography and at least seven upper division courses in systematic and regional geography. Students who were not undergraduate geography majors are encouraged to apply but may be required to make up deficiencies.

Special Application Requirements—Three letters of recommendation must be sent directly to the department. Tardy letters delay processing of the application. Scores from the General (Aptitude) Test of the Graduate Record Examination (GRE) that are less than five years old are required of students with baccalaureate degrees from U.S. institutions. Graduate study in the program begins in the fall quarter. The application deadline is January 1; all applications are evaluated once each year in early February.

Master Degree Requirements—The minimum number of course credits is 28 credits for Plan A (excluding thesis credits) and 44 credits for Plan B. All students must take three of the seven proseminars (8001-8007) during the course of their graduate program. The final examination for both plans is oral. In unusual circumstances the graduate faculty may substitute a written examination for the Plan B oral examination. For further information about master’s degree requirements, contact the director of graduate studies.

Doctoral Degree Requirements—Information on selecting an adviser and constructing a doctoral program can be obtained by requesting a copy of “The Graduate Program in Geography at the University of Minnesota” from the director of graduate studies. All students must take three of the seven proseminars (8001-8007) during the course of their graduate program.

Language Requirements—M.A. and Ph.D. students are expected to acquire competence in the research tools appropriate to their endeavors as graduate students and to their future professional work. Often these are foreign languages and/or quantitative or experimental skills. The language and technique requirement is set by the advising committee, which is also responsible for certifying that the requirement has been met before the M.A. final examination is scheduled.

Minor Requirements for Students Majoring in Other Fields—A minor program must be developed in consultation with an appropriate faculty adviser. Consult the director of graduate studies about selecting an adviser.

For Further Information and Applications—Contact the Department of Geography, University of Minnesota, 414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612/625-6080; fax 612/624-1044; e-mail willi046@tc.umn.edu; http://www.geog.umn.edu).

Geog 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

Geog 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

Geog 8888. Thesis Credits: Doctoral. (36 cr required)
Regional Studies

Geog 5101. Historical Geography of North America. (4 cr) Lukermann
Sequential analysis of settlement and economy in changing environment and resource pattern of North America in the period of frontier interaction, 1500-1900.

Geog 5111. Selected Regions of the Eastern United States. (4 cr; offered alt yrs) Hart
Intensive geographical analysis of selected regions east of the Great Plains. Regions selected vary yearly.

Geog 5131. Colonial Mexico and the Caribbean. (4 cr) Barrett
Exploration, discovery, livelihood, and circulation to about 1800.

Geog 5132. South America. (4 cr; offered alt yrs) Weil
Regional survey of physical resources, population, agriculture, manufacturing, and transportation in South America.

Geog 5142. Geography of East Africa. (4 cr, §Afro 5142; offered alt yrs) Porter, Samatar
Physical and human geography of Kenya, Tanzania, and Uganda with emphasis on environment as resource, historical geography of colonial and postcolonial eras, geographical organization of human activity, and regional contrasts.

Geog 5143. Geography of West Africa. (4 cr, §Afro 5143) Scott
Regional study of West Africa from Senegal to Cameroon: social geography of resource use, population, settlement, economic development, and international relations.

Geog 5145. Development in Africa. (4 cr, §Afro 5145, §IntR 5145) Samatar, Scott
Economic, political and social development in Africa, from independence to present. Recording colonial landscapes, bases for North-South relations, big power interventions, and participation in the world economy.

Geog 5171. Western Europe. (4 cr; offered when feasible) Leitner, Rice

Geog 5173. Norden. (4 cr; offered alt yrs) Rice
Physical and human geography of Sweden, Finland, Denmark, Norway, and Iceland; emphasis on population change and settlement patterns.

Geog 5176. Scandinavia in the 19th and 20th Centuries. (4 cr, §Hist 3273; offered alt yrs) Metcalf, Rice
Team-taught, interdisciplinary examination of social and economic transformation of Scandinavia, 1800 to present; from agrarian periphery to European integration; impact of demographic, economic, and social change; social democracy and politics of consensus.

Geog 5177. Scandinavia in the Early Modern Period. (4 cr, §Hist 3272; offered alt yrs) Metcalf, Rice
Team-taught, interdisciplinary examination of social and economic transformation of Scandinavia, 1500-1800; centralization of state power and the Reformation; struggle for commercial and political control of Baltic; absolutism in the North; political and agrarian reforms.

Geog 5178. Scandinavia in the Middle Ages. (4 cr, §Scan 5118; offered alt yrs) Rice, Metcalf
Team-taught interdisciplinary examination of economic, political, and social history of Scandinavia, from late Viking period until circa 1500. Agrarian and urban societies; peasant and elite perspectives; growth of economic, political, religious and social institutions.

Geog 5181. Russia and Environments. (4 cr) Adams
Physical and human geography of republics of former USSR. Imprint of central planning and state socialism on regional economies, city systems, and internal structures of cities. Economic and cultural linkages among regions and republics. Conflicts rooted in religion, ethnicity, and tradition. Contacts with neighboring states and regions. Physical environmental problems.

Geog 5211. East Asia: Regional Analysis. (4 cr, §3211) Hsu
Regional aspects of East Asian life. The effects, within a traditional context, of population growth and modern technology on the transformation of society and reorganization of space.

Geog 5212. South Asia. (4 cr, §3212) Schwartzberg
Physical and human geography of India, Pakistan, Bangladesh, Sri Lanka, Afghanistan, and the Himalayan kingdoms; geographic aspects of social structure, population pressure, economic development, and international relations.

Geog 5215. China. (4 cr, §3215; prereq social science course) Hsu
Socioeconomic geography of China. Environment as resource, population dynamics, economic development, and social change. Geographic organization of human activities, regional contracts, foreign trade, and international relations.

Topical Studies

Geog 5361. The Geography of Land Ownership. (4 cr; prereq #) Squires

Geog 5371. North American Cities. (4 cr; prereq 1301 or 1501 or 1970 or 3371 or 3973 or 5001 or #) Adams
Emergence of towns and cities in North America; urban economy and its locational requirements, past and present; central place theory; comparisons of city systems in capitalist, socialist, and developing areas; structure and change of land used inside urban areas.

Geog 5372. Metro Analysis I: Population and Housing. (4 cr) Adams
Metro housing stocks, supply of housing services; demand for housing; population and households; housing price structure, changes, intramural migration; spatial submarkets and housing in metro areas. Emphasis on linking theory, method, and case studies.
Geog 5373. Metropolitan Analysis II: Land Use and Transportation. (4 cr) Adams
Metropolitan economic structure, change, and measurement methods; transportation and urban land use and land use conflict; competition for local property tax base; industrial and commercial land blight and real estate redevelopment.

Geog 5385. Political Economy of Development. (4 cr; prereq sr or grad student or #) Samanar
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. Look of the Land. (4 cr; offered alt yrs) Hart
Major components of landscape; emphasis on interaction between structures created by people and distinctive rural landscapes in North America, northwestern Europe.

Geog 5411. Medical Geography. (4 cr; offered alt yrs) Weil
Concepts and methods, including distribution and diffusion of disease; impact of environmental, population, and social change on health; distribution, accessibility, and use of health practitioners and facilities.

Geog 5423. Climate Models and Modeling. (4 cr; prereq 3421 or #) Klink, Skaggs
Survey of development of and research with one-, two-, and three-dimensional climate models. Overview of environmental processes and their numerical representation in models; evaluation of model sensitivity and accuracy; coupling between atmosphere, biosphere, hydrosphere, and cryosphere; assessment of model predictions for climate change.

Geog 5426. Climate Variations. (4 cr; prereq 3421, Soil 3421 or #)
Theories of climate fluctuation and change at decadal to centuries time scales; analysis of temporal and spatial patterns in climate fluctuations, especially during periods of instrumental records.

Geog 5441. Quaternary Landscape Evolution. (4 cr; prereq 1401 or #) Brown
Roles of geomorphic history, climate change, soil development, and vegetation change in evolution of landscape patterns during Quaternary, with emphasis on North America.

Control of water resources by natural system functions, user actions, and social and political institutions. How these controls vary in space and time, complexities of each, and feedbacks among them.

Geog 5601. Introduction to Land Use Planning. (4 cr) Lukemann
Context of planning within changing geographic patterns of land use. Nature of land use plans; purpose and process of land use planning.

Geog 5605, 5606. Geographical Perspectives on Urban Planning I, II. (4 cr; offered alt yrs) Leitner, Miller

Technical Studies

Geog 5511. Cartographic Analysis. (4 cr; prereq 3511 or basic statistics course; offered alt yrs) Brown, Hsu, McMaster, Porter
Methods of data compilation; quantitative analysis of maps, map types, graphic correlation, composite mapping; area sampling, classification, and other generalization problems.

Geog 5512. Cartography: Topics. (4 cr; prereq 3511 or #; offered alt yrs) Brown, Hsu, McMaster, Porter, Veregin
Selected topics: the system of cartographic communication, map design, map reading, map analysis, history of cartography.

Geog 5522. Computer Cartography: Principles and Design Concepts. (4 cr; prereq 3511 or #) Hsu Elements and principles of cartographic design; applications to different map themes; using microcomputer with package software to explore message-focused map design.

Geog 5523. Elements of Digital Cartography. (4 cr; prereq 3511, 3531 or 5522, 1 programming language or #) McMaster, Veregin

Geog 5530. Cartography Internship. (2-5 cr per qtr [max 10 cr, incl combined cr at 3xxx and 5xxx levels]; prereq #) Hsu, McMaster
Internship with institution, government agency, or private company arranged through and supervised by department.

Geog 5531. Advanced Quantitative Methods in Geography. (4 cr; prereq basic statistics course; offered alt yrs) Klink, McMaster, Sheppard, Skaggs
Topics include multivariate methods, regionalization, spatial autocorrelation, spatial pattern analysis.

Geog 5562. Introduction to Geographic Information Systems. (4 cr, §LA 5562; prereq jr or sr in geog or LA or grad student or #) Brown, McMaster, Veregin
Geographic information systems structure; theory and applications for geographic research, location and resource analysis, and regional planning; location principles, data structure, and variable attributes.
Geog 5563. Advanced Geographic Information Systems. (4 cr; prereq 5562 or LA 5562 or #) MCMaster, Veregin

Geog 5564. Urban Geographic Information Systems and Analysis. (4 cr, §PA 5564; prereq 5562, PA 5501 or #)

Geog 5565. Geographical Analysis of Environmental Systems and Global Change. (4 cr; prereq FR 5130, Geog 5562, LA 5562, sr or grad or #)
Applications of geographic information systems and other spatial analysis tools to analysis of environmental systems patterns, dynamics, and interactions. Global-to-landscape databases developed for analysis of atmospheric, hydrospheric, geomorphic, pedalogic, biologic, and human land-use systems.

Geog 5701. Field Research. (4 cr; prereq 12 cr geog, #)
Field investigation in physical, cultural, and economic geography; techniques of analysis and presentation; reconstruction of environments.

Geog 5710. Field Internship. (Cr ar, §IntR 5701; prereq IntR 5930)
Requirements and credits vary with nature of internship. Those for MSID normally carry eight credits per quarter for up to two quarters. All internships are conducted off campus and require contract with department supervisor specifying work to be accomplished and means of reporting achievement.

History and Philosophy of Geography

Geog 5001. Modes of Geographic Inquiry. (4 cr) Sheppard
Different ways of knowing the world and their application to explaining and interpreting geography since 1960. Empirical approaches and geographical hypothesis; structural approaches and socio-spatial systems; interpretive approaches and meaning of geographical phenomena. Application to city systems; integration and diffusion.

Geog 5775. Geographical Education. (4 cr; prereq three geog courses, background in social studies or history of educ or #)
Teaching geography in middle school and above; 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 5801. Development of Geographic Thought. (4 cr, §3801; prereq sr or grad student, three geog courses) Lukermann
Concepts and methods of geography; differing schools of geographical thought as expressed in contemporary geographic literature.

Geog 5808. Regional Analysis of North America. (4 cr; prereq # Gersmehl
Regions: what they are, where they come from, how we delimit them, how people perceive them, how they interact with other places, and how they change through time. Attendance at selected lectures and slide presentations in Geog 3101 required.

Geog 5856. The Meanings of Place. (4 cr, §Arch 5956; prereq # Martin
Analysis of messages and meanings of our surroundings. Twin Cities central districts and neighborhoods, and selected settings elsewhere. Direct experience.

Directed Studies

Geog 5900. Topics in Geography. (4 cr; prereq sr or grad student, #)
Course on special topics and regions offered by visiting professors in their research fields.

Geog 8001. Proseminar: Geography and Cultural Ecology. (3 cr; prereq #)
Interconnectedness of people and environment: human ecology, behavioral geography, cultural ecology, behavioral environment, perception of environment, ethnogeography, energetics, and natural hazards research. Efforts to connect this theme to physical geography, study of spatial organization, geo-political economy, and regional geography.

Geog 8002. Proseminar: The Economy, the State, and Spatial Development. (3 cr; prereq #)
Conceptual literature in economic, political, and urban geography; theoretical foundations for examining interrelationship between political and economic processes and spatial organization of society; survey of empirical research documenting nature and extent of interrelationship at different spatial scales.

Geog 8003. Proseminar: Historical Geography. (3 cr; prereq #)
Development, traditions, and major problems and approaches in current research.

Geog 8004. Proseminar: Physical Geography. (3 cr, §8401; prereq # Brown, Gersmehl, Klink, Skaggs
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; prereq #)
Approaches taken by geographers and social scientists to better understand current population issues and problems.

Geog 8006. Proseminar: Research Methods in Geography. (3 cr; prereq #)
Research design, strategies, and methods of data collection, analysis, and representation.
Geog 8007. Proseminar: Theories of Development and Change. (3 cr; prereq #)
Capitalism and underdevelopment; populist vs. Marxist debates; grassroots movements and development; gender, development, and democracy; nongovernmental organizations in the democratic transition; new paradigms of development.

Geog 8010. Seminar: Theoretical Geography. (3 cr; prereq #; offered when feasible)

Geog 8020. Seminar: Economic Geography. (3 cr; prereq #; offered alt yrs)

Geog 8120. Seminar: Historical Geography. (1-3 cr; prereq #)

Geog 8125. Seminar: Public Land History. (3 cr; prereq #) Squires

Geog 8140. Seminar: Africa. (3 cr; prereq #) Porter, Samatar, Scott

Geog 8210. Seminar: South Asia. (1-3 cr; prereq #) Schwartzberg

Geog 8300. Geographical Writing. (3 cr; prereq #) Hart
Analysis of the organization and presentation of geographic research. Critiques of selected examples of geographical writing.

Geog 8301. Geographical Education. (3 cr; prereq #) Gersmehl
Guided study of the process of teaching geography at the college level.

Geog 8302. Research Development. (1-3 cr; prereq #)
Guided study of research proposal process: topic choice, statement of problems, research design, identification of funding sources, and proposal writing.

Geog 8320. Considering Space, Place, and Human Activity. (3 cr; prereq #) Martin
Aspects of place analysis/place description from variety of analytical and perceptual perspectives.

Geog 8330. Seminar: Rural Geography. (3 cr; prereq #) Hart

Geog 8335. Agrarian Change in the Third World. (4 cr) Samatar
Nature of agricultural development in Third World capitalist economies. Assessment of transformation of peasant agriculture into predominantly commodity-producing system.

Geog 8344-8345†. Seminar: Public Land Policy. (3 cr per qr; prereq #) Squires
Policies of federal and state governments in acquiring and using land.

Geog 8350. Seminar: World Population Problems. (3 cr; prereq #; offered alt yrs) Hsu, Rice

Geog 8380. Seminar: Medical Geography. (3 cr; prereq 5411 or #)

Geog 8400. Seminar: Physical Geography. (3 cr; prereq #) Brown, Gersmehl, Klink, Skaggs

Geog 8420. Seminar: Climatology. (3 cr; prereq #; offered alt yrs) Klink, Skaggs
Detailed study of selected topics. Topics vary yearly; examples include modeling, climatic variability, predictability, severe local storms, drought, and energy balance.

Geog 8510. Seminar: Cartography. (1.3 cr; prereq #; offered when feasible) Hsu, McMaster, Porter

Geog 8800. Seminar: Development of Geographic Thought. (3 cr; prereq #) Lukermann

Geog 8970. Directed Readings. (1-5 cr)

Geog 8980. Topics in Geography. (1-3 cr; prereq #)

Geog 8990. Research Problems in Geography. (Cr ar)

Geological Engineering (GeoE)

Professor: Steven L. Crouch, head; Andrew Drescher; Charles Fairhurst; Efi Foufoula-Georgiou; Theodore V. Galambos; Gary Parker; Otto D. L. Strack

Adjunct Professor: Peter A. Cundall

Associate Professor: Randal J. Barnes; Gary A. Davis; Emmanuel M. Detourmay; Catherine E. French; Joseph F. Labuz; David E. Newcomb; Karl A. Smith; Mark B. Snyder; Henryk K. Stolarski; Vaughan R. Voller

Assistant Professor: Jerome F. Hajjar; Carol Kittredge Shield

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S. (Plan A and Plan B), M.Geo.E., and Ph.D.

Curriculum—The graduate program in geological engineering is administered in the Department of Civil Engineering and is closely allied with civil engineering. The master of geological engineering (M.Geo.E.) program is designed for engineering graduates who are particularly interested in planning, design, operation, and management in geotechnical areas, or for graduate students with experience in engineering geology and other geotechnical areas who wish to study current developments and design procedures.

Prerequisites for Admission—In general, adequate preparation in undergraduate subjects and in the sciences fundamental to geological engineering is required. A bachelor’s degree from an engineering program accredited by the Accreditation Board for Engineering and
Technology (ABET) is required for admission to the M.Geo.E. program. Applicants to this professional program who have B.S. degrees in other fields (geology, physics, chemistry) are required to make up deficiencies in the basic engineering curriculum after admission.

Special Application Requirements—None.

Degree Requirements—For M.S. and Ph.D. degree requirements, see the General Information section of this bulletin. M.Geo.E. students should consult the General Information section under Professional Master’s Degree in Engineering. All students should also consult the Department of Civil Engineering General Information Bulletin for Graduate Students for more information.

The final examination for the M.S. and M.Geo.E. degrees is oral.

Language Requirements—None.

For Further Information and Applications—Contact the Geological Engineering Program, University of Minnesota, Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612/625-5522; fax 612/626-7750; e-mail cive@tc.umn.edu; http://www.cme.umn.edu).

GeoE 5262. Geo-Engineering Analysis. (4 cr; prereq sr or #, IT student or grad IT major) Barnes
Comprehensive analysis of a geological engineering or rock mechanics problem. Involves integration of concepts of rock and soil mechanics, geology and geophysics, mineral engineering, and economics in a specific problem chosen by the student and staff. Preparation of a professional report.

GeoE 5302. Applied Rock Mechanics. (4 cr, §CE 5302; prereq CE 3300 or #, IT upper div or grad student) Detournay, Labuz
Site investigation; rock mass classifications; in situ stress; behavior of intact rock; shear strength of joints; rock mass behavior; stereographic projections; kinematic analysis of rock slopes; foundations on rock.

GeoE 5437. Computer Applications in Geological Engineering. (4 cr; prereq CE 3020, Math 3221 or equiv or #) Barnes, Voller
Methods (finite differences, finite elements, boundary elements) for solution of problems in hydrology, structural engineering, geomechanics, and environmental engineering that reduce to partial differential equations. Each method illustrated in context of one or more practical problems.

GeoE 5555. Engineering Geostatistics. (4 cr; prereq Stat 3091 or #, IT upper div or grad student) Barnes
Problem solving and decision making in geological engineering using tools of applied statistics. Emphasis on spatially correlated data, e.g., geologic site characterization, rock mass parameter estimation, ore body modeling, optimal sample design for groundwater contamination assessment.

GeoE 5660-5661-5662. Special Geological-Engineering Problems. (Cr and hrs ar; prereq IT sr or #)
For M.S. and Ph.D.

GeoE 5700. Systems Analysis for Geological Engineering. (4 cr; prereq IT upper div or grad student) Barnes
Introduction to systems analysis and decision making; expert systems; operations research techniques, modeling and simulation. Applications in geological engineering and related fields.

GeoE 5830. Soil/Rock Plasticity and Limit Analysis. (4 cr, §CE 8302; prereq 3300) Drescher

GeoE 5832. Thermoporoelasticity. (4 cr, §CE 8320; prereq AEM 5580 or #) Detournay
GeoE 8336. Boundary Element Methods I. (4 cr; prereq AEM 3016 or #) Crouch

GeoE 8350. Advanced Rock Mechanics I. (4 cr; prereq 5302) Labuz
Implementation of rock mechanics techniques in civil and mining engineering practice, involving lab and field techniques for specification of rock material and rock mass properties, stress determination in rock, rock support, reinforcement and improvement, and methods of measuring response of rock to excavation-induced loads.

GeoE 8352. Modeling Geomechanical Processes. (4 cr; prereq geo eng grad major or #) Detournay
Data-limited nature of problems in geomechanics; dimensional analysis; regimes of solution; similarity solutions; elements of fracture mechanics, elastoplasticity, poroelasticity; geomechanical applications to stability of underground excavations (borehole, tunnel), fluid flow in fracture, tool-rock interaction (cutting, indentation), hydraulic fracturing (initiation, propagation).

GeoE 8360. Engineering Model Fitting. (4 cr; prereq civil or mineral or geo eng grad student or #; offered alt yrs) Barnes
Parameter estimation and inverse modeling in civil, geological, and mineral engineering. Formulation of engineering model fitting problems, comparison and selection of various fit criteria, selection and implementation of solution algorithms on computer, analysis and interpretation of results, and design of future measurement plans.

GeoE 8601, 8602, 8603. Seminar: Geological-Engineering. (Cr ar; prereq #)
GeoE 8612, 8613, 8614. Geological-Engineering Research Problems. (Cr ar; prereq #)

Geology and Geophysics (Geo)

Regents’ Professor: Herbert E. Wright, Jr. (emeritus)
Professor: William Seyfried, Jr., head; E. Calvin Alexander, Jr.; Subir K. Banerjee; Roger LeB. Hooke; Peter J. Hudleston; Thomas C. Johnson; Shun-ichiro Karato; Kerry R. Kelts; David L. Kohlstedt; Ronald L. Morton; V. Rama Murthy; Robert O. Pepin; Hans-Olaf Pfannkuch; Robert E. Sloan; David L. Southwick; James H. Stout; Paul W. Weiblen; David Yuen
Adjunct Professor: Wayne C. Shanks III
Associate Professor: Christian P. Teyssier, director of graduate studies; R. Lawrence Edwards; Emi Ito; Karen L. Kleinspehn; Bruce Moskowitz; Christopher Paola
Assistant Professor: Mark A. Person
Other: Michael E. Berndt; Val W. Chandler; Daniel R. Engstrom; Paul H. Glaser; Neal R. Iverson; Robert G. Johnson; Glenn B. Morey; Linda C. K. Shane

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—Geology: M.S. (Plan A, Plan B, and coursework-only option with emphasis in hydrogeology and environmental geoscience) and Ph.D; Geophysics: M.S. (Plan A and Plan B) and Ph.D.

Curriculum—The geology major includes the areas of Quaternary studies, structural geology, stratigraphy, paleontology, crystallography, mineralogy, economic geology, experimental and theoretical petrology, isotopic and aqueous geochemistry, experimental geochemistry, geomorphology, glaciology, groundwater geology, limnology, and sedimentology. The geophysics major includes the areas of applied and theoretical geophysics, paleomagnetism and rock magnetism, and mineral and rock physics. Courses in the minor and supporting fields are normally taken from outside the department, although they may be taken from within in special cases. Students may accommodate other areas of interest such as earth resources, engineering geology, environmental geology, materials science, soil science, and paleoecology by choosing a minor or supporting field from outside the department.

Prerequisites for Admission—A bachelor’s degree in geology or geophysics; at least one year of study in calculus, chemistry, and physics; and a full-time geological field course of at least five weeks’ duration are required. Applicants with degrees in other fields or with limited background deficiencies are also considered. In general, an outstanding academic record is expected.

Special Application Requirements—Graduate Record Examination scores are required for admission and financial aid consideration; three letters of recommendation are required for financial aid and are optional but recommended for admission consideration. Applications for admission are considered at any time, although applications for financial aid should be submitted by January 15 to ensure consideration. Studies may begin in any quarter or summer session, although fall quarter is preferable.

General Degree Requirements—For both the master’s and doctoral degrees, certain advanced courses must be completed either before entrance
or during the first year of graduate work. These courses include two quarters of mathematics or one quarter each of mathematics and statistics (in addition to the prerequisites for admission) and two quarters of 5xxx or 8xxx analytical science, with courses selected from a list available from the director of graduate studies. These courses may form part of a supporting field or minor if taken after admission.

**Master’s Degree Requirement**—For Plan A, the minimum course credit requirement is 20 credits in the major (excluding thesis credits) and 8 credits in the supporting program. For Plan B, the minimum course credit requirement is 44 credits, which includes 20 credits in the major and 8 credits in the supporting program. For the coursework only option, the minimum course credit requirement is 44 credits, which includes 24 credits in the major and 8 credits in the supporting program (or 9 credits in a designated minor).

**Doctoral Degree Requirements**—The minimum course credit requirement for the doctoral program is 37 credits in the major (excluding thesis credits).

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—Established on an individual basis with approval by the Graduate Studies Committee.

**For Further Information and Applications**—Contact the Department of Geology and Geophysics, University of Minnesota, 106 Pillsbury Hall, 310 Pillsbury Drive S.E., Minneapolis, MN 55455 (612/624-1333; fax 612/625-3819; e-mail umn_geo@darcy.geo.umn.edu; http://www.geo.umn.edu).

**Geo 8666.** Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

**Geo 8777.** Thesis Credits: Master’s. (16 cr required; Plan A only)

**Geo 8888.** Thesis Credits: Doctoral. (36 cr required)

**General Geology**

**Geo 5004.** Mineralogy. (4 cr, §3401; prereq Chem 1051, Math 1252 or #; not open to geol or geophys or geo or min engr majors) Introduction to crystallography, crystal chemistry, and crystal physics. Physical and chemical properties, crystal structures and chemical equilibria of major mineral groups. Lab includes crystallographic and polarizing microscopes. X-ray diffraction exercises, hand specimen mineral identification.

**Geo 5010.** Field Workshop. (2 cr; prereq geol or geophys or geo eng major or #) Geologic or geophysical field study.

**Geo 5020.** Laboratory Workshop. (2 cr; prereq geol or geophys or geo eng major or #) Geologic or geophysical lab study.

**Geo 5030.** Modeling Workshop. (2 cr; prereq geol or geophys or geo eng major or #) Modeling of geologic or geophysical systems.

**Geo 5051.** Physical Geology for Teachers. (4 cr, §1001; prereq educ degree, 1 term college chem or physics; no grad cr for geol or geophys majors) Introduction to scientific methods and the nature of Earth. Survey of main features of the physical world and of processes that have evoked them.

**Geo 5052.** Historical Geology for Teachers. (4 cr, §1002; prereq educ degree, 1001 or 5051 or #; no grad credit for geol or geophys majors) Sloan Introduction to origin of Earth, physical evolution of its crust through geological time, and biological changes that occurred during its history. Lab, fieldwork, and seminar.

**Geo 5054.** Introduction to the Mesozoic for Teachers. (4 cr, §1003; prereq educ degree) Kirkby Introduction to dinosaurs and Mesozoic Era; concepts of plate tectonics, evolution, extinction, and global change; students design course modules for elementary or secondary schools.

**Geo 5061.** Earth System Science from the Perspective of Minnesota Geology for Teachers. (4 cr, §1031; prereq educ major or educ degree or #) Weiblen Basic principles of geology used to explore dynamic interactions of the solid Earth, hydrosphere, biosphere, and atmosphere; increasing significance of human activity in geological processes; pedagogic approaches to Earth System Science, field trips, and lab exercises.

**Geo 5101f.** Geochronology and Stratigraphy. (4 cr; prereq 3301) Methods for measuring geologic time and dating rocks; correlation and other stratigraphic techniques.

**Geo 5108.** Advanced Environmental Geology. (4 cr; prereq geol core curriculum through 5201 for majors or #) Pfannkuch Human impact on the geological environment and effect of geology/geologic processes on human life from point of view of ecosystems and biogeochemical cycles. Geologic limits to resources and carrying capacity of Earth. Land use planning, environmental impact assessment, ecogeologic world models. Field project.

**Geo 5111su.** Advanced Field Geology. (4 cr; prereq 3111, #) Geologic mapping; igneous, metamorphic, and sedimentary rocks; structures and surficial features; problem solving. Paper required.
Geo 5112su. Field Hydrogeology. (4 cr; prereq 5641, # Alexander, Person, Pfannkuch)
Aquifer, vadoze zone, and surface water hydrology field techniques; shallow soil boring and sampling; well installation; single and multiple well aquifer testing; ground water sampling for chemical analysis; weather data collection, hydrogeologic mapping, and water balance calculation.

Geo 5121f. History of the Earth. (3 cr; prereq geol major or #) Sloan
Analysis of interrelationships between plate tectonics, atmospheric composition, sea level, stratigraphic record, and organism evolution. Causes of mass extinctions and adaptive radiations.

Geo 5151. Introduction to Paleontology. (5 cr; prereq 1002 or #) Sloan
Morphology, classification, and ecology of major fossil groups.

Geo 5154. Vertebrate Paleontology I. (5 cr; prereq 5151 or EEB 5114) Sloan
Morphology, evolution, and stratigraphic distribution of fossil fish, amphibians, reptiles, and birds.

Geo 5155. Vertebrate Paleontology II. (5 cr; prereq 5154 or EEB 5114) Sloan
Morphology, evolution, and stratigraphic distribution of fossil mammals.

Geo 5201. Structural Geology. (4 cr; prereq 3402, 5101 or #) Teyssier
Concepts related to deformation of Earth’s crust; processes associated with deformation, faulting, folding, and fabric development; labs, recitations, and field trips.

Geo 5202. Tectonic Styles. (3 cr; prereq 5201 or #) Hudleston
Origin and nature of major types of disturbances affecting the continental crust, including analysis of the form and development of individual structural components.

Geo 5203. Geotectonics. (3 cr; prereq 5201 or #) Kleinspehn, Teyssier
Problems associated with global tectonics; structure and evolution of Earth’s crust and lithosphere; active compressional, extensional, and wrench tectonic regimes, with numerous examples from various parts of the world; interpretation of older tectonic systems.

Geo 5251. Geomorphology. (4 cr [5 cr with term project]; prereq 1001, Math 1031 or # 3 lect, 2 lab hrs per wk, lab often used for field trips) Hooke
Origin, development, and continuing evolution of landforms in various environments. Environmental implications emphasized. Weathering, slope and shore processes, fluvial erosion and deposition, wind action, tectonics, and impact phenomena.

Geo 5252. Regional Geomorphology. (3 cr [may be repeated for cr if different regions studied]; prereq 5201 or # 1-wk field trip; offered alt yrs) Hooke
Geology of particular region of country, emphasizing geomorphology. One-week field trip late in quarter.

Geo 5255. Glaciology. (4 cr [5 cr with term project]; prereq Math 3261 or # offered alt yrs) Hooke
Theory of glacier flow. Internal structures and temperature distribution in glaciers and ice sheets. Reading assignments and problems.

Geo 5261. Glacial Geology. (4 cr [5 cr with field trips]; prereq 1002 or #)
Formation and characteristics of modern glaciers; erosional and depositional features of Pleistocene glaciers; history of Quaternary environmental changes in glaciated and non-glaciated areas. Field trips.

Geo 5311. Geochemical Processes. (4 cr; prereq 3301, Chem 5520 or #) Ito, Seyfried
Processes pertinent to the distribution and control (structural, thermodynamic and kinetic) of chemical species in Earth and hydrosphere.

Geo 5313. Aqueous Geochemistry. (4 cr; prereq 5311, Chem 5520 or #) Seyfried
General principles of solution chemistry with application to geology including solution-mineral equilibria, redox processes in natural waters, and geochemistry of hydrothermal fluids.

Geo 5321. Isotope Geology. (4 cr; prereq 3301 or #) Edwards, Ito
Introduction to theory and uses of radioactive, radiogenic, and stable isotopes in geology. Radioactive dating, geothermometry, and tracer techniques in geologic processes.

Geo 5405. Optical Mineralogy. (2 cr; prereq 3401) Weiblen
Optical properties of minerals; symmetry and crystal optics; identification of minerals using polarizing microscope.

Geo 5452. Igneous and Metamorphic Petrology. (5 cr; prereq 3402, Chem 5520, Math 3261 or #) Stout
Theoretical course that develops basic thermodynamic tools and chemographic analysis for the interpretation of chemical processes in igneous and metamorphic rocks. Lab, field trip, problem sets, and term paper.

Geo 5454. Electron Microprobe Theory and Practice. (2-4 cr; prereq 3401, 1 yr chem and physics or #) McSwiggen
Introduction to characterizing solid materials with electron beam instrumentation, including reduction of X-ray data to chemical compositions.

Geo 5601. Limnology. (4 cr $EEB 5601; prereq Chem 1052)
Events occurring in lakes, reservoirs, and ponds; their origins, physics, chemistry, and biology. Interrelationships of these parameters and effects of civilization on lakes.

Geo 5603. Geological Limnology. (4 cr; prereq 5601 or EEB 5601)
Tectonic and climatic setting of lakes; physical, chemical, and biological processes of sedimentation in lakes.
Geo 5613. Karst Hydrogeology and Tracer Applications. (4 cr; prereq 5641, #; offered alt yrs) Kleinspehn
Physical and chemical principles and processes operating in karst hydrogeology and use of natural and synthetic chemical and isotopic labels or tracers to determine source, age, and mixing parameters of water in various natural reservoirs.

Geo 5621. Limnology Laboratory. (2 cr, §EEB 5621; prereq 5601 or EEB 5601 or #) Megard
Lab to accompany Geo 5601 (EEB 5601). Techniques for obtaining information about conditions in lakes and streams. Procedures for measuring abundance and population dynamics of aquatic organisms, with emphasis on plankton. Field instruments, sampling devices, chemical analyses, microscopy, and analysis of data. One Saturday field trip.

Geo 5631. Earth System: Geosphere/Biosphere Interactions. (4 cr, §EEB 5004; prereq 3202, 3301 or #)
Interdisciplinary study of mechanisms, feedbacks, and dynamics that force global change on various time scales, using paleorecord to illustrate processes.

Geo 5641. General and Physical Hydrogeology. (4 cr; prereq 1001, Chem 1052, Math 1252, Phys 1105; core curriculum through 3402 for geol majors or #) Pfannkuch
Introduction to theory of groundwater geology, hydrologic cycle, watershed hydrology. Darcy’s law, governing equations of groundwater motion, flow net analysis, analog models, and groundwater resource evaluation and development.

Geo 5642. Quantitative Hydrogeology. (4 cr; prereq 1001, Chem 1052, Math 1252, Phys 1105; core curriculum through 3402 for geol majors or #) Person
Applied analysis of steady and transient equations of groundwater motion and chemical transport using analytical and numerical methods. Numerical flow net analysis, well hydraulics, salt-water intrusion problems, and unsaturated flow.

Geo 5643. Chemical Hydrogeology. (4 cr; prereq 1001, Chem 1052, Math 1252, Phys 1105; core curriculum through 3402 for geol majors or #) Alexander
Introduction to chemistry of natural waters, acid-base and redox reactions, carbonate equilibria, contaminant hydrology, isotope hydrology, and chemical modeling.

Geo 5651. Sedimentology. (4 cr; prereq 3402, IT upper div major in geol, geophys, geo engr, mineral engr or CLA jr or sr geol major or #: no grad cr for geol or geophys majors) Paola
Interpretation of origin of sedimentary rocks through application of basic physical and chemical principles, understanding of modern depositionnal environments, and petrographic microscopy.

Geo 5653. Stratigraphy and Basin Analysis. (4-6 cr [6 cr with lab]; prereq 5651 or #; offered alt yrs) Kleinspehn
Modern techniques and principles of stratigraphic analysis of sedimentary basins in various tectonic settings. Seismic stratigraphy, correlation techniques, paleocurrent analysis, computer basin modeling, and geochronology of sedimentary basins.

Geo 5654. Marine and Lacustrine Sedimentary Environments. (4 cr; prereq 5651 or #; offered alt yrs) Kleinspehn
Principles of facies analysis of modern and ancient marine depositional systems, including deltas, fan deltas, barrier islands, beaches, storms, and turbidity currents in lakes and marine settings. Interpretations of marine tidal systems, carbonate platforms, reefs, continental shelves, and abyssal-plain processes.

Geo 5655. Continental Sedimentary Environments. (4 cr; prereq 5651 or #; offered alt yrs) Kleinspehn
Principles of facies analysis of modern and ancient non-marine depositional systems.

Geo 5656. Depositional Mechanics. (3-4 cr; prereq 5651, Math 3261 or #: offered alt yrs) Paola
Elementary mechanics of sediment transport applied to quantitative interpretation of sedimentary rocks.

Geo 5701. Scientific Visualization. (4 cr; prereq CSci 3101, CSci 3102 or CSci 3113 or #)
Practical application to data evaluation from such fields as geology, geophysics, engineering, and medicine.

Geo 5980. Seminar: Current Topics in Geology and Geophysics. (1-6 cr; prereq #)
Geo 8097. Seminar: Current Topics in Geology and Geophysics. (1-6 cr; prereq #)
Geo 8098. Seminar: Current Topics in Geology and Geophysics. (1-6 cr; prereq #)
Geo 8099. Research in Geology and Geophysics. (1-6 cr; prereq #)

Geo 8202. Advanced Structural Geology. (3 cr; prereq 5201; offered alt yrs) Hudleston
Detailed study of structural geometry of folded rocks; origin of foliation and lineation; multiple deformation; advanced structural methods. Extensive reading in journal literature. Lab research on selected topics. Field trips.

Geo 8203. Geotectonics. (3 cr, §5203; prereq 5201 or #: offered alt yrs) Kleinspehn, Teyssier
Problems associated with global tectonics; structure and evolution of Earth’s crust and lithosphere; active compressional, extensional, and wrench tectonic regimes, with numerous examples from various parts of the world; interpretation of older tectonic systems.

Geo 8262. Quaternary Paleoecology and Climate. (4 cr; prereq 5261 or #: Kelts, Wright)
Principles of stratigraphic pollen analysis. Pleistocene and Holocene vegetation and climatic history as interpreted from pollen diagrams from different parts of the world. Paleoclimatic interpretation of ocean-sediment cores.

Geo 8351. Geochemical Modeling of Aquifer Systems. (3 cr; prereq 5313 or #)
Using mass transfer reaction path models to assess chemical evolution of natural fluids, hydrothermal alteration processes, and formation of hydrothermal ore deposits.
Geo 8453. Phase Equilibrium in Mineral Systems. (3 cr; prereq 5452, Chem 5520, Math 3261; offered yrly when demand warrants) Stout 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 8454. Igneous Petrology. (3 cr; prereq 5452; offered yrly when demand warrants) Weiblen Igneous rocks and processes including igneous textures and associations, and appropriate phase equilibria to relate current theory and observation to the broad problems of petrogenesis. Term paper required.

Geo 8455. Metamorphic Petrology. (3 cr; prereq 8453; offered yrly when demand warrants) Stout Metamorphic processes; theory and observation are related to current problems. Fundamental concepts and techniques are related to progressive development of mineral assemblages. Term paper required.

Geo 8602. Advanced Limnology. (3 cr, §EEB 8602; prereq 5601 or EEB 5601, #) Detailed study of selected problems in limnology using current and classical literature. Term paper required.

Geo 8612. Analytical Geohydrology. (3 cr [4 cr with term paper]; prereq Math 3261, CE 3400 or #, offered alt yrs) Pfannkuch Microphysics of flow through porous media; geological factors in aquifer performance; equations for groundwater flow; analysis of pumping tests; potential theory in groundwater flow; computer and analog models of aquifers: groundwater basin analysis.

Geo 8617. Transport Phenomena in Natural Porous Media. (2-3 cr; prereq CE 3400 or Chem 5520 or equiv or #, 2 lect hrs per wk, term paper) Pfannkuch Microscopic flow parameters, momentum, mass and energy transport through porous media, rate processes, coupled processes and nonequilibrium thermodynamics, geologic controls of natural flow systems in porous media and aquifers.


Geo 8620. Geo-fluids Seminar: Fluid Flow and Geologic Processes Within the Earth’s Crust. (2 cr; prereq #) Person Chemical-rock interactions in mid-ocean ridge systems, metal ore genesis, remagnetization of sediments by hydrothermal fluids, fate of pollutants, ice flow in glaciers, magma melt migration, mantle convection. Lab, field, and computational methods used to study fluid transport processes and rock-water interactions within Earth’s crust.

Geophysics

Geo 5505. Solid-Earth Geophysics I. (4 cr; prereq 3201, Phys 1253) Basic elasticity, basic seismology, and physical structure of Earth’s crust and deep interior.

Geo 5506. Solid-Earth Geophysics II. (4 cr; prereq 3201, Phys 1253) Earth’s gravity fields, mantle viscosity, paleomagnetism, seismic tomography, and basic mantle convection and thermal history.

Geo 5507. Solid-Earth Geophysics III. (4 cr; prereq 3201, Phys 1253) Mechanical properties and transport processes in Earth materials and their importance to geophysical phenomena.


Geo 5515. Principles of Geophysical Exploration. (4 cr; prereq Phys 1253) Seismic exploration (reflection and refraction), potential techniques (gravity and magnetics), and electrical techniques of geophysical exploration.

Geo 5522. Time-Series Analysis of Geological and Geophysical Phenomena. (4 cr; prereq Math 3221 or #) Yuen Analysis of both linear and nonlinear phenomena. Examples 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 5541. Geomagnetism. (4 cr; prereq 3201, Math 1251, Phys 1251 or #, offered alt yrs) Banerjee Present geomagnetic field at Earth’s surface and core-mantle boundary, secular variation, paleointensity variation, geomagnetic field reversal, models for field transition.

Geo 5543. Paleomagnetism. (4 cr; prereq 3201, Math 1251, Phys 1251 or #, offered alt yrs) Moskowitz Physical and chemical basis of paleomagnetism. Origin of natural remanent magnetization and its stability, mineralogy of magnetic minerals, paleomagnetic measurement techniques, statistics of paleomagnetic data, magnetic polarity stratigraphy, apparent polar wander, environmental magnetism.

Geo 5561. Magnetism: Physics, Geophysics, and Engineering. (3 cr; §EE 5561, §Phys 5561; prereq Phys 1251) Moskowitz Elementary statistical mechanics, rock magnetism, and micromagnetic modeling; applications of magnetism in geophysics; biomagnetism; magnetic sensors; and recording.
Geo 8522. Time-Series Analysis of Geological and Geophysical Phenomena. (3 cr; prereq Math 3221 or #) Yuen
Time-series analysis of linear and nonlinear phenomena. Examples 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 8543. Principles of Rock Magnetism. (3 cr; prereq 5541 or #) Banerjee
Remanent magnetizations, their classification and origins. Primary versus secondary magnetizations. Separation of multicomponent magnetizations. Paleointensities from rocks and meteorites.

Geo 8571. Advanced Geodynamics. (3 cr; prereq Math 3261 or # offered alt yrs) Yuen
Theory of mantle convection, thermal history of Earth, viscoelastic processes in Earth, postglacial rebound, and mantle rheology.

Geophysics

See Geology and Geophysics.

German

Professor: Jack D. Zipes, chair; James A. Parente, Jr., director of graduate studies; Evelyn S. Firchow; Frank D. Hirschbach (emeritus); Ruth-Ellen B. Joeres; Anatoly Liberman; Jochen Schulte-Sasse; Wolfgang F. Taraba (emeritus); Gerhard H. Weiss

Associate Professor: Leonard L. Duroche; G. Lee Fullerton; Richard W. McCormick; Hanna Schissler; Arlene A. Teraoka; Ray M. Wakefield

Assistant Professor: Gary C. Thomas; Stephanie C. Van D’Elden

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.A. (Plan B only) and Ph.D.

Curriculum—Coursework and theses may emphasize German literature, philologically oriented aspects of the language, or a combination of the two.

Prerequisites for Admission—For major work, a minimum of 36 upper division quarter credits or equivalent in German, of which a minimum of 20 credits must be in German literature courses, is required. Candidates whose preparatory work evidences gaps that can be remedied may be asked to complete supplemental work before admission.

Special Application Requirements—The following must be forwarded directly to the department: three letters of recommendation, a complete set of transcripts (in addition to transcripts sent to the Graduate School), a copy of one or more papers representative of current level of scholarly development, and a statement of professional goals describing the applicant’s intellectual development and plans for the future. For master’s program applicants, and for all students wishing to be considered for fellowships, the General (Aptitude) Test of the Graduate Record Examination (GRE) is required; the GRE is optional for those applicants whose native language is not English and who are required to take the Test of English as a Foreign Language (TOEFL). For the doctoral program, applicants must have a master’s degree from an accredited institution or present other evidence of adequate background and competence.

Prospective students should contact the department for further information. Students generally are admitted in the fall quarter only. All financial aid application materials for the Graduate School Fellowship, departmental fellowships, and teaching assistantships must be received by January 15.

Master’s Degree Requirements—Students must complete Ger 8001-8002-8003 or equivalent; four literature courses selected from four of the following periods: 1) Middle Ages, 2) Renaissance to Baroque, 3) 18th century, 4) 19th century, 5) 20th century; two courses in philology; and two or more courses outside the German program for a minimum of 44 credits. Consult the current Graduate Study in German brochure for more details. Students must demonstrate proficiency in German at the ACTFL Advanced Plus level and submit one research paper of high quality. The final examination is oral, involving not only the areas included in coursework but also the Plan B paper and the minor or related field.

Doctoral Degree Requirements—A minimum of seven courses (28 credits) beyond the M.A. level is required, including one philology course and 8801. In addition, five courses (totaling at least 18 credits) outside the department are required for a minor or supporting program. For the written preliminary examination, the candidate submits a bibliography of her/his research area from which three department examiners develop a set of questions. The candidate selects one question and has one week to write a 20- to 25-page paper. The oral
preliminary examination includes general questions on German literature, philology, and the minor or supporting program. Consult the current *Graduate Study in German* brochure for more details.

**Language Requirements**—For the M.A. degree, proficiency in German is the only requirement, but students are strongly urged to learn a third language. For the Ph.D. degree, students must demonstrate a high degree of competence in one language, or reading proficiency in two languages, other than German and English.

**Minor Requirements for Students Majoring in Other Fields**—The approval of the director of graduate studies is a prerequisite for minor work in the field. A minimum of 12 credits in German literature courses is required for an M.A. minor in German, and a minimum of 24 credits in graduate German courses (12 credits beyond the M.A.), which must include 4 credits in philology, is required for a Ph.D. minor.

**For Further Information and Applications**—Contact the Department of German, Scandinavian, and Dutch, University of Minnesota, 205 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612/625-2080; fax 612/624-8297; http://macro.micro.umn.edu/german).

*Note*—Because not all courses listed below are offered every year, see current *Graduate Study in German* brochure for course selection in a given year.

**Ger 8666. Doctoral Pre-Thesis Credits.** (max 18 cr per qtr; doctoral student who has not passed oral prelims)

**Ger 8777. Thesis Credits: Master’s.** (16 cr required; Plan A only)

**Ger 8888. Thesis Credits: Doctoral.** (36 cr required)

**German (Ger)**

**German Language, Literature, and Culture Studies**

**Ger 5011. Advanced Composition and Conversation.** (4 cr; prereq 3013 or equiv)

**Ger 5016. Advanced Translation: Theory and Practice.** (4 cr; prereq 3016 or #)

Readings and discussion of translation theory, related issues in stylistics, philosophy of language; examination of sample translations; student production of translations, with methodological commentary.

**Ger 5101, 5102. The Analysis of German.** (4 cr per qtr; prereq 1105, Ling 3001/5001 or #)

5101: Phonology and morphology of modern German.

5102: Syntax of modern German.

**Ger 5103. The Teaching of Germanic Languages.** (4 cr)

Second language acquisition theory, methods, testing, and technology with respect to modern Germanic languages.

**Ger 5331. Cultural Analysis.** (4 cr; prereq 1 qtr German civilization and culture or equiv)

Techniques of cultural analysis (contrastive, anthropological, traditional) through the examination of literary texts, newspapers, language usage, etc.; “cultural myths” and forms of humor.

**Ger 5490. Topics in German Literature.** (4 cr per qtr [max 8 cr]; prereq 3104, 3105, jr or sr or grad student)

Topic, specified in *Class Schedule*, focuses on specific author, group of authors, genre, period, or subject matter.

**Ger 5510. Topics in Contemporary German Culture.** (4 cr [may be repeated for max 8 cr]; prereq 3513 or equiv)

**Ger 5621. German Cinema From Caligari to Hitler.** (4 cr; prereq 3000 film studies course or #; may be applied toward German major or minor if part of reading done in German)

German cinema from its beginnings, through its golden age in 1920s, to end of Weimar Republic in 1933; includes Expressionism and New Objectivity; leading directors: Rye, Wiene, Lubitsch, Murnau, Lang, Pabst.

**Ger 5622. Nazi and Postwar German Cinema.** (4 cr; prereq 3000 film studies course or #; may be applied toward German major or minor if part of reading done in German)

German cinema, 1933-1962: Nazi cinema, including Riefenstahl, Harlan, Sirk; continuities (e.g., Harlan) and discontinuities (e.g., Staudte’s work in East and West Germany) in postwar cinema.

**Ger 5623. New German Cinema.** (4 cr; 3000 film studies course or #; may be applied toward German major or minor if part of reading done in German)

West German cinema, 1962 to present: from early acclaim in mid-1960s (Schlondorff, Kluge) to attainment of international stature by mid-1970s (Herzog, Fassbinder, Wenders, von Trotta); feminist and avant-garde films; crisis of 1980s.

**Ger 5624. GDR Cinema.** (4 cr; prereq 3000 film studies course or #; may be applied toward German major or minor if part of reading done in German)

History of East German cinema, from Staudte’s work in 1940s, through “socialist realism” in 1950s, to development of more critical and sophisticated cinema of 1970s and 1980s (Wolf, Beyer, others).

**Ger 5630. Topics in German Cinema.** (4 cr [max 8 cr]; prereq 3000 film studies course or #; may be applied toward German major or minor if part of reading done in German)

Topic may focus on specific directors, formal or political characteristics, film production or reception, or other film-theoretical issues (e.g., “Politics of Melodrama in Sirk and Fassbinder”).

**Ger 5711, 5712. History of German Language.** (4 cr)

Internal and external history. Changes in sounds, grammar, and vocabulary of German and its dialects as manifested in texts from 750 A.D. to present.
Ger 5721-5722. Middle High German Language. (4 cr)

Ger 5731-5732. Old High German. (4 cr)
Reading and analysis of texts. Formal description of phonology, morphology, and syntax.

Ger 5734. Old Saxon. (4 cr)
Reading and analysis of texts. Formal description of phonology, morphology, syntax.

Ger 5740. Readings in Philology. (4 cr per qtr [max 12 cr])
Reading of new and/or old research on some single topic in structure of historical and/or contemporary German languages.

Ger 5771. Early New High German. (4 cr)
Reading and analysis of texts. Formal description of phonology, morphology, syntax.

Ger 5781, 5782. Varieties of Modern German. (4 cr per qtr)
Regional varieties. Social varieties. Lexical, syntactic, and phonological variation examined using contemporary methods of dialectology and sociolinguistics.

Ger 5970. Directed Studies. (1-5 cr; prereq #, △, □)

Ger 8001-8002-8003. Basic Seminar in German Literature. (4 cr per qtr; prereq grad major in German or #)
Guided research in selected areas; methods and theory applicable in study of German literature. Introduction to bibliography and research skills. Oral reports and seminar papers.

Ger 8020. Nibelungenlied. (4 cr; prereq 5721 or 5722 or #)

8203. Middle High German Courtly Lyric. (4 cr; prereq 5721 or 5722 or #)

Ger 8204. Walther von der Vogelweide. (4 cr; prereq 5721 or 5722 or #)

8205. Middle High German Courtly Epic. (4 cr; prereq 5721 or 5722 or #)

Ger 8206. Topics in Middle High German Literature. (4 cr; prereq 5721 or 5722 or #)

Ger 8210. Topics in 16th- and 17th-Century German Literature. (4 cr per qtr [max 12 cr])

Ger 8211. Literature From 1500 to 1600. (4 cr)

Ger 8212. German Literature of the 17th Century. (4 cr)

Ger 8219. Literature of the 19th Century. (4 cr)
Literature, literary movements and influences represented in drama, lyric, and shorter prose forms.

Ger 8220. Topics in 18th-Century German Literature. (4 cr per qtr [max 12 cr])

Ger 8221, 8222. Romanticism. (4 cr per qtr)

Ger 8230. Lyric Poetry. (4 cr per qtr [max 12 cr])
Literary periods or movements, thematic and genre issues, historical and cultural contexts.

Ger 8235, 8236. Eighteenth Century: From Aufklärung Through Sturm Und Drang. (4 cr per qtr)

Ger 8241. Expressionism in German Literature. (4 cr)

Ger 8261, 8262. German Literature Since World War II. (4 cr per qtr)

Ger 8301. The 19th-Century Novel. (4 cr)

Ger 8307. The German Novelle: From Goethe to Kafka. (4 cr)

Ger 8311. The 20th-Century Novel. (4 cr)

Ger 8324, 8325, 8326. German Drama From Naturalism to the Present. (4 cr per qtr)
8324: From 1880 to 1910. 8325: From 1910 to 1930. 8326: From 1930 to present.

Ger 8330. Topics in 19th-Century German Literature. (4 cr per qtr [max 12 cr])
An issue or movement in 19th-century German literature, using a variety of critical approaches.

Ger 8331. The 18th-Century Novel. (4 cr)
Selected readings, theoretical writings on the novel; several contemporaneous non-German novels by English writers.

Ger 8340. Topics in 20th-Century German Literature. (4 cr per qtr [max 12 cr])

Ger 8351. Romantheorie. (4 cr)
Analysis of 20th-century criticism of the genre Roman.

Ger 8407. Goethe. (4 cr)

Ger 8421. Heinrich Von Kleist. (4 cr)

Ger 8431. Heine. (4 cr)

Ger 8451. Friedrich Nietzsche. (4 cr per qtr)

Ger 8801. Dissertation Seminar. (4 cr)
For doctoral students beginning to establish topics and doing research for dissertations in German literature.

Ger 8810. The German Woman as Writer. (4 cr per qtr [max 8 cr])
German women writers from 18th to 20th century, using methods of feminist critical analysis.

Ger 8820. Advanced Theoretical Seminar. (4 cr per qtr [max 12 cr]; prereq 8003 or #)
Issues in contemporary critical thought.

Philology

Ger 8701. Philological Proseminar: Bibliography. (4 cr)

8713. Contemporary German. (4 cr; prereq 8712)
Varieties and analysis in an historical framework.

Ger 8740. Readings in Philology. (4 cr per qtr [max 12 cr])
Ger 8741, 8742, 8743. Gothic and Methods of Comparative Germanic Linguistics. (4 cr per qtr; prereq #)

Ger 8751-8752. Manuscript Readings and Text Reconstruction. (4 cr per qtr; 8751: prereq #; 8752: prereq 8751 or #) 8751: Manuscript readings. 8752: Medieval text editing.

Ger 8761, 8762, 8763. Philological Seminar. (4 cr per qtr; prereq #)

**Literature and Philology**

Ger 8990. Reading and Research. (Cr ar [3-6 cr; prereq #; may be taken on tutorial basis with #)

**Dutch (Dutch)**

Dtc 5490. Topics in Dutch Literature. (4 cr per qtr [max 8 cr]; prereq reading knowledge of Dutch, jr or sr or grad student) Topic on specific author, group of authors, genre, period, or subject matter. Topic listed in Class Schedule.

Dtc 5742. Middle Dutch. (4 cr) Study of oldest recorded poetry and prose; linguistic and literary aspects; older Dutch dialects; relations between Middle Dutch and Middle High German.

Dtc 5743. Early Modern Dutch. (4 cr; prereq 5742 or #) Study of 16th and 17th century Dutch poetry and prose; linguistic and literary aspects in context of Dutch “Golden Age.” Development toward modern standard Dutch.

Dtc 5970. Directed Studies. (1-5 cr; prereq #, ∆, □)

**Germanic Philology**

*Professor:* Evelyn S. Firchow (German, Scandinavian, and Dutch); Nils Hasselmo (German, Scandinavian, and Dutch); Calvin B. Kendall (English); Anatoly Liberman (German, Scandinavian, and Dutch); James A. Parente (German, Scandinavian, and Dutch); Anatoly Liberman (German, Scandinavian, and Dutch); Nils Hasselmo (German, Scandinavian, and Dutch); Calvin B. Kendall (English); Anatoly Liberman (German, Scandinavian, and Dutch); Robert Sonkowsky (Classical and Near Eastern Studies); David J. Wallace (English)

*Associate Professor:* Rita Copeland (English); Kaaren Grimstad (German, Scandinavian, and Dutch); Nita Krevans (Classical and Near Eastern Studies); Ray M. Wakefield (German, Scandinavian, and Dutch)

*Other:* Stephanie C. Van D’Elden (associate director, Independent Study), director of graduate studies

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

**Degrees Offered**—M.A. (Plan A and Plan B) and Ph.D.

**Curriculum**—Emphases are medieval literature and the history and structure of the Germanic languages.

**Prerequisites for Admission**—None.

**Special Application Requirements**—Three letters of recommendation and a satisfactory score on the General (Aptitude) Test of the Graduate Record Examination (GRE) are required. Because Germanic philology is not listed in the GRE department codes, applicants should use the department code for Scandinavian when taking the test. GRE results should be forwarded to the Department of German, Scandinavian, and Dutch.

**Master’s Degree Requirements**—Nine quarter courses are required. See the program publication for details. The final examinations consist of a three-hour written and a one-hour oral examination.

**Doctoral Degree Requirements**—A total of 25 to 30 quarter courses (including work completed for the M.A. degree) are recommended. A Ph.D. qualifying examination, which is substantially the same as the written M.A. examination in Germanic philology, is administered to students who have earned their M.A. degree at another institution. This examination must be taken within one year of entering the Ph.D. program. See the program publication for details.

**Language Requirements**—For the M.A. degree, students must demonstrate competence in English and Medieval Latin. For the Ph.D. degree, students must demonstrate competence in English, German, Medieval Latin, and two additional languages chosen in consultation with the adviser.

**Minor Requirements for Students Majoring in Other Fields**—For a master’s degree minor, three philological courses are required. All courses must be selected with the help of a philology adviser from the committee. For a doctoral degree minor, three additional philological courses are required.

**For Further Information and Applications**—Contact the Germanic Philology Program, Center for Medieval Studies, University of Minnesota, 304 Walter Library, 117 Pleasant Street S.E., Minneapolis, MN 55455 (612/626-0805).

**GPhl 8666. Doctoral Pre-Thesis Credits.** (max 18 cr per qtr; doctoral student who has not passed oral prelims)

**GPhl 8777. Thesis Credits: Master’s.** (16 cr required; Plan A only)

**GPhl 8888. Thesis Credits: Doctoral.** (36 cr required)
Gerontology (Gero)

Professor: Nancy N. Eustis (public affairs), director of graduate studies; Dennis A. Ahlburg (industrial relations); David O. Born (health ecology; dentistry); Pauline G. Boss (family social science); James C. Cloyd (pharmacy practice); Daniel F. Detzner (family social science); Maurice W. Dysken (psychiatry); Judith M. Farrar (public health); Robert L. Kane (public health); Rosalie A. Kane (health services research and policy, public health); Joseph M. Keenan (family practice and community health); Frank M. Lassman (emeritus: otorhinolaryngology; communication disorders; physical medicine and rehabilitation); Matthew K. McGue (psychology); Donald G. McTavish (sociology); Susan S. Meyers (rural sociology); Jeylan T. Mortimer (sociology); Jean K. Quam (social work); Muriel B. Ryden (nursing); Mariah Snyder (nursing); Michael Wade (kinesiology and leisure studies); Jonathan D. Wirtschafter (ophthalmology); Shirley L. Zimmerman (family social science)

Associate Professor: Charles E. Boult (family practice and community health); Margaret J. Bull (nursing); Sara S. DeHart (family social science); Richard P. DiFabio (physical medicine and rehabilitation); Corinne T. Ellingham (physical medicine and rehabilitation); Bernadine M. Feldman (nursing); Cynthia R. Gross (pharmacy practice); Peter A. Hancock (kinesiology and leisure studies); Lois J. Heller (physics); Robert E. Kennedy (sociology); Mary E. O’Connell (pharmacy practice); Richard L. Reed (family practice and community health); Robert C. Serfass (kinesiology and leisure studies); Stephen K. Shuman (dentistry); Marlene S. Stum (family social science); Jennifer Williams (social work); Robert E. Yahnke (General College)

Assistant Professor: Leslie A. Grant (public health); Kenneth W. Hepburn (family practice and community health); Merrie J. Kaas (nursing); Kathleen Krichbaum (nursing); James T. Pacala (family practice and community health); James R. Reinardy (social work); Carla E. S. Tabourne (kinesiology and leisure studies); La Dora V. Thompson (physical medicine and rehabilitation); Paul D. Thurais (psychiatry)

Adjunct Assistant Professor: Barton W. Galle, Jr. (continuing medical education)

Clinical Assistant Professor: Susan L. Cooper (pharmacy practice); Patrick W. Irvine (medicine)

Senior Fellow: Sharon K. Patten (public affairs)

Other: Christine A. Heine (nursing); Alice J. Stark (public health)

1 University of Minnesota, Duluth

Course of Study—Minor in gerontology, applicable to master’s (M.A. and M.S.) and doctoral programs.

Curriculum—The graduate minor program in gerontology provides a multidisciplinary foundation in gerontology and a concentration in one of the following four tracks within gerontology: clinical care; social and behavioral sciences; policy, administration, and ethics; and arts and humanities. The program of courses is developed in consultation between the student and the director of graduate studies of the Center on Aging.

Prerequisites for Admission—Admission to the gerontology graduate minor is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School and preparation of a minor program of coursework approved by the director of graduate studies in gerontology. Informal discussion of potential programs can be arranged with the director of graduate studies at any time.

Minor Requirements—At the master’s level, the minor program requires a minimum of 9 graduate-level quarter credits that include the Multidisciplinary Perspectives on Aging course (4 credits). In addition, students select at least 5 credits in designated courses within one of the four tracks.

The doctoral program requires a minimum of 18 graduate-level quarter credits. For a doctoral program, students select one of the four tracks in which to take 12 credits of designated fundamental courses and at least 6 credits of designated supplemental courses.

If mastery of the field of gerontology is desired, it is suggested that the student consider additional coursework beyond the required minimums for the master’s or doctoral programs. Students also have the option of a related area in gerontology at the master’s level or a supporting program in gerontology for the doctoral programs that are described further in this bulletin.

Language Requirements—None specific to the minor program. See requirements of the major department.

Application Procedures—Contact the director of graduate studies of the Center on Aging.
For Further Information and Applications—Contact the Graduate Minor Program in Gerontology, Center on Aging, University of Minnesota, Box 197 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (612/624-3904; fax 612/624-8448).

Courses sponsored directly by the minor program and the Center on Aging are identified below. In addition, designated courses are listed under each of the four tracks.

**Gero 8100. Research in Gerontology.** (3 cr; prereq #)
Current multidisciplinary theoretical and research literature on age-related issues. Topics specified in Class Schedule. Project that includes analysis and interpretation of age-related data.

**AdEd 5440; CPsy 5305; Nurs 5780; PubH 5737; Soc 5960 (sec 1); SW 5024. Multidisciplinary Perspectives on Aging.** (4 cr)
Multidisciplinary introduction to aging and aging process. Biological, social, and psychological aspects of aging; theories of aging; physiology of aging; death and bereavement; issues and problems of older adults in America; human services and delivery systems such as social services, health, nutrition, long-term care, and education; public policy and legislation; advocates; retirement; lifelong learning; and humanities and aging.

**FPCH 5653. Future Health Interventions for Older Populations.** (2 cr; prereq hlth sci grad student or hlth sci grad degree)
Successful and promising interventions designed by managed care organizations, including outcome data.

**SAPh 5007. Biology of Aging.** (2 cr)
Biological theories of aging; organ systems; cardiovascular and renal systems; reproductive and endocrine systems; immunity, hearing, visual, and dental changes in older individuals; and issues of health and disease.

**Designated Courses**

### Clinical Care

- FPC 5650, 5651, 5652. Principles of Geriatrics
- FPC 5653. Future Health Interventions for Older Populations
- Nurs 5609. Special Educational Experiences in Nursing
- Nurs 5642. Behavioral Problems in Persons with Dementia
- Nurs 5943. Care of the Elderly II: Psychosocial Concepts
- Nurs 8020. Evaluating Quality of Healthcare in Communities
- PMEd 5817w. Special Topics in Physical Therapy: The Biology of Aging
- SAPh 5870. Geriatric Assessment

### Social and Behavioral Sciences

- DHA 5481. Designed Environments for Aging
- FSoS 5251. Aging Families
- FSoS 5252. Aging, Family, and Society
- Psy 5138. Psychology of Aging
- Rec 5240. Recreation and Aging
- Soc 5956. Sociology of Death
- SW 5212. Social Work With Older Adults
- WoSt 5201. The Older Women: A Feminist Perspective

### Policy, Administration, and Ethics

- FPCH 5653. Future Health Interventions for Older Populations
- Nurs 5609. Special Educational Experiences in Nursing
- Nurs 5660. Basic Management in Long-Term Care Facilities
- PA 5413. Seminar: Aging and Disability Policy
- PA 5415. Economic and Demographic Aspects of Aging
- PubH 5749. Long-Term Care Administration
- PubH 5750. Long-Term Care Industry
- PubH 8803. Long-Term Care: Principles and Policies

### Arts and Humanities

- Engl 5910. Topics in English and North American Literature
- FSoS 5251. Aging Families
- FSoS 5252. Aging, Family, and Society
- FSoS 5253. Humanities, Aging, and Family Living
- Nurs 5609. Special Educational Experiences in Nursing
- Soc 5956. Sociology of Death
- SW 5211. Advanced Theories of Human Growth and Change
- WoSt 5201. The Older Woman: A Feminist Perspective

### Greek

See Classical and Near Eastern Studies.

### Health Informatics (HInf)

**Professor:** Laël C. Gatewood, director; health computer sciences; Stanley M. Finkelstein, director of graduate studies; Donald P. Connelly; Sheila A. Corcoran-Perry; David P. Fan; Ilene B. Harris; Paul E. Johnson; George G. Klee; Donald G. McQuarrie; Robert P. Patterson; Stuart M. Speedie; George L. Wilcox

**Associate Professor:** Christopher G. Chute; Lynda B. Ellis; Stephen C. Strother

**Assistant Professor:** Steven D. Hillson; Sandra J. Potthoff

**Research Associate:** Denton R. Peterson; Ernest F. Retzel; Bruce H. Sielaff

**Other:** David A. Garloff; Brian J. Westrich

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

### Degrees Offered—M.S (Plan A and Plan B) and Ph.D.

### Curriculum—The graduate programs in health informatics train students to apply the methodologies and use of computers, statistics,
and information sciences to information management for the health sciences. These programs offer instruction in health services computing, clinical decision making, health systems analysis, simulation, and consulting. Training is provided for health professionals seeking a master’s degree to validate competencies in information management, for information technologists obtaining a master’s degree to emphasize health applications, and for graduate students undertaking doctoral studies to develop new methodologies and to evaluate applications of clinical information systems. Further information on current research areas is available from the director of graduate studies.

Prerequisites for Admission—A baccalaureate degree in one of the social, biological, mathematical, or physical sciences is required. Before admission to the program, a student must complete at least two courses in the biological or life sciences, one year of calculus, linear algebra, and experience or coursework in at least one higher-level computer programming language. At least one course in biology or life science, the calculus, and the programming prerequisite are required before applying for admission to the program. A course in differential equations is required for doctoral studies.

Special Application Requirements—The Graduate Record Examination or similar professional examination (e.g., MCAT) is required. Three letters of recommendation and a statement of purpose must be submitted with the application. Fall quarter entry is recommended.

Master’s Degree Requirements—Both plans require seven core courses in health informatics (24 credits), a sequence in statistics or biostatistics (10-12 credits), and registration in the Health Informatics Seminar (3 credits) for the first year of study. For most students, the program takes two academic years. It is concluded with an oral examination. For the Plan B master’s degree, an additional 20 credits is required. Of these, 10 credits come from a technical area and 10 credits from the health sciences. The research-oriented Plan A master’s degree is available to advanced applicants, such as those with a doctoral or professional degree in a health sciences discipline. In addition to the required courses, the Plan A requires 8 credits in related fields. Programs are planned with the aid of a faculty adviser. A student handbook containing sample programs and other information is available upon request from the director of graduate studies.

Doctoral Degree Requirements—For the Ph.D. degree, students should fulfill the master’s basic requirements (37 credits). Also, 18 additional credits in health informatics and a minimum of 18 credits in a minor or supporting program are required. At least 24 of the total credits must be in 8xxx courses in the area of concentration. Preliminary written and oral examinations are required for admission to candidacy. A final oral examination is required upon completion of the dissertation.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Programs are arranged on an individual basis upon consultation with the director of graduate studies, who also approves the final program. Programs consist of 9 or more quarter credits in health informatics for the master’s program (Plan A or B) and 18 or more quarter credits for the doctoral program.

For Further Information and Applications—Contact the Director of Graduate Studies in Health Informatics, Division of Health Computer Sciences, University of Minnesota, Box 511 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (mailing address) (612/625-8440; fax 612/625-7166; e-mail doreen@umnhcs.labmed.umn.edu).

HInf 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

HInf 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

HInf 8888. Thesis Credits: Doctoral. (36 cr required)

HInf 5430. Health Informatics I: Concepts and Elements. (4 cr; prereq elem algebra, programming, stats or #) Gatewood

History and challenges of health informatics; computerized patient records; clinical information systems; basics of information, computation, and communication; data management in health settings.
HInf 5431. Health Informatics II: Methods and Systems. (4 cr; prereq 5430, elem algebra, programming, stats or #) Finkelstein
Clinical decision analysis and support systems; clinical monitoring; signal processing; image analysis; modeling and simulation; computational biology; informatics support for basic research.

HInf 5432. Health Informatics III: Organizational Context. (4 cr; prereq 5430, 5431, elem algebra, programming, stats or #) Gatewood
Structures of healthcare delivery systems; clinical information exchange; databases supporting clinical and research efforts; evaluation methodologies; managing information technology as strategic resource for healthcare organizations.

HInf 5433. Computer Methodology in the Delivery of Healthcare I: Physiological Monitoring and Testing. (3 cr; prereq 5432 or #) Finkelstein
Role of computer in monitoring and testing patients; hardware and software requirements for processing clinically significant signals; comparison and evaluation of currently available systems.

HInf 5434. Computer Methodology in the Delivery of Healthcare II: Introduction to Medical Decision-Making Techniques. (3 cr; prereq 5432 or PubH 5452 or #) Connelly, Speedie
Introduction to biometrical concepts and techniques used to support medical decision-making process, including test efficacy measures, decision analysis, Bayes’ Theorem, expert systems, decision support systems, and multivariate analysis.

Models for queuing, inventory, networks, linear programming, and scheduling.

HInf 5436. Seminar: Health Informatics. (1-3 cr) Ellis
Presentation and discussion of research problems and current literature.

HInf 5446. Professional Studies in Health Informatics. (1 cr per qtr [3 qtr sequence required]; prereq HInf major, 5432, PubH 5454 or #) Gatewood
Health informatics as a profession, including discipline, responsibilities, resources, and job opportunities. Directed experiences in consulting, teaching, writing, conducting research, and managing facilities.

HInf 5470. Topics in Health Informatics. (Cr ar; prereq #)
Selected readings and/or projects.

HInf 8405, 8406, 8407. Advanced Topics in Health Informatics I, II, III. (3 cr per qtr; prereq 5432, 5435, PubH 5452 or # offered alt yrs) Finkelstein
Computer systems design for health sciences, small computer concepts and use, computers for clinical services, computer-aided medical decision making, biomedical image processing, and pattern recognition. All topics use techniques and incorporate actual examples or case studies from the health sciences.

HInf 8415. Mathematical Modeling in the Health Sciences I: Deterministic Models. (3 cr; prereq Math 3221, programming or #; offered alt yrs) Altmann

HInf 8416. Mathematical Modeling in the Health Sciences II: Stochastic Models. (3 cr; prereq 8415, Math 3221, PubH 5450 or #; offered alt yrs) Altmann

HInf 8417. Mathematical Modeling in the Health Sciences III: Stochastic Simulation. (3 cr; prereq 8416, Math 3221, PubH 5450, PubH 5452, programming or #; offered alt yrs) Altmann

HInf 8449. Advanced Readings in Health Informatics. (1-3 cr; prereq 5432, PubH 5434, #)
Discussion of methodology and results.

HInf 8450. Research in Health Informatics. (Cr ar; prereq #)

Health Services Research and Policy (PubH)

Professor: Bryan E. Dowd, director of graduate studies; Jon B. Christianson; Roger D. Feldman; Judith M. Garrard; Robert L. Kane; Rosalie Ann Kane; John E. Kralewski; Theodor J. Litman; Nicole Lurie; Willard G. Manning; Ira S. Moscovice

Associate Professor: Thomas Choi; John A. Nyman
Assistant Professor: Kathleen Call

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.
Degree Offered—M.S. (Plan A and Plan B).

Curriculum—The objective of the program is to train health services researchers and health policy analysts to carry out studies using appropriate theoretical and empirical techniques, formulate health policy options, work effectively in the political arena to shape policies, and evaluate policy initiatives once implemented. The degree can serve as a terminal degree or as the first step toward the Ph.D. in health services research, policy and administration. Two options are available. Plan A is primarily for students with a professional degree in medicine, dentistry, nursing, or pharmacy. Plan B is for students without a health professional background. Students electing Plan B substitute additional coursework and special projects, including a summer internship in a public or private health services agency/organization, for the thesis. Both options are two-year programs.

In the first year of the program, students receive an overview of the health services research field and are introduced to the social and health sciences paradigms employed most frequently in health services research: economics, sociology, and epidemiology. Students also complete coursework in theoretical statistics and regression analysis. The second year focuses on research design and advanced analytic techniques in coursework on research methods, surveys and sampling, measurement, and evaluation research. In the health policy sequence, analytic methods are applied to current problems. Students may choose electives from other divisions within the School of Public Health or from other departments within the University.

Prerequisites for Admission—Applicants who have not completed coursework in calculus, statistics, and microeconomics, but are otherwise qualified for admission, will be required to take relevant summer session courses either at the University or at another accredited institution before beginning the program.

Special Application Requirements—Above average performance in the Graduate Record Examination is required for admission. A statement of purpose and three letters of reference are also required. Students are admitted in fall quarter only. The program is full time.

Master’s Degree Requirements—Plan A students are required to take a minimum of 48 course credits (as well as 16 thesis credits). Plan B students are required to take a minimum of 55 credits.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A minimum of 18 credits is required for the minor.

For Further Information and Applications—Contact the Student Services Center, School of Public Health, University of Minnesota, Box 819 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (612/626-3500 or 1/800/774-8636; fax 612/626-6931; e-mail sph-uofm@greg2.sph.umn.edu; http://www.sph.umn.edu).

PubH 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

Note—Courses in health services research and policy are listed and described under Public Health in this bulletin. See PubH 5330, 5790, 5852, 5862, 5863, 5868, 5870, 5893, 5894, 8801, 8810-8811-8812, 8813, 8830, 8831, and 8832. See also Stat 5121, 5122, and 5302 under Statistics.

Health Services Research, Policy and Administration (PubH)

Professor: Willard G. Manning, director of graduate studies; Mario F. Bogmann; Jon B. Christianson; Bright M. Dornblaser; Bryan E. Dowd; Roger Feldman; Judith M. Garrard; Robert L. Kane; Rosalie A. Kane; John Kralewski; Theodor J. Litman; Nicole Lurie; A. Marshall McBean; Ira Moscovice; Vernon E. Weckwerth

Associate Professor: Thomas Choi; Michael D. Finch; George O. Johnson; John A. Nyman; Michael D. Resnick

Adjunct Associate Professor: N. Tor Dahl; Richard J. Oszustowicz

Assistant Professor: Kathleen T. Call; Robert A. Connor; Leslie A. Grant; Sandra J. Potthoff

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degree Offered—Ph.D.

Curriculum—The doctoral studies program offers advanced graduate education for students seeking teaching and research positions related
to health services in academic institutions, government, or the private sector. Students acquire an understanding of the influence of economic, social, and political forces on health and healthcare, including the cost of healthcare, with emphasis on the factors affecting the public and private financing of health services; the problems of access to health services among different population subgroups and the attendant issues of equity and social justice in the allocation of healthcare resources; the nature and evolution of government involvement in healthcare and its consequences; and the legislative process and role of interest groups in the formulation of health policy.

**Prerequisites for Admission**—Applicants who have not completed coursework in calculus, statistics, and microeconomics, but are otherwise qualified for admission, will be required to take relevant summer session courses either at the University or at another accredited institution before beginning the program.

**Special Application Requirements**—Above average performance on the Graduate Record Examination is required for admission. A statement indicating reasons for seeking the Ph.D., plus three letters of reference attesting to the applicant’s academic ability and potential for a career in teaching and research, are required. Students are admitted in fall quarter only. The program is full time.

**Doctoral Degree Requirements**—The minimum credit requirement for the Ph.D. is 54 course credits in the major, 18 credits for a supporting program or minor, and 36 thesis credits.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—A minimum of 18 credits is required for the minor.

**For Further Information and Applications**—Contact the Student Services Center, School of Public Health, University of Minnesota, Box 819 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (612/626-3500 or 1/800/774-8636; fax 612/626-6931; e-mail sph-uofm@greg2.sph.umn.edu; http://www.sph.umn.edu).

### HISPANIC AND LUSO-BRAZILIAN LITERATURES AND LINGUISTICS

**PubH 8666. Doctoral Pre-Thesis Credits.** (max 18 cr per qtr; doctoral student who has not passed oral prelims)

**PubH 8888. Thesis Credits: Doctoral.** (36 cr required)

*Note*—Courses in health services research, policy and administration are listed and described under Public Health in this bulletin. See PubH 5868, 5893, 8750 to 8796, and 8801-8833.

### Hispanic and Luso-Brazilian Literatures and Linguistics

*Professor*: Rene Jara; Louise Mirrer; Antonio Ramos-Gascón; Nicholas Spadaccini; Hernan Vidal; Anthony N. Zahareas

*Associate Professor*: Amy K. Kaminsky; Carol A. Klee; Francisco A. Ocampo; Joanna O’Connell; Constance A. Sullivan

*Assistant Professor*: Fernando E. Arenas

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

**Degrees Offered**—M.A. (Plan A and Plan B): Hispanic Literature, Luso-Brazilian Literature, Hispanic Linguistics; Ph.D.: Hispanic and Luso-Brazilian Literatures and Linguistics.

**Curriculum**—Emphases available for the Ph.D. are Spanish literature, Spanish-American literature, Lusophone literatures, and Hispanic linguistics.

**Prerequisites for Admission**—Prospective students generally have completed an undergraduate degree or substantial coursework in the field, although individuals with other backgrounds may be admitted. The Graduate Studies Committee may require completion of background coursework, without graduate degree credit, for admitted students with insufficient preparation.

**Special Application Requirements**—Three letters of recommendation from previously attended institutions evaluating the applicant’s scholarship, a sample of a writing project, and a complete set of transcripts in addition to that required by the Graduate School should be sent to the director of graduate studies. The Graduate Record Examination is strongly recommended, and is required for fellowship candidates. The deadline for application for admission and financial aid is January 15 for fall quarter entry.
Master’s Degree Requirements—The minimum coursework requirement for Plans A and B is 44 credits. For more specific information about program requirements, consult the department’s Graduate Handbook.

Both written and oral final examinations are required for all M.A. degrees.

Doctoral Degree Requirements—A minimum of 17 courses in the major beyond the bachelor’s degree is required. Students who hold an M.A. degree or who wish to bypass the M.A. program must pass a Ph.D. qualifying examination by the second quarter after beginning work toward the doctorate. For further information consult the department’s Graduate Handbook.

Language Requirements—For the doctoral degree, students must have proficiency in the minor language (i.e., Portuguese for those emphasizing one of the Hispanic components, Spanish for those emphasizing the Luso-Brazilian component). Proficiency is usually demonstrated by use of the minor language in written and oral forms (see the department’s Graduate Handbook).

For Further Information and Applications—Contact the Department of Spanish and Portuguese, University of Minnesota, 34 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612/625-5858; fax 612/625-3549). Students are issued the department’s Graduate Handbook on admission.

Port 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

Span 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

Span 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

Span 8888. Thesis Credits: Doctoral. (36 cr required)

Portuguese (Port)

Port 5523. Nationalism in Brazilian Literature. (4 cr; prereq three 3xxx Portuguese courses or Δ)

Major literary works—poetry, novel, essay, memoirs, or drama—and literary trends from Colonial period and/or 19th century as expressions of nativist/nationalistic project in Brazil.

Port 5524. Brazilian Literature and Modernization. (4 cr; prereq three 3xxx Portuguese courses or Δ)

Major literary works—poetry, novel, essay, memoirs, or drama—and literary trends from 20th century as expressions of modernization process of Brazilian society.

Port 5910. Topics in Luso-Brazilian Cultures. (4 cr; prereq Span 3104 or SpPt 3104 or Δ)

Important cultural manifestations in Portuguese-speaking world: e.g., literature, music, film, oral traditions, TV. Topics specified in Class Schedule.

Port 5920. Figures in Luso-Brazilian Literature. (4 cr; prereq Span 3104 or SpPt 3104 or Δ)

One Portuguese, Brazilian, or other major Lusophone writer or group of writers whose work has had impact on thought, literature, or social problems. Figures specified in Class Schedule.

Port 5970. Directed Readings. (1-5 cr per qtr [max 15 cr]; prereq # and Δ, CLA approval)

Luso-Brazilian studies, especially in areas not previously covered. Students must submit reading plans for particular topics, figures, periods, or issues. For M.A. and Ph.D. candidates.

Port 5990. Directed Research. (1-5 cr; prereq #, Δ, CLA approval)

Port 8101. Literary Criticism and Research Methods. (4 cr)

Port 8920. Seminar: Luso-Brazilian Literature. (4 cr)

Advanced level study of problems in Luso-Brazilian language, literature, and cultural history. Topics specified in Class Schedule.

Spanish (Span)

Linguistics, Philology, History of the Language, and Research Methods

Span 5015. Methods of Translation. (4 cr; prereq 10 cr from 3001-3005 series or #)

Meaning, use, and theories of translation. Techniques and problems of translation from Spanish and Portuguese to English and vice versa. Translation patterns, use of special vocabularies, and other adjuncts needed to understand both languages. Practical vocabulary and usage for various fields of work.

Span 5701, 5702. History of Ibero-Romance. (4 cr per qtr; prereq 3701 or 3702 or #)

Comparative study of origins and development of Ibero-Romance languages; evolution of Catalan, Portuguese, and Spanish compared and contrasted. Methods in reading and analysis of non-literary and literary medieval texts.

Span 5711. The Structure of Modern Spanish: Phonology. (4 cr; prereq 3701, Ling 5302 or #)

Formulation and evaluation of phonological descriptions of Spanish. Approaches to problems in Spanish phonology within metrical, autosegmental, and lexical phonological theories. Useful for students who plan to teach Spanish and for those whose primary language is Spanish.
Span 5713. The Structure of Modern Spanish: Syntax. (4 cr; prereq 3702, Ling 5302 or #)
Introduction to linguistic types that appear across languages, such as grammatical relations, word order, transitivity, causative constructions, relative clauses, and how these are present in syntax of Spanish. Useful for students who plan to teach Spanish and for those whose primary language is Spanish.

Span 5714. The Structure of Modern Spanish: Semantics. (4 cr; prereq 5713 or #)
Relationship between syntax and semantics. Application of structural semantics to the Spanish language, including concepts of semantic and lexical fields. Examines cultural patterns in Hispanic world as reflected in semantic structures. Theories of meaning: euphemisms; taboos; semantics and social class. Semantic approaches to literary analysis.

Span 5715. The Structure of Modern Spanish: Pragmatics. (4 cr; prereq 5713 or #)
Introduction to concepts used in current literature in Spanish pragmatics.

Span 5732. Spanish Dialectology: Regional and Social Dialects of Modern Spanish America. (4 cr; prereq #)
Major dialect areas in modern Hispanic America. Form, speech, and language as they relate to the old political and religious divisions of Hispanic America and to the new national boundaries.

Span 5985. The Study of Spanish in the United States: Theory and Field Methods. (4 cr; prereq 3701)
Sociolinguistic theory and field methods related to study of Spanish in United States; field experience in Hispanic community of St. Paul.

Span 5991. The Acquisition of Spanish as a First and Second Language. (4 cr; prereq 3702 or #)
Examination of studies on acquisition of Spanish as a first and second language; second language acquisition in both formal and informal environments.

Span 8730. Seminar in Spanish and Portuguese Syntax. (4 cr; prereq 5713 or #)
Research and critical examination of readings in specific topic of Hispanic syntax.

Span 8750. Seminar in Spanish and Portuguese Pragmatics. (4 cr; prereq 5715 or #)
Research and critical examination of readings in specific topic of Hispanic pragmatics.

Span 8780. Seminar in Hispanic Sociolinguistics. (4 cr; prereq 5985 or #)
Current topics.

Peninsular Literature

Span 5106. The Literature of the Reconquest and Feudal Spain. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese)
Major literary works and genres of medieval Spain—from the primitive lyric to La Celestina—examined against background of social and historical transformations of Spanish Middle Ages.

Span 5107. The Literature of the Spanish Empire and Its Decline. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese)
Major Renaissance and baroque works of 16th and 17th centuries—poetry, nonfiction prose, novel, drama—examined against background of establishment of Spanish Empire, internal economic crisis, and ideological apparatus developed by the modern state.

Span 5108. The Spain of Cervantes' Don Quixote: History and Fiction. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or ∆)
Historical function of literary techniques, narrative perspectives, and ironic discourse of Cervantes' major work during the period of imperial decadence. Tradition of Erasmian folly, madness as anachronism and social satire.

Span 5109. The Literature of Bourgeois Order: Enlightenment, Romanticism, and Positivism. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese)
Major literary works—poetry, essay, novel, and drama—and literary movements of 18th and 19th centuries examined as aesthetic expressions of the long process of consolidation of the bourgeois social order in Spain.

Span 5111. The Literature of the Spanish Crisis of the 20th Century. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese)
Major literary works and aesthetic trends of contemporary Spain examined within context of the social, political, and intellectual crisis, from the Spanish-American War of 1898 to the post-Franco period.

Span 5221. Spanish Literature of the 17th Century: The Drama. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or ∆)
Representative playwrights: Lope, Alarcón, Tirso, Calderón. Dramatic forms, especially comedy, tragedy, and auto sacramental. Approaches to golden age comedy. Themes of honor, purity of blood, country vs. city, free will, others, viewed against background of literary, cultural, and social history.

Span 5234. Feminism and Literature in Spain. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or ∆)
Spanish feminism in thought and practice; literature, cultural discourse, and literary theory.

Span 5272. Hispanic Modernism. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or ∆)
Span 8100. Research in Sociohistorical Approaches to Spanish Literature. (4 cr)
Sociohistorical functions of Spanish literary texts and major theories concerning literary production.

Span 8200. Spanish Literary Texts: Theories of Formal Structures. (4 cr)
Research in approaches to and methods of literary analysis of the discourse.

Span 8202. Orality and Literacy in Medieval Spain. (4 cr; offered when feasible)

Span 8252. Spanish Literature: 19th Century. (4 cr; offered when feasible)

Span 8271. Spanish Theatre in the 20th Century. (4 cr; offered when feasible)

Span 8300. The Construction of Spanish Literary History. (4 cr)
Critical purview of how canon of Spanish literary history has been established during last 100 years. Sociocultural and sociopolitical theories that underlie constitution of literary history as an academic and historiographic discipline. Literature from Spain or literature in Spanish. Hegemonic literature as national literature in Spain.

Span 8533. The Baroque in European Literature: Spain. (4 cr)
Third quarter of interdepartmental sequence of literature in translation. The baroque movement in Spain. Characteristics in common with the baroque movement in Italy, France, and Germany.

**Spanish-American Literature**

Span 5525. Caribbean Literature: An Integral Approach. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or Δ)
Review of the literature of the Caribbean area; common generic traits and preoccupations. Conceptualization of the region as a totality: themes, similar lines of development, generic tendencies, periods of development and crisis.

Span 5526. Creole Consciousness and Mercantilist Culture. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or Δ)
Texts written between 1492 and 1780, sociohistorical context. Generic variants and the approach to changing reality in which they are inscribed.

Span 5527. National Literary Consciousness and Free Trade. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or Δ)
Literary movements as part of the process of formation of nation-states: the incorporation of Latin America in the international capitalist system as producer of foodstuffs and raw materials and importer of manufactured goods (1780-1900).

Span 5528. Popular Literary Consciousness, 1900-1950. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or Δ)
Spanish-American literature between the eve and aftermath of the two world wars. Impact of modernization, industrialization, and nationalistic and populist thought on emergence of distinctive writing, thematic trends, and literary genre conventions.

Span 5529. National Affirmation and Transnationalization. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or Δ)
Literary trends of the period (1950 to present) as a reaction to internal social demands for development of independent national cultures and conflicting influence of international economic system.

Span 5531. Hispanic Literatures of the United States. (4 cr; prereq three 3xxx or 5xxx Spanish or Portuguese lit courses or Δ; offered when feasible)

Span 5532. Literature and National Disintegration. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or Δ)
Literary reaction to contemporary structural changes in world economic system (1970 to present). Effects on literature as institution. Texts related to revolutionary trends and social movements (feminism, Theology of Liberation, defense of human rights).

Span 5533. Latin-American Cultural Discourse. (4 cr; prereq three 3xxx or 5xxx lit courses in Spanish or Portuguese or Δ)

Span 8940. Advanced Research in Spanish-American Literary Historiography. (4 cr)
Sources and procedures that have given rise to institutionalizations of Spanish-American literary history. Evaluation and review of epistemological principles and assumptions in theory of literary criticism and histories of literature.

Span 8960. Advanced Research in Social Approaches to Spanish-American Literary Texts. (4 cr)
Function of Spanish-American literature in society according to various theories of social structures: Marxist, Weberian, Frankfurt School, Dependency Theory, Simmelian sociology.

Span 8980. Advanced Research in Semiotic/Structural Analysis of Spanish-American Literary Texts. (4 cr)
Challenging Spanish-American literary texts as semiotic processes, both to illuminate their structural machinery of meaning and to open their semiotic projection to the symbolic activity pervading Spanish-American cultural and social environment.
Span 8990. Advanced Comparative Research of Caribbean Genres. (4 cr)
Major literary works and genres of Caribbean literature studied against the background of the sociohistorical vicissitudes of the process leading to the formation and consolidation of the national states.

Topics, Seminars, and Directed Study

Span 5800. Spanish Culture and Society in 20th-Century Spain. (4.5 cr)
Major sociocultural changes in Spanish society from humanities and social sciences perspectives; emphasizes current situation and developments leading into 21st century. Literature, history, politics, geography and regional diversity, art, music, and cinema.

Span 5910. Topics in Spanish Peninsular Literature. (4 cr; prereq Span 3104 or Δ)
Major issues or approaches of Spanish literature examined through important groups, movements, trends, methods, genres. Topics may include: conversos; “mythicism”; poesia tradicional; “essay” and Enlightenment; novela realista; avant-garde. Topics specified in Class Schedule.

Span 5920. Topics in Spanish-American Literature. (4 cr; prereq Span 3104 or SpPt 3104 or Δ)
Spanish-American literature examined through important groups, movements, trends, methods, genres. Topics specified in Class Schedule.

Span 5930. Topics in Ibero-Romance Linguistics. (4 cr per qtr [max 12 cr]; prereq 10 cr from Span 3001-3005 series or #)
Topics specified in Class Schedule. For list of sample topics, consult the department. Problems in Hispanic linguistics, including aspects of Luso-Brazilian language. A variety of linguistic approaches and methods.

Span 5950. Figures in Spanish-American Literature. (4 cr; prereq Span 3104 or Δ)
One Spanish-American writer or group of writers whose work has had impact on thought, literature, or social problems.

Span 5970. Directed Readings. (1.5 cr per qtr [max 15 cr]; prereq #, Δ, CLA approval)
To fill gaps in students’ preparation, especially when certain courses have not been offered. Students must submit reading plans for particular topics, figures, periods, or issues. Readings in Spanish and/or Spanish-American areas. For master’s and Ph.D. candidates.

Span 5990. Directed Research. (1-5 cr ar; prereq #, Δ, CLA approval)

Span 8900.* Spanish Seminar. (4 cr)
Special projects relying heavily on advanced research in Spanish problems. Limited to small group of students. Investigation of assigned fields, analysis of problems, appraisal of principles. For list of sample seminars, consult the department.

Span 8920. Seminar: Migration, Transnationalization, and Hispanic Literature. (4 cr)
Development of growing corpus of literature that, while Hispanic in character, has no specific Hispanic national or regional origins but instead issues out of cultural context created by displaced Spanish American populations, particularly in the United States.

Span 8950.* Seminar: Spanish-American Literature. (4 cr)
Special projects of advanced research in Latin-American problems. Investigation of assigned areas, analysis of problems, appraisal of principles. Limited to small group of students. For list of sample topics, consult the department.

Span 8970. Directed Readings in Romance Languages. (Cr ar; prereq Δ)
Studies in authors and topics not offered in other courses. Weekly meetings based on student’s research and analysis. Students and instructor agree on plan of reading or particular topics, figures, issues, etc. Readings in Spanish or Spanish-American areas. Primarily for Ph.D. candidates.

Spanish-Portuguese (SpPt)

SpPt 5930. Selected Topics in the Hispanic Cultural Discourses. (4 cr; prereq reading knowledge of Spanish and Portuguese)
Cultural discourses of Portuguese-speaking and Spanish-speaking worlds. Common background and differences among Iberian and/or Latin American intellectual production. Taught in Portuguese.

SpPt 5999. The Teaching of College-Level Spanish and Portuguese: Theory and Practice. (4 cr)
For new teaching assistants in Department of Spanish and Portuguese.

SpPt 8911. Seminar: Feminist Perspectives on Hispanic and Luso-Brazilian Cultural Discourses. (4 cr)
Feminist theoretical issues and critical practice, application to Hispanic and Luso-Brazilian literary and cultural discourse; relationship of feminist criticism to other theoretical models and methodologies.

SpPt 8920. Cross-Cultural Issues in Hispanic and Luso-Brazilian Literatures. (4 cr; prereq #)
Comparative study of literary production in historical periods when economic, social, political, and ideological bonds among Hispanic and Lusophone countries are intensified.

History (Hist)

Professor: Kinley J. Brauer, chair; Josef L. Altholz; Bernard S. Bachrach; Paul W. Bamford (emeritus); Hyman Berman; Clarke A. Chambers (emeritus); John K. Evans; Sara M. Evans; Caesar E. Farah (Afro-American and African studies); Edward L. Farmer; David F. Good; Barbara A. Hanawalt; John R. Howe; Allen F. Isaacman;
Thomas Kelly; Sally G. Kohlstedt (history of science and technology); David Kopf; Edwin T. Layton (history of science and technology); Stanford E. Lehmberg; Byron K. Marshall; Elaine Tyler May (American studies); Mary Jo Maynes; Robert E. McCaa; Russell R. Menard; Michael F. Metcalf; John K. Munholland; Paul L. Murphy; David W. Noble; Thomas S. Noonan; Carla R. Phillips; William D. Phillips, Jr.; Kathryn L. Reyerson; David Roediger; Richard L. Rudolph; Joel B. Samaha; Stuart B. Schwartz; Theofanis G. Stavrou; Romeyn Taylor (emeritus); John A. Thayer; James D. Tracy; Carol L. Urness (James Ford Bell Library); Rudolph J. Vecoli; William E. Wright (emeritus)

Associate Professor: George D. Green, director of graduate studies; Jean M. Allman; John M. Eyler (history of medicine); Susan N. G. Geiger (women’s studies); Andrea Hinding (Humanities/Social Sciences Libraries); David O. Kieft; Lary L. May (American studies); Gianna Pomata; Steven Ruggles; Allan H. Spear; Dennis Valdes; Ann B. Waltner

Assistant Professor: Victoria Coifman (Afro-American studies); Lisa A. Norling; Jean M. O’Brien-Kehoe

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.A. (Plan A and Plan B) and Ph.D.

Curriculum—Areas of concentration include Africa; Asia; England; Ancient, Medieval, Early Modern, and Modern Europe; Early Modern World; Latin America; and the United States and its colonial background. Scholarly resources include the Center for Austrian Studies, the Center for Advanced Feminist Studies, the Center for Medieval Studies, the Immigration History Research Center, Modern Greek Studies, the Center for Early Modern History, and the Social Welfare History Archives.

Prerequisites for Admission—Applicants for the master’s degree normally should have completed general undergraduate survey courses in two or three broad areas of history, two years of advanced undergraduate work in two areas of history, and training in a foreign language. Some prerequisites may be made up after admission. In some circumstances, students without undergraduate history majors may be admitted to the M.A. program. Applicants for the Ph.D. program normally should have completed a master’s degree, but highly qualified applicants may apply directly for admission to the Ph.D. program without having completed an M.A. degree.

Special Application Requirements—The following are required by the department: a statement of background and purpose, three letters of recommendation, a statement of specific areas and subfields of interest, and scores from the General (Aptitude) Test of the Graduate Record Examination or the Miller Analogies Test. Deadline for financial aid applications is the last week in December. Forms and instructions should be requested from the department.

Master’s Degree Requirements—Plan A requires a thesis, plus a minimum of nine courses in history (including thesis credits for the equivalent of four of these) and two courses in other fields. Plan B requires a minimum of seven courses in history, two in outside fields, and two more in either history or outside fields. For detailed requirements see the department publication Graduate Study in History. A final oral examination is required for all master’s programs.

Doctoral Degree Requirements—Students must complete advanced research seminars and prepare for preliminary examinations in areas of concentration. Students are expected to complete twelve courses in history and five in outside fields. Detailed requirements are outlined in the department publication Graduate Study in History.

Language Requirements—A reading knowledge of one foreign language is required before admission to the master’s examination, and of two foreign languages before admission to the preliminary examinations for the Ph.D. degree. Some areas of concentration may require additional foreign languages. In some cases, competence in quantitative methods may replace one of the foreign languages. See Graduate Study in History for details.

Minor Requirements for Students Majoring in Other Fields—For the master’s degree, Plan A (a Plan B minor is not available), a minimum of three related courses in history are required. For the Ph.D. degree, at least six courses in history, including proseminar or seminar work, and a written and oral examination, are required.
For Further Information and Applications—Contact the Department of History, University of Minnesota, 633 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612/624-2800).

Hist 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

Hist 8777. Thesis Credits: Master's. (16 cr required; Plan A only)

Hist 8888. Thesis Credits: Doctoral. (36 cr required)

Methodology and Comparative History

Hist 5011, 5012. Quantitative Methods in Historical Research. (4 cr per qtr; prereq # McCaa, Menard, Ruggles
Introduction to quantitative approaches to analysis of historical problems. Data collection, questions of measurement, analytical techniques, and rudimentary statistics as they apply to historical research. Relationship of quantitative inferences to nonquantitative procedures.

Hist 5429. Slavery in the Americas. (4 cr; offered alt yrs) Isaacman, Menard, Schwartz, Spear
Comparative history of slavery, concentrating on slave regimes in the United States, Latin America, and Caribbean. Emphasis on slavery as both an economic and social system.

Hist 5630. Comparative Early Modern History. (4 cr; prereq #)
Critical examination of literature comparing history of different regions of world in Early Modern era, ca. 1450-1750.

Hist 5436. Social History of African Women: 1850 to Present. (4 cr; prereq # for undergrads) Geiger
Recent scholarship in African women’s social history, undertaken from various perspectives and employing, as well as testing, differing frameworks of historical analysis for African continent.

Hist 5970. Directed Study. (1-15 cr; prereq #, ∆, CLA approval)
Qualified senior and graduate students may register for work on a tutorial basis.

Hist 5990. Directed Research. (1-15 cr; prereq #, ∆, CLA approval)
Qualified senior and graduate students may register for work on a tutorial basis.

Hist 8011. Social History as Social Science. (4 cr; prereq # offered when feasible) Pomata

Hist 8015. Scope and Methods of Historical Studies. (4 cr; prereq #)
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 8630. Seminar in Early Modern History. (4 cr; prereq grad in history, ∆; 5630 recommended)

Hist 8640. World History. (4 cr; prereq #)
Critical examination of historical literature on theoretical approaches to and teaching of world history.

Hist 8942. Mass Media and Popular Culture in the 18th and 19th Centuries. (4 cr; prereq #)
Follows Hist 5942. Students write research paper on an historical aspect of popular culture or on a topic in which popular culture is an inherent component.

Hist 8970. Directed Study. (1-15 cr; prereq #)
Work on a tutorial basis.

Hist 8990. Directed Research. (1-15 cr; prereq #)
Work on a tutorial basis.

Africa and African Peoples

Hist 5436. Social History of African Women: 1850 to Present. (4 cr; prereq # for undergrads) Geiger
Recent scholarship in African women’s social history, undertaken from various perspectives and employing, as well as testing, differing frameworks of historical analysis for African continent.

Hist 5446. Problems in West African History. (4 cr)
Advanced seminar focusing on specific historical debates and methodological problems. Topics such as slavery and the state, Islam and trade, colonial encounter, gender and social change, resistance, nationalism.

Hist 5931. History of Africa: Social Groupings, Conflicts. (4 cr; prereq #; offered alt yrs) Isaacman
Rise of social differentiations in precolonial and contemporary African societies and how this process affects state formation and development.

Hist 5932. African Historiography. (4 cr; prereq #)
Isaacman
Written sources of African history from antiquity to the present. Emphasis on critique of content and writing.
Hist 5939. Methodology for the Study of African History. (4 cr; prereq #; offered alt yrs) Isaacman
The process of historical reconstruction in nonliterate societies; collection and interpretation of oral traditions.

Hist 8944, 8945. African History. (3 cr per qtr; prereq #; offered when feasible) Isaacman

Ancient

Hist 5061. History of Greece: To 600 B.C. (4 cr) Kelly
Political, economic, and social developments from first appearance of Greeks to ca. 600 B.C.

Hist 5062. History of Greece: 600-400 B.C. (4 cr) Kelly
Birth and development of democracy in Athens and militarism in Sparta; birth and development of philosophical and historical thought; development of Athenian Empire; Peloponnesian War between Athens and Sparta.

Hist 5063. History of Greece: 400-200 B.C. (4 cr) Kelly
Spartan, Theban, and Macedonian hegemony; Alexander the Great and the Hellenistic monarchies to 200 B.C.

Hist 5071, 5072, 5073, 5074. History of Rome. (4 cr per qtr) J Evans

Hist 5561-5562†. Ancient Greek History. (4 cr per qtr; prereq #, offered when feasible) Kelly

Hist 5571-5572-5573. Roman History. (4 cr per qtr; prereq #, offered when feasible) J Evans

East Asia

Hist 5461. Ancient China. (4 cr)
Origins of Chinese civilization, classical philosophies, and Han empire (to 220 A.D.).

Hist 5462. Buddhist China. (4 cr; offered alt yrs) Disintegration of Han empire; aristocratic society; barbarian invasions; spread of Buddhism and reintegration of empire in T’ang period (220-906 A.D.).

Hist 5464. Early Modern China: 1350-1750. (4 cr, §3464) Farmer, Waltner
Ming and early Ch’ing empires; expulsion of Mongols and centralization of imperial power; high point of Confucian bureaucratic rule, commercial development, philosophical innovation, popular fiction, Manchu conquest, and early Western contacts.

Eighteenth-century demographic crisis; growth of Western trade, Opium Wars, and peasant rebellion; early reform efforts, cultural conflicts with West, imperialism in China, and first phase of Chinese revolution.

Hist 5467. The Nationalist Revolution in China: 1900 to Present. (4-5 cr; prereq # for 5-cr regis) Farmer

Hist 5468. People’s Republic of China: The Communist Revolution, 1900 to Present. (4 cr, §3468; prereq 3468) Farmer

Impact of industrialization on family life, economic role of women, educational opportunities and curriculum, the work ethic and Japanese employment system in 19th and 20th centuries.

Hist 5510. Topics in East Asian History. (4 cr per qtr [may be repeated for cr; prereq #, offered when feasible) Farmer, Marshall, Taylor

Hist 5511. Social and Intellectual Change in Late Chou and Han China. (4 cr; prereq #, offered alt yrs)
Axial Age transcendence of primordial myths in cultural crisis of late Chou and early Han: major schools of philosophy and statecraft; establishment of literati as social elite.

Hist 5515. Local Institutions in Modern China. (4 cr; prereq #, offered alt yrs) Farmer
Marketing system, village, and clan and family structure in rural China; local control devices, religious practices, and status of women.

Hist 5517. Chinese Intellectual History: 20th Century. (4 cr; prereq #, offered alt yrs) Farmer
Cultural change and intellectual currents leading up to May 4th Movement of 1919. Major disputes and problems growing out of that period.

Hist 5518. Chinese Intellectual History: Mao Tse-tung and Marxism. (4 cr; prereq #, offered alt yrs) Farmer
Introduction of Marxism into China; thought and writings of Mao Tse-tung, questions of cultural identity and values in People’s Republic of China.

Hist 5519. Topics in Chinese History. (4 cr; prereq #, offered alt yrs) Farmer
Readings and discussions of topics in recent Chinese history.

Hist 5521. Introductory Proseminar on the Meiji Revolution in Japan. (4 cr; prereq #, offered alt yrs) Marshall
Readings in English on the reforms from 1868 to 1912 and their economic, social, political, and cultural consequences.
Readings in English on current interpretations and topics in Japanese history.

Hist 8465, 8466. Research in Late Imperial China: Yuan, Ming, and Qing. (3 cr per qtr; prereq reading knowledge of Chinese; #; offered when feasible) Farmer, Waltner

Hist 8960. Topics in Chinese History. (4 cr; prereq good reading knowledge of modern Chinese) Farmer, Waltner

Near East
Hist 5730. Proseminar in Middle East History, 16th to 19th Century. (4 cr per qtr [max 12 cr]) Farah
Topics, which vary quarterly, on Mamluk, Safavid-Qajar, and Ottoman era concerning relations with each other and outside world, to include political, diplomatic, and ideological orientations and conflicts; cultural and social trends; commerce; transformations due to Western impact, to secularization, and to modernization and colonial encroachments, which shaped new ideological trends and gave rise to nationalisms and Islamic activism.

Medieval Europe
Hist 5100. Selected Topics in Medieval Europe. (4 cr per qtr; prereq #; offered when feasible) Bachrach, Hanawalt, W Phillips, Reyerson

Hist 5115. Medieval Latin Historians. (4 cr; prereq good reading knowledge of Latin) Bachrach
Writing of history in Western Europe during 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. Original Latin texts only.

Hist 5118. Scandinavia in the Middle Ages. (4 cr, §§Scan 5118, §§Geog 5178) Metcalf, Rice
Team-taught interdisciplinary examination of economic, political, and social history of Scandinavia from late Viking period until circa 1500. Agrarian and urban societies; peasant and elite perspectives; growth of economic, political, religious, and social institutions.

Hist 5134. Russia Before the Mongol Conquest. (4 cr; offered alt yrs) Noonan
Origins and development of the Kievan state, 850-1240.

Hist 5610, 5611, 5612, 5613. Medieval History. (4 cr per qtr; prereq 1 yr of medieval history or equiv, reading knowledge of French or German, #) Bachrach, Hanawalt, W Phillips, Reyerson

Hist 5616. Proseminar: Medieval Spain. (4 cr; prereq #)
Review of secondary literature of history of medieval Spain from Visigothic period to Renaissance. Emphasis on later Middle Ages.

Hist 5620. Selected Topics in Medieval History. (4 cr; prereq 1 yr medieval hist or equiv, reading knowledge of appropriate foreign languages; #) Topics in European and/or Mediterranean history from fall of Roman Empire through end of Middle Ages.

Hist 5634. Proseminar: Medieval Russian History. (4 cr per qtr; prereq #; offered when feasible) Noonan
Hist 5641, 5642, 5643. Proseminar: Medieval English History. (4 cr per qtr; prereq 1 yr medieval hist, reading knowledge of French or German, #) Hanawalt
Major historiographical issues; types of primary source evidence.

Hist 8111-8112-8113†. Medieval History. (3 cr per qtr; prereq #; offered when feasible) Bachrach, Hanawalt, W Phillips, Reyerson
Hist 8141-8142†. Medieval French History. (3 cr per qtr; prereq #; offered when feasible) Bachrach, Reyerson

Early Modern Europe
Hist 5135. From Khan to Tsar: Russia, 1240-1530. (4 cr; offered alt yrs) Noonan
Mongol rule of Russia, rise of Lithuania, emergence of Muscovy.

Hist 5136. From Ivan the Terrible to Peter the Great: Russia, 1530-1700. (4 cr; offered alt yrs) Noonan
Reign of Ivan the Terrible, time of troubles, great Cossack revolt in Ukraine, 17th-century Muscovy, enserfment of peasantry.


Hist 5211. France in the Old Regime. (4 cr; offered when feasible)

Hist 5617. Spain, the Early Modern Period, 1450-1750. (4 cr; prereq #; offered when feasible) C Phillips

Hist 5618. Spanish Paleography: Deciphering Handwriting of the 15th-18th Centuries. (2-4 cr; prereq reading knowledge of Spanish) Practical training in reading handwritten Spanish documents; essential for research in early modern Spain or colonial Spanish America.

Hist 5631. Early Modern History. (4 cr; prereq #; reading knowledge of at least 1 foreign language) Review of secondary literature on processes of global integration ca. 1450-1700 and on comparative study of different regions.

Hist 5635. Early Modern Russian History. (4 cr; prereq #)
Hist 5640. Topics in Early Modern Europe. (4 cr)
Hist 5650. Early Modern Europe, 1450-1650.  
(4 cr [max 12 cr]; prereq #)  
Readings in economic, intellectual, political, and religious history. Students choose one of the following to emphasize: France, Germany, Italy, the Low Countries, or Spain. Countries may vary with instructor.

Hist 5651-5652-5653. English History: Tudor and Stuart Periods.  
(4 cr per qtr; prereq #) Lehmburg  
Critical study of principal writings about English history. 5651: 1485 to 1558. 5652: 1558 to 1625. 5653: 1625 to 1689.

Hist 5715. Readings on European Women's History: 1450-1750.  
(4 cr per qtr; prereq #) Pomata  
Survey of recent literature on social history of European women and introduction to bibliographical and archival resources.

Hist 5961-5962. Expansion of Europe.  
(4 cr per qtr; prereq #)

Modern Europe

Hist 5200. Topics in European History.  
(4 cr) Detailed treatment of selected historical themes. Topics vary quarterly.

Hist 5212. French Revolution and Napoleon.  
(4 cr; offered when feasible)

Hist 5231. Modern France From 1848 to de Gaulle.  
(4-5 cr) Munholland  
Survey of French society and political life from revolution of 1848 to contemporary France. Foreign language component (French) available for an extra credit.

Hist 5249. The History of Poland in the 19th and 20th Centuries.  
(4 cr)

Hist 5265. Modern Russia: The 19th Century.  
(4 cr; offered alt yrs) Stavrou  
Political, cultural, and social developments from Alexander I to the 1905 revolution. The revolutionary movement and consequences of the emancipation of the serfs; Russian industrialization.

Hist 5266. Modern Russia: The 20th Century.  
(4 cr; offered alt yrs) Stavrou  
Fall of the Russian monarchy, revolutions, and Soviet regime.

Hist 5276. Intellectual and Cultural History of Modern Greece.  
(4 cr; offered alt yrs) Stavrou  
Literary and cultural contributions of modern Greece in national and European contexts.

Hist 5284. Diplomatic History of Europe: 1848-1900.  
(4 cr; offered when feasible) Kieft

Hist 5285. Diplomatic History of Europe: 1900-1945.  
(4 cr; offered when feasible) Kieft

Hist 5286. Diplomatic History of Europe: 1945 to Present.  
(4 cr; offered when feasible) Kieft

Hist 5294. Social History of Russia and Eastern Europe.  
(4 cr) Rudolph  
Lives of peasants and workers, nobles, and merchants. Family, marriage, sexuality; culture and tradition; work; social movements (revolutionary, women’s, nationalist); socialist societies and economies; post-community society. Through 19th century.

Hist 5671-5672-5673†. Modern England: 1783 to Present.  
(4 cr per qtr; prereq #; offered alt yrs) Altholz

Hist 5720. Introductory Proseminar in Contemporary Europe.  
(4 cr per qtr; prereq #) Selected topics to introduce problems of interpretation and analysis in contemporary European history from late 19th century to Cold War period.

Hist 5721-5722†. Europe in the 20th Century.  
(4 cr per qtr; prereq #; offered alt yrs) Munholland 5721: Background and impact of World War I. 5722: Interwar years and World War II.

Hist 5735. Readings on European Women's History: 1750-Present.  
(4 cr per qtr; prereq #) Maynes  
Reading and discussion.

Hist 5744. Topics in Modern German History.  
(4 cr; prereq #; offered alt yrs) Kieft, Maynes  
Selected readings and discussions on topics such as the reform era, social crisis of Vörmarz, 1848 revolution, unification, imperial economic development, World War I, growth of German socialism, intellectual history of Weimar, Nazi state.

Hist 5756-5757†. Modern Greek Studies.  
(4 cr per qtr; prereq #; offered alt yrs) Stavrou  
Evolution of modern Greece from middle of 18th century to present. 5756: Political, cultural, and socioeconomic factors that contributed to Greek nationalism and establishment of independent Greece. 5757: Political and cultural developments in 20th century.

Hist 5761. Russian History.  
(4 cr; prereq reading knowledge of Russian or German or French or #; offered alt yrs) Stavrou

Hist 5764, 5765, 5766. New Interpretations and Approaches in Russian History.  
(4 cr; prereq #) Interpreations, methods, and approaches that have revolutionized Russian history since late 1980s. 5764: Medieval and Early Modern periods. 5765: From Peter the Great to present. 5766: Students write substantive essay.
Hist 5777, 5778. Austrian and Habsburg History. (4 cr per qtr; prereq #; offered alt yrs) Good, Rudolph, Wright
5777: Habsburg Central Europe to 1918. 5778: Modern Austria in context of Central and Eastern Europe after 1918.

Hist 5784-5785. Diplomatic History of 19th- and 20th-Century Europe. (4 cr per qtr; prereq #; offered when feasible) Kieft

Hist 5791, 5792. Social History of Modern Europe Since 1750. (4 cr per qtr; prereq #; offered when feasible) Rudolph

Hist 5793, 5794. Readings in European Economic History: 1750 to Present. (4 cr per qtr; prereq #)
5793: Europe’s rise in world economy, England’s industrial revolution; uneven spread of development within Europe. 5794: Late-nineteenth-century capitalism and imperialism, interwar economic instability, post-World War II economic miracle in western Europe, continuity and change in eastern Europe.

Hist 8150. Seminar in English History. (3 cr [may be repeated for cr]; prereq #; offered when feasible) Altholz, Hanawalt, Lehmberg

Hist 8223. Recent European History. (3 cr; prereq #; Munholland

Hist 8260. Research in Modern European History. (4 cr; prereq #)

Hist 8735. Research on European Women’s History: 1750 to Present. (4 cr; prereq 5735, one European language, #; Maynes)
Follows 5735. Research project based on primary sources identified in 5735.

Latin America

Hist 5420. Topics in Latin American History. (4 cr per qtr; prereq #; McCaa, C Phillips, Schwartz, Valdes)
Detailed treatment of historical themes common to entire Latin American area. Topics vary quarterly.

Hist 5901, 5902. Latin American History. (4 cr per qtr; prereq reading knowledge of Spanish, #; McCaa, Schwartz, Valdes)
Designed for beginning graduate students as an introduction to major historical writings on various Latin American themes.

Hist 8401-8403. Latin American History. (3 cr per qtr; prereq #; offered when feasible) McCaa, Schwartz

United States

Hist 5331, 5332. American Constitutional History. (4 cr per qtr; offered alt yrs) Murphy
Origins and development of constitutional government in America with emphasis on role of constitutional politics in evolution of public policy. 5331: English and colonial background through reconstruction. 5332: Constitution and the rule of law in modern America.

Hist 5334. American Legal History. (4 cr; Murphy
History of American law from English antecedents, American reception, Americanization, and development of American legal institutions and legal culture through the rise and decline of legal realism.

Hist 5349. Social Welfare in America. (4 cr; Chambers
Advanced survey of social services, public policies, and profession of social work—colonial era to present. Issues include dependency, deviancy, crime, social security, public health, social reform, functions of public and voluntary institutions (charities, settlements).

Hist 5379. Problems in Colonial American History. (4 cr; prereq 3801 or #; Howe, Menard, Norling, O’Brien-Kehoe
Specific problems in colonial history with emphasis on intellectual and cultural history.

Hist 5381su. Minnesota History Workshop. (5 cr)
Survey of Minnesota history with emphasis on local resources for constructing such accounts, and appropriate methodologies. Themes vary yearly.

Hist 5801-5802†. Seventeenth- and Eighteenth-Century American History. (4 cr per qtr; prereq #; offered alt yrs; Menard, O’Brien-Kehoe

Hist 5807. Research in U.S. Political History. (4 cr; prereq 5805 or 5806 or #; offered when feasible) Howe

Hist 5816. The Beginnings of American Politics. (4 cr; prereq #; offered alt yrs) Howe
Development of American political institutions, behavior, and culture from colonial beginnings through American Revolution and ratification of federal constitution. Emphasis on connections between politics, society, and American culture.

Hist 5817. Proseminar: 19th-Century U.S. Political History. (4 cr; prereq #; offered alt yrs) Howe

Hist 5821-5822. American History in the 20th Century. (4 cr per qtr; prereq #; Berman, Chambers, Spear

Hist 5831-5832†. American Political and Constitutional History. (4 cr per qtr; prereq #; offered alt yrs; Murphy
Reading and research proseminar exploring various dimensions of constitutional politics in American experience. 5831: Late 18th and 19th century. 5832: 20th century.

Hist 5841, 5842. American Economic History. (4 cr per qtr; prereq #; Green
Hist 5844, 5845. American Labor History. (4 cr per qtr; prereq #) Berman
Readings in classics of American labor history. Research methods and materials in labor history.

Hist 5857-5858. Social History of American Women. (4 cr per qtr; prereq #) S Evans, Norling
Survey of historical literature, conceptual frameworks, and methodological problems in history of American women from 1600 to present.

Hist 5861-5862. History of American Immigration. (4 cr per qtr; offered alt yrs) Vecoli
Readings in the historiography of immigration and ethnic groups.

Hist 5871-5872. Intellectual History of the United States in the 19th and 20th Centuries. (4 cr per qtr; prereq #) Noble
Writings of current scholars of American culture that express paradigmatic conflicts in study of ideas and values.

Hist 5881, 5882. American Foreign Relations. (4 cr per qtr; offered alt yrs) Brauer
Intensive readings in the historiography of American foreign relations with emphasis on American imperialism, domestic sources of foreign policy, and international political, economic, and cultural relations. 5881: To 1900. 5882: Since 1900.

Hist 5900. Topics in American Indian Social History. (4 cr; max 12 cr; prereq #) O’Brien-Kehoe
Social history of American Indian groups, focusing on historical demography, gender roles, interracial relationships, urbanization, and internal differences within Indian communities.

Hist 5910. Topics in American History. (4 cr; prereq #)
Cultural, social, economic, and political concerns in the United States and its constituent elements.

Hist 5957. Law, Society, and American Criminal Justice. (4 cr; prereq #) Samaha
Readings in societal, legal, and ideological development of modern American criminal justice, focusing on influences of ideology, politics, culture, social science on law and criminal justice.

Hist 8239-8240. Gender, Race, Class, and/or Ethnicity in America. (4 cr per qtr [max 12 cr for 8240], §AmSt 8239, §AmSt 8240; prereq # or ∆ for 8239, 8239 or # or ∆ for 8240) E May
Social, psychological, historical, and artistic modes of self-expression and intellectual analysis of people in the United States identified as female and male or as members of racial, ethnic, or national-origin groups. 8239: Research strategies. 8240: Topical development.

Hist 8347. Social History of American Women. (4 cr; prereq 5857-5858, #; offered when feasible) S Evans, Norling

Hist 8381. History of American Foreign Relations. (3 cr; prereq 5881, 5882, #; offered when feasible) Brauer

History of Medicine and Biological Sciences (HMed)
Professor: Leonard G. Wilson, head and director of graduate studies
Associate Professor: John H. Beatty; John M. Eyler

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degree Offered—M.A. (Plan A only) and Ph.D.

Curriculum—Candidates for the master’s degree take 21 credits in the history of medicine and 8 credits in history. Doctoral students complete approximately 54 credits in the history of medicine, history of science, history, and science.

Prerequisites for Admission—Applicants for the master’s degree should already possess either the M.D. degree, or a Ph.D. or master’s degree in a medical or biological science. Applicants for the Ph.D. degree should either possess the M.S. degree, or have extensive training in the biological sciences basic to medicine or in public health.

Special Application Requirements—Three letters of recommendation from former teachers and scores from the General (Aptitude) and Subject (Advanced) Tests of the Graduate Record Examination are required of all applicants. New students are admitted quarterly.

Master’s Degree Requirements—The program is intended to be completed within four to six academic quarters of full-time study, or an equivalent period of part-time study. Each candidate will be required to submit a 40- to 50-page thesis on a subject in the history of medicine based on historical research in primary sources with proper citation of the sources used.

Doctoral Degree Requirements—Survey courses in the history of medicine and history of science are required. Other courses are chosen on the advice of the director of graduate studies. Students are required to take their minor or supporting field in history, unless they already possess extensive training in history.

Language Requirements—Master’s students must demonstrate competence in one foreign
language, preferably French or German. Doctoral students must demonstrate competence in two foreign languages, preferably French and German. Doctoral students must pass the examination in one foreign language before the end of their first academic year and in the second language before the end of their second academic year. For students interested in a historical period before 1800, Latin is a third required foreign language.

Minor Requirements for Students Majoring in Other Fields—Master’s degree students with a minor in history of medicine and history of the biological sciences must complete the sequence of survey courses in the history of medicine (5400, 5401, 5402) and the seminar (5410-5411-5412). Ph.D. students with a minor in history of medicine and history of the biological sciences must complete the same course requirements as for the M.A. minor and take written and oral examinations.

For Further Information and Applications—Write to the Department of History of Medicine, University of Minnesota, Box 506 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (mailing address) (612/624-4416).

HMed 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

HMed 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

HMed 8888. Thesis Credits: Doctoral. (36 cr required)

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.

Formulation of the germ theory of disease and consequences for medical procedures (therapeutics, surgery, management of hospitals), public health programs, and structure and prestige of the medical profession.

HMed 5045. Medical Profession in America. (4 cr, §Hist 5045) Eyler
Historical analysis of the American medical profession in the 19th and 20th centuries; role of institutions, influence of social and moral values, and consequences of specialization and scientific innovation.

HMed 5102. Medicine and Society in the Enlightenment. (4 cr, §Hist 5702; prereq #) Eyler
Seminar dealing with the interrelations of medicine and society from the late 17th to the early 19th centuries. Emphasis on methods and materials used by medical historians. Readings and research.

HMed 5120-5130. Historical Topics: Medicine and the Modern State. (4 cr per qtr [sequence may be repeated for max 16 cr], §Hist 5940-5950; prereq #) Eyler
Topics vary yearly. Emphasis on mid-18th century to the present.

HMed 5400. Early History of Medicine to 1650. (4 cr; offered alt yrs) Wilson
Paleopathology, primitive medicine, medicine in ancient Egypt and Mesopotamia, Greek medicine in classical times and under Roman Empire, transmission of Greek medicine through the Arabs to the Latin West, medieval medicine. Andreas Vesalius and the revival of anatomy, William Harvey and the discovery of circulation of the blood.

HMed 5401. Medicine During the Scientific Revolution: 1650-1850. (4 cr; offered alt yrs) Wilson
Thomas Sydenham and the concept of distinct diseases, new chemical and mechanical theories of medicine, rise of medical teaching, pathological anatomy and definition of new diseases, impact of chemistry and physics on medicine in early 19th century, cell theory, discovery of anesthesia.

HMed 5402. Medicine Since 1850. (4 cr; offered alt yrs) Wilson
Controversy over spontaneous generation and germ theory of disease, development of antiseptic surgery, the public health movement, revolution in basic medical sciences, reform of medical education and growth of medical specialties, changing relationship of medicine to society.

HMed 5410f-5411w-5412s†. Seminar: Emergence of Modern Medicine, 1750-1900. (3 cr per qtr; prereq 3001, 3002, 3003, Hist 3031, Hist 3032, Hist 3033 or 5400, 5401, 5402) Wilson

HMed 8630, 8631, 8632f, w.s. Directed Study. (3 cr per qtr [max 15 cr]; prereq #)
Work on a tutorial basis.